SYBASE®

Reference Manual: Commands

Adaptive Server® Enterprise

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About This Book

The *Adaptive Server Reference Manual* includes four guides to Sybase® Adaptive Server® Enterprise and the Transact-SQL® language:

- *Building Blocks* describes the "parts" of Transact-SQL: datatypes, built-in functions, global variables, expressions and identifiers, reserved words, and SQLSTATE errors. Before you can use Transact-SQL sucessfully, you need to understand what these building blocks do and how they affect the results of Transact-SQL statements.
- *Commands* provides reference information about the Transact-SQL commands, which you use to create statements.
- *Procedures* provides reference information about system procedures, catalog stored procedures, extended stored procedures, and dbcc stored procedures. All procedures are created using Transact-SQL statements.
- *Tables* provides reference information about the system tables, which store information about your server, databases, users, and other details of your server. It also provides information about the tables in the dbccdb and dbccalt databases.

Audience

The *Adaptive Server Reference Manual* is intended as a reference tool for Transact-SQL users of all levels.

How to use this book

- Chapter 1, "Commands," lists the Adaptive Server commands in a table that provides the name and a brief description. Click on a command name in Table 1-1 on page 1 to go directly to the command.

Complex commands, such as select, are divided into subsections. For example, there are reference pages on the compute clause and on the group by and having clauses of the select command.

Related documents

The Sybase Adaptive Server Enterprise documentation set consists of the following:

- The release bulletin for your platform – contains last-minute information that was too late to be included in the books.

A more recent version of the release bulletin may be available on the World Wide Web. To check for critical product or document information that was added after the release of the product CD, use the Sybase Technical Library.

- The *Installation Guide* for your platform – describes installation, upgrade, and configuration procedures for all Adaptive Server and related Sybase products.
- *What's New in Adaptive Server Enterprise?* – describes the new features in Adaptive Server version 12.5.1, the system changes added to support those features, and the changes that may affect your existing applications.
- *ASE Replicator User's Guide* – describes how to use the ASE Replicator feature of Adaptive Server to implement basic replication from a primary server to one or more remote Adaptive Servers.
- *Component Integration Services User's Guide* – explains how to use the Adaptive Server Component Integration Services feature to connect remote Sybase and non-Sybase databases.
- *Configuring Adaptive Server Enterprise* for your platform – provides instructions for performing specific configuration tasks for Adaptive Server.
- *EJB Server User's Guide* – explains how to use EJB Server to deploy and execute Enterprise JavaBeans in Adaptive Server.
- *Error Messages and Troubleshooting Guide* – explains how to resolve frequently occurring error messages and describes solutions to system problems frequently encountered by users.
- *Full-Text Search Specialty Data Store User's Guide* – describes how to use the Full-Text Search feature with Verity to search Adaptive Server Enterprise data.
- *Glossary* – defines technical terms used in the Adaptive Server documentation.
- *Historical Server User's Guide* – describes how to use Historical Server to obtain performance information for SQL Server® and Adaptive Server.
- *Java in Adaptive Server Enterprise* – describes how to install and use Java classes as data types, functions, and stored procedures in the Adaptive Server database.

- *Job Scheduler User's Guide* – provides instructions on how to install and configure, and create and schedule jobs on a local or remote Adaptive Server using the command line or a graphical user interface (GUI).
- *Monitor Client Library Programmer's Guide* – describes how to write Monitor Client Library applications that access Adaptive Server performance data.
- *Monitor Server User's Guide* – describes how to use Monitor Server to obtain performance statistics from SQL Server and Adaptive Server.
- *Performance and Tuning Guide* – is a series of four books that explains how to tune Adaptive Server for maximum performance:
  - *Basics* – the basics for understanding and investigating performance questions in Adaptive Server.
  - *Locking* – describes how the various locking schemas can be used for improving performance in Adaptive Server.
  - *Optimizer and Abstract Plans* – describes how the optimizer processes queries and how abstract plans can be used to change some of the optimizer plans.
  - *Monitoring and Analyzing* – explains how statistics are obtained and used for monitoring and optimizing performance.
- *Quick Reference Guide* – provides a comprehensive listing of the names and syntax for commands, functions, system procedures, extended system procedures, datatypes, and utilities in a pocket-sized book.
- *Reference Manual* – is a series of four books that contains the following detailed Transact-SQL® information:
  - *Building Blocks* – Transact-SQL datatypes, functions, global variables, expressions, identifiers and wildcards, and reserved words.
  - *Commands* – Transact-SQL commands.
  - *Procedures* – Transact-SQL system procedures, catalog stored procedures, system extended stored procedures, and `dbcc` stored procedures.
  - *Tables* – Transact-SQL system tables and `dbcc` tables.

- *System Administration Guide* – provides in-depth information about administering servers and databases. This manual includes instructions and guidelines for managing physical resources, security, user and system databases, and specifying character conversion, international language, and sort order settings.
- *System Tables Diagram* – illustrates system tables and their entity relationships in a poster format. Available only in print version.
- *Transact-SQL User's Guide* – documents Transact-SQL, Sybase's enhanced version of the relational database language. This manual serves as a textbook for beginning users of the database management system. This manual also contains descriptions of the pubs2 and pubs3 sample databases.
- *Using Adaptive Server Distributed Transaction Management Features* – explains how to configure, use, and troubleshoot Adaptive Server DTM features in distributed transaction processing environments.
- *Using Sybase Failover in a High Availability System* – provides instructions for using Sybase's Failover to configure an Adaptive Server as a companion server in a high availability system.
- *Utility Guide* – documents the Adaptive Server utility programs, such as isql and bcp, which are executed at the operating system level.
- *Web Services User's Guide* – explains how to configure, use, and troubleshoot Web Services for Adaptive Server.
- *XA Interface Integration Guide for CICS, Encina, and TUXEDO* – provides instructions for using the Sybase DTM XA interface with X/Open XA transaction managers.
- *XML Services in Adaptive Server Enterprise* – describes the Sybase native XML processor and the Sybase Java-based XML support, introduces XML in the database, and documents the query and mapping functions that comprise XML Services.

Other sources of information

Use the Sybase Getting Started CD, the Sybase Technical Library CD and the Technical Library Product Manuals Web site to learn more about your product:

- The Getting Started CD contains release bulletins and installation guides in PDF format, and may also contain other documents or updated information not included on the Technical Library CD. It is included with your software. To read or print documents on the Getting Started CD you need Adobe Acrobat Reader (downloadable at no charge from the Adobe Web site, using a link provided on the CD).

- The Technical Library CD contains product manuals and is included with your software. The DynaText reader (included on the Technical Library CD) allows you to access technical information about your product in an easy-to-use format.

  Refer to the *Technical Library Installation Guide* in your documentation package for instructions on installing and starting the Technical Library.

- The Technical Library Product Manuals Web site is an HTML version of the Technical Library CD that you can access using a standard Web browser. In addition to product manuals, you will find links to EBFs/Updates, Technical Documents, Case Management, Solved Cases, newsgroups, and the Sybase Developer Network.

  To access the Technical Library Product Manuals Web site, go to Product Manuals at http://www.sybase.com/support/manuals/.

Sybase certifications on the Web

Technical documentation at the Sybase Web site is updated frequently.

❖ **Finding the latest information on product certifications**

1. Point your Web browser to Technical Documents at http://www.sybase.com/support/techdocs/.
2. Select Products from the navigation bar on the left.
3. Select a product name from the product list and click Go.
4. Select the Certification Report filter, specify a time frame, and click Go.
5. Click a Certification Report title to display the report.

❖ **Creating a personalized view of the Sybase Web site (including support pages)**

Set up a MySybase profile. MySybase is a free service that allows you to create a personalized view of Sybase Web pages.

1. Point your Web browser to Technical Documents at http://www.sybase.com/support/techdocs/.
2. Click MySybase and create a MySybase profile.

Sybase EBFs and software maintenance

❖ **Finding the latest information on EBFs and software maintenance**

1. Point your Web browser to the Sybase Support Page at http://www.sybase.com/support.

2 Select EBFs/Maintenance. Enter user name and password information, if prompted (for existing Web accounts) or create a new account (a free service).

3 Select a product.

4 Specify a time frame and click Go.

5 Click the Info icon to display the EBF/Maintenance report, or click the product description to download the software.

Conventions

The following sections describe conventions used in this manual.

SQL is a free-form language. There are no rules about the number of words you can put on a line or where you must break a line. However, for readability, all examples and most syntax statements in this manual are formatted so that each clause of a statement begins on a new line. Clauses that have more than one part extend to additional lines, which are indented. Complex commands are formatted using modified Backus Naur Form (BNF) notation.

Table 1 shows the conventions for syntax statements that appear in this manual:

Table 1: Font and syntax conventions for this manual

Element	Example
Command names, command options, utility names, utility options, and other keywords are in "command" font (Arial, 8 point).	select sp_configure
Database names, datatypes, file names and path names are in "database object" font (Arial, 8 point).	master database
Book names, file names, variables, and path names are in italics.	*System Administration Guide* *sql.ini* file *column_name* *$SYBASE/ASE* directory
Variables, or words that stand for values that you fill in, are in "variable" font (Italics).	select *column_name* from *table_name* where *search_conditions*
Type parentheses as part of the command.	compute *row_aggregate* (*column_name*)
Double colon, equals sign indicates that the syntax is written in BNF notation. Do not type this symbol. Indicates "is defined as".	::=
Curly braces mean that you must choose at least one of the enclosed options. Do not type the braces.	{cash, check, credit}

Element	Example
Brackets mean that to choose one or more of the enclosed options is optional. Do not type the brackets.	[cash | check | credit]
The comma means you may choose as many of the options shown as you want. Separate your choices with commas as part of the command.	cash, check, credit
The pipe or vertical bar (|) means you may select only one of the options shown.	cash | check | credit
An ellipsis (...) means that you can repeat the last unit as many times as you like.	buy thing = price [cash | check | credit] [, thing = price [cash | check | credit]]... You must buy at least one thing and give its price. You may choose a method of payment: one of the items enclosed in square brackets. You may also choose to buy additional things: as many of them as you like. For each thing you buy, give its name, its price, and (optionally) a method of payment.

- Syntax statements (displaying the syntax and all options for a command) appear as follows:

  sp_dropdevice [*device_name*]

  or, for a command with more options:

  select *column_name*
  from *table_name*
  where *search_conditions*

  In syntax statements, keywords (commands) are in normal font and identifiers are in lowercase. Italic font shows user-supplied words.

- Examples showing the use of Transact-SQL commands are printed like this:

```
select * from publishers
```

- Examples of output from the computer appear as follows:

```
pub_id    pub_name                city          state
-------   ---------------------   -----------   -----
0736      New Age Books           Boston        MA
0877      Binnet & Hardley        Washington    DC
1389      Algodata Infosystems    Berkeley      CA

(3 rows affected)
```

In this manual, most of the examples are in lowercase. However, you can disregard case when typing Transact-SQL keywords. For example, SELECT, Select, and select are the same.

Adaptive Server's sensitivity to the case of database objects, such as table names, depends on the sort order installed on Adaptive Server. You can change case sensitivity for single-byte character sets by reconfiguring the Adaptive Server sort order. For more information, see the *System Administration Guide*.

If you need help

Each Sybase installation that has purchased a support contract has one or more designated people who are authorized to contact Sybase Technical Support. If you cannot resolve a problem using the manuals or online help, please have the designated person contact Sybase Technical Support or the Sybase subsidiary in your area.

CHAPTER 1

Commands

This volume describes commands, clauses, and other elements used to construct a Transact-SQL statement.

Overview

Table 1-1 provides a brief description of the commands in this chapter.

Table 1-1: Transact-SQL commands

Command	Description
alter database	Increases the amount of space allocated to a database.
alter role	Defines mutually exclusive relationships between roles and adds, drops, and changes passwords for roles.
alter table	Adds new columns; adds, changes, or drops constraints, changes constraints; partitions or unpartitions an existing table.
begin...end	Encloses a series of SQL statements so that control-of-flow language, such as if...else, can affect the performance of the whole group.
begin transaction	Marks the starting point of a user-defined transaction.
break	Causes an exit from a while loop. break is often activated by an if test.
case	Allows SQL expressions to be written for conditional values. case expressions can be used anywhere a value expression can be used.
checkpoint	Writes all *dirty* pages (pages that have been updated since they were last written) to the database device.
close	Deactivates a cursor.
coalesce	Allows SQL expressions to be written for conditional values. coalesce expressions can be used anywhere a value expression can be used; alternative for a case expression.
commit	Marks the ending point of a user-defined transaction.
compute clause	Generates summary values that appear as additional rows in the query results.
connect to...disconnect	Specifies the server to which a passthrough connection is required.
continue	Causes the while loop to restart. continue is often activated by an if test.
create database	Creates a new database.
create default	Specifies a value to insert in a column (or in all columns of a user-defined datatype) if no value is explicitly supplied at insert time.

Command	Description
create existing table	Confirms that the current remote table information matches the information that is stored in *column_list*, and verifies the existence of the underlying object.
create function (SQLJ)	
create index	Creates an index on one or more columns in a table.
create plan	Creates an abstract query plan.
create procedure	Creates a stored procedure that can take one or more user-supplied parameters.
create proxy_table	Creates a proxy table without specifying a column list. Component Integration Services derives the column list from the metadata it obtains from the remote table.
create role	Creates a user-defined role.
create rule	Specifies the domain of acceptable values for a particular column or for any column of a user-defined datatype.
create schema	Creates a new collection of tables, views and permissions for a database user.
create table	Creates new tables and optional integrity constraints.
create trigger	Creates a trigger, a type of stored procedure often used for enforcing integrity constraints. A trigger executes automatically when a user attempts a specified data modification statement on a specified table.
create view	Creates a view, which is an alternative way of looking at the data in one or more tables.
dbcc	Database Consistency Checker (dbcc) checks the logical and physical consistency of a database. Use dbcc regularly as a periodic check or if you suspect any damage.
deallocate cursor	Makes a cursor inaccessible and releases all memory resources committed to that cursor.
declare	Declares the name and type of local variables for a batch or procedure.
declare cursor	Defines a cursor.
delete	Removes rows from a table.
delete statistics	Removes statistics from the sysstatistics system table.
disk init	Makes a physical device or file usable by Adaptive Server.
disk mirror	Creates a software mirror that immediately takes over when the primary device fails.
disk refit	Rebuilds the master database's sysusages and sysdatabases system tables from information contained in sysdevices. Use disk refit after disk reinit as part of the procedure to restore the master database.
disk reinit	Rebuilds the master database's sysdevices system table. Use disk reinit as part of the procedure to restore the master database.
disk remirror	Reenables disk mirroring after it is stopped by failure of a mirrored device or temporarily disabled by the disk unmirror command.
disk resize	Dynamically increase the size of database devices, rather than initializing a new device
disk unmirror	Disables either the original device or its mirror, allowing hardware maintenance or the changing of a hardware device.
drop database	Removes one or more databases from a Adaptive Server.
drop default	Removes a user-defined default.

Command	Description
drop function (SQLJ)	
drop index	Removes an index from a table in the current database.
drop procedure	Removes user-defined stored procedures.
drop role	Removes a user-defined role.
drop rule	Removes a user-defined rule.
drop table	Removes a table definition and all of its data, indexes, triggers, and permission specifications from the database.
drop trigger	Removes a trigger.
drop view	Removes one or more views from the current database.
dump database	Makes a backup copy of the entire database, including the transaction log, in a form that can be read in with load database. Dumps and loads are performed through Backup Server.
dump transaction	Makes a copy of a transaction log and removes the inactive portion.
execute	Runs a system procedure, a user-defined stored procedure, or a dynamically constructed Transact-SQL command.
fetch	Returns a row or a set of rows from a cursor result set.
goto label	Branches to a user-defined label.
grant	Assigns permissions to users or to user-defined roles.
grant dbcc	Allows the System Administrator to grant access on certain dbcc commands.
group by and having clauses	Used in select statements to divide a table into groups and to return only groups that match conditions in the having clause.
if...else	Imposes conditions on the execution of a SQL statement.
insert	You can use the insert command to create a new file directory. To do so, use only the filename, filetype and content columns. You specify “DIR” as the filetype, then filename is created as a directory.
kill	Kills a process.
load database	Loads a backup copy of a user database, including its transaction log.
load transaction	Loads a backup copy of the transaction log.
lock table	Explicitly locks a table within a transaction.
nullif	Allows SQL expressions to be written for conditional values. nullif expressions can be used anywhere a value expression can be used; alternative for a case expression.
online database	Marks a database available for public use after a normal load sequence and, if needed, upgrades a loaded database and transaction log dumps to the current version of Adaptive Server.
open	Opens a cursor for processing.
order by clause	Returns query results in the specified column(s) in sorted order.
prepare transaction	Used by DB-Library™ in a two-phase commit application to see if a server is prepared to commit a transaction.
print	Prints a user-defined message on the user’s screen.

Command	Description
quiesce database	Suspends and resumes updates to a specified list of databases.
raiserror	Prints a user-defined error message on the user's screen and sets a system flag to record that an error condition has occurred.
readtext	Reads text and image values, starting from a specified offset and reading a specified number of bytes or characters.
reconfigure	The reconfigure command currently has no effect; it is included to allow existing scripts to run without modification. In previous releases, reconfigure was required after the sp_configure system procedure to implement new configuration parameter settings.
remove java	Removes one or more Java-SQL classes, packages, or JARs from a database. Use when Java is enabled in the database.
reorg	Reclaims unused space on pages, removes row forwarding, or rewrites all rows in the table to new pages, depending on the option used.
return	Exits from a batch or procedure unconditionally, optionally providing a return status. Statements following return are not executed.
revoke	Revokes permissions or roles from users or roles.
revoke dbcc	Allows the System Administrator to revoke access on some dbcc commands.
rollback	Rolls a user-defined transaction back to the last savepoint inside the transaction or to the beginning of the transaction.
rollback trigger	Rolls back the work done in a trigger, including the update that caused the trigger to fire, and issues an optional raiserror statement.
save transaction	Sets a savepoint within a transaction.
select	Retrieves rows from database objects.
set	Sets Adaptive Server query-processing options for the duration of the user's work session. Can be used to set some options inside a trigger or stored procedure. Can also be used to activate or deactivate a role in the current session.
setuser	Allows a Database Owner to impersonate another user.
shutdown	Shuts down Adaptive Server or a Backup Server™. This command can be issued only by a System Administrator.
truncate table	Removes all rows from a table.
union operator	Returns a single result set that combines the results of two or more queries. Duplicate rows are eliminated from the result set unless the all keyword is specified.
update	Changes data in existing rows, either by adding data or by modifying existing data; updates all statistics information for a given table; updates information about the number of pages in each partition for a partitioned table; updates information about the distribution of key values in specified indexes.
use	Specifies the database with which you want to work.
waitfor	Specifies a specific time, a time interval, or an event for the execution of a statement block, stored procedure, or transaction.
where clause	Sets the search conditions in a select, insert, update, or delete statement.

Command	Description
while	Sets a condition for the repeated execution of a statement or statement block. The statement(s) execute repeatedly, as long as the specified condition is true.
writetext	Permits non-logged, interactive updating of an existing text or image column.

alter database

Description

Increases the amount of space allocated to a database.

Syntax

```
alter database database_name
        [on {default | database_device } [= size]
            [, database_device [= size]]...]
        [log on { default | database_device } [ = size ]
            [ , database_device [= size]]...]
        [with override]
        [for load]
        [for proxy_update]
```

Parameters

database_name

is the name of the database. The database name can be a literal, a variable, or a stored procedure parameter.

on

indicates a size and/or location for the database extension. If you have your log and data on separate device fragments, use this clause for the data device and the log on clause for the log device.

default

indicates that alter database can put the database extension on any default database device(s) (as shown by sp_helpdevice on page 281 in *Reference Manual: Procedures*). To specify a size for the database extension without specifying the exact location, use this command:

```
on default = size
```

To change a database device's status to default, use the system procedure sp_diskdefault.

database_device

is the name of the database device on which to locate the database extension. A database can occupy more than one database device with different amounts of space on each. Add database devices to Adaptive Server with disk init.

size
is the amount of space to allocate to the database extension. size can be in the following unit specifiers: 'k' or 'K' (kilobytes), 'm' or 'M' (megabytes), and 'g' or 'G' (gigabytes). Sybase recommends that you always include a unit specifier. If you do not specify a value, alter database extends a database by 1MB or 4 allocation unit, whichever is larger. The following table describes the minimum amounts:

Server's logical page size	Database extended by:
2K	1MB
4K	1MB
8K	2MB
16K	4MB

log on
indicates that you want to specify additional space for the database's transaction logs. The log on clause uses the same defaults as the on clause.

with override
forces Adaptive Server to accept your device specifications, even if they mix data and transaction logs on the same device, thereby endangering up-to-the-minute recoverability for your database. If you attempt to mix log and data on the same device without using this clause, the alter database command fails. If you mix log and data, and use with override, you are warned, but the command succeeds.

for load
is used only after create database for load, when you must re-create the space allocations and segment usage of the database being loaded from a dump.

for proxy_update
forces the re-synchronization of proxy tables within the proxy database.

Examples

Example 1 Adds 1MB to the with a 2K page size database mydb on a default database device:

```
alter database mydb
```

Example 2 Adds 3MB to the space allocated for the pubs2 database on the database device named newdata:

```
alter database pubs2 on newdata = 3
```

If you do not provide a unit specifier for *size*, the value provided for newdata is presumed to be in megabytes.

Example 3 Adds 10MB of space for data on userdata1 and 2MB for the log on logdev:

```
alter database production
on userdata1 = "10M"
log on logdev = '2.5m'
```

You can use both single and double quotes, and both “m” and “M” as size specifiers.

Usage

Restrictions

- alter database for proxy update drops all proxy tables in the proxy database.
- Quotes are optional if you do not include a unit specifier. However, you must use quotes if you include a unit specifier.
- If you do not include a unit specifier, Adaptive Server interprets the size in terms of megabytes of disk space, and this number is converted to the logical page size the server uses.
- Adaptive Server reports an error if the total size of all fixed-length columns, plus the row overhead, is greater than the table’s locking scheme and page size allows.
- If you create a data-ony locking (DOL) table with a variable-length column that exceeds a 8191-byte offset, you cannot add any rows to the column.
- Because Adaptive Server allocates space for databases for create database and alter database in chunks of 256 logical pages, these commands round the specified size down to the nearest multiple of allocation units.
- You can specify the *size* as a float datatype, however, the size is rounded down to the nearest multiple of the allocation unit.
- The minimum size that space is allocated to a database is the larger of:
  - One megabyte.
  - One allocation unit of the server’s logical page size.
- Although Adaptive Server does create tables in the following circumstances, you will receive errors about size limitations when you perform data manipulation language operations:
  - If the total row size for rows with variable-length columns exceeds the maximum column size.

  - If the length of a single variable-length column exceeds the maximum column size.
  - For DOL tables, if the offset of any variable-length column other than the initial column exceeds the limit of 8191 bytes.

- If Adaptive Server cannot allocate the requested space, it comes as close as possible per device and prints a message telling how much space has been allocated on each database device.
- You must be using the master database, or executing a stored procedure in the master database, to use alter database.
- If Adaptive Server cannot allocate the requested space, it comes as close as possible per device and prints a message telling how much space has been allocated on each database device.
- You can expand the master database only on the master device. An attempt to use alter database to expand the master database to any other database device results in an error message. Here is an example of the correct statement for modifying the master database on the master device:

```
alter database master on master = 1
```

- Each time you allocate space on a database device with create database or alter database, that allocation represents a device fragment, and the allocation is entered as a row in sysusages.
- If you use alter database on a database that is in the process of being dumped, the alter database command cannot complete until the dump finishes. Adaptive Server locks the in-memory map of database space use during a dump. If you issue an alter database command while this in-memory map is locked, Adaptive Server updates the map from the disk after the dump completes. If you interrupt alter database, Adaptive Server instructs you to run sp_dbremap. If you fail to run sp_dbremap, the space you added does not become available to Adaptive Server until the next reboot.
- You can use alter database on database_device on an offline database.

Backing up *master* after allocating more space

- Back up the master database with the dump database command after each use of alter database. This makes recovery easier and safer in case master becomes damaged.
- If you use alter database and fail to back up master, you may be able to recover the changes with disk refit.

Placing the log on a separate device

- To increase the amount of storage space allocated for the transaction log when you have used the log on extension to create database, give the name of the log's device in the log on clause when you issue the alter database command.
- If you did not use the log on extension of create database to place your logs on a separate device, you may not be able to recover fully in case of a hard disk crash. In this case, you can extend your logs by using alter database with the log on clause, then using sp_logdevice.

Getting help on space usage

- To see the names, sizes, and usage of device fragments already in use by a database, execute sp_helpdb *dbname*.
- To see how much space the current database is using, execute sp_spaceused.

The *system* and *default* segments

- The system and default segments are mapped to each new database device included in the on clause of an alter database command. To unmap these segments, use sp_dropsegment.
- When you use alter database (without override) to extend a database on a device already in use by that database, the segments mapped to that device are also extended. If you use the override clause, all device fragments named in the on clause become system/default segments, and all device fragments named in the log on clause become log segments.

Using *alter database* to awaken sleeping processes

- If user processes are suspended because they have reached a last-chance threshold on a log segment, use alter database to add space to the log segment. The processes awaken when the amount of free space exceeds the last-chance threshold.

Using *for proxy_update*

- If the for proxy_update clause is entered with no other options, the size of the database will not be extended; instead, the proxy tables, if any, will be dropped from the proxy database and re-created from the metadata obtained from the pathname specified during create database ... with default_location = 'pathname'.
- If this command is used with other options to extend the size of the database, the proxy table synchronization is performed after the size extensions are made.

- The purpose of this alter database extension is to provide the DBA with an easy-to-use, single-step operation with which to obtain an accurate and up-to-date proxy representation of all tables at a single remote site.
- This re-synchronization is supported for all external data sources, and not just the primary server in a HA-cluster environment. Also, a database need not have been created with the for proxy_update clause. If a default storage location has been specified, either through the create database command or with sp_defaultloc, the metadata contained within the database can be synchronized with the metadata at the remote storage location.
- To make sure databases are synchronized correctly so that all the proxy tables have the correct schema to the content of the primary database you just reloaded, you may need to run the for proxy_update clause on the server hosting the proxy database.

Standards

ANSI SQL – Compliance level: Transact-SQL extension.

Permissions

alter database permission defaults to the Database Owner. System Administrators can also alter databases.

See also

Commands create database, disk init, drop database, load database

System procedures sp_addsegment, sp_dropsegment, sp_helpdb, sp_helpsegment, sp_logdevice, sp_renamedb, sp_spaceused

alter role

Description

Defines mutually exclusive relationships between roles; adds, drops, and changes passwords for roles; specifies the password expiration interval, the minimum password length, and the maximum number of failed logins allowed for a specified role.

Syntax

alter role *role1* { add | drop } exclusive
{ membership | activation } *role2*

alter role *role_name* [add passwd "*password*" |
drop passwd] [lock | unlock]

alter role { *role_name* | "all overrides" }
set { passwd expiration | min passwd length |
max failed_logins } *option_value*

Parameters

role1
is one role in a mutually exclusive relationship.

add
adds a role in a mutually exclusive relationship; adds a password to a role.

drop
drops a role in a mutually exclusive relationship; drops a password from a role.

exclusive
makes both named roles mutually exclusive.

membership
does not allow you to grant users both roles at the same time.

activation
allows you to grant a user both roles at the same time, but does not allow the user to activate both roles at the same time.

role2
is the other role in a mutually exclusive relationship.

role_name
is the name of the role for which you want to add, drop, or change a password.

passwd
adds a password to a role.

password
is the password to add to a role. Passwords must be at least 6 characters in length and must conform to the rules for identifiers. You cannot use variables for passwords.

lock
locks the specified role.

unlock
unlocks the specified role.

all overrides
applies the setting that follows to the entire server rather than to a specific role.

set
activates the option that follows it.

passwd expiration
specifies the password expiration interval in days. It can be any value between 0 and 32767, inclusive.

min passwd length
specifies the minimum length allowed for the specified password.

max failed_logins
specifies the maximum number of failed login attempts allowed for the specified password.

option_value
specifies the value for passwd expiration, min passwd length, or max failed_logins. To set all overrides, set the value of *option_value* to -1.

Examples

Example 1 Defines intern_role and specialist_role as mutually exclusive:

```
alter role intern_role add exclusive membership specialist_role
```

Example 2 Defines roles as mutually exclusive at the membership level and at the activation level:

```
alter role specialist_role add exclusive membership intern_role
alter role intern_role add exclusive activation surgeon_role
```

Example 3 Adds a password to an existing role:

```
alter role doctor_role add passwd "physician"
```

Example 4 Drops a password from an existing role:

```
alter role doctor_role drop passwd
```

Example 5 Locks the role physician_role:

```
alter role physician_role lock
```

Example 6 Unlocks the role physician_role:

```
alter role physician_role unlock
```

Example 7 Changes the maximum number of failed logins allowed for physician_role to 5:

```
alter role physician_role set max failed_logins 5
```

Example 8 Sets the minimum password length for physician_role, an existing role, to five characters:

```
alter role physician_role set min passwd length 5
```

Example 9 Overrides the minimum password length of all roles:

```
alter role "all overrides" set min passwd length -1
```

Example 10 Removes the overrides for the maximum failed logins for all roles:

```
alter role "all overrides" set max failed_logins -1
```

Usage

- The alter role command defines mutually exclusive relationships between roles and adds, drops, and changes passwords for roles.
- The all overrides parameter removes the system overrides that were set using sp_configure with any of the following parameters:
  - passwd expiration
  - max failed_logins
  - min passwd length

  Dropping the role password removes the overrides for the password expiration and the maximum failed logins options.

Mutually exclusive roles

- You need not specify the roles in a mutually exclusive relationship or role hierarchy in any particular order.
- You can use mutual exclusivity with role hierarchy to impose constraints on user-defined roles.
- Mutually exclusive membership is a stronger restriction than mutually exclusive activation. If you define two roles as mutually exclusive at membership, they are implicitly mutually exclusive at activation.

- If you define two roles as mutually exclusive at membership, defining them as mutually exclusive at activation has no effect on the membership definitions. Mutual exclusivity at activation is added and dropped independently of mutual exclusivity at membership.
- You cannot define two roles as having mutually exclusive after granting both roles to users or roles. Revoke either granted role from existing grantees before attempting to define the roles as mutually exclusive on the membership level.
- If two roles are defined as mutually exclusive at activation, the System Security Officer can assign both roles to the same user, but the user cannot activate both roles at the same time.
- If the System Security Officer defines two roles as mutually exclusive at activation, and users have already activated both roles or, by default, have set both roles to activate at login, Adaptive Server makes the roles mutually exclusive, but issues a warning message naming specific users with conflicting roles. The users' activated roles do not change.

Changing passwords for roles

- To change the password for a role, first drop the existing password, then add the new password, as follows:

```
alter role doctor_role drop passwd
alter role doctor_role add passwd "physician"
```

Note Passwords attached to user-defined roles do not expire.

Standards

ANSI SQL – Compliance level: Transact-SQL extension.

Permissions

Only a System Security Officer can execute alter role.

See also

Documents For more information on altering roles, see the *System Administration Guide*.

Commands create role, drop role, grant, revoke, set

Functions mut_excl_roles, proc_role, role_contain, role_id, role_name

System procedures sp_activeroles, sp_displaylogin, sp_displayroles, sp_modifylogin

alter table

Description

Adds new columns to a table; drops or modifies existing columns; adds, changes, or drops constraints; changes properties of an existing table; enables or disables triggers on a table.

Syntax

```
alter table [[database.][owner].table_name
        { add column_name datatype
            [default {constant_expression | user | null}]
            {identity | null | not null}
            [off row | in row]
            [ [constraint constraint_name]
            { { unique | primary key }
                [clustered | nonclustered]
                [asc | desc]
                [with { fillfactor = pct,
                    max_rows_per_page = num_rows,
                    reservepagegap = num_pages }]
                [on segment_name]
            | references [[database.]owner.]ref_table
                [(ref_column)]
                [match full]
            | check (search_condition) ] ... }
            [, next_column]...
        | add {[constraint constraint_name]
        {  unique | primary key}
                [clustered | nonclustered]
                (column_name [asc | desc]
            [, column_name [asc | desc]...])
            [with { fillfactor = pct,
                    max_rows_per_page = num_rows,
                    reservepagegap = num_pages}]
            [on segment_name]
        | foreign key (column_name [{, column_name}...])
            references [[database.]owner.]ref_table
            [(ref_column [{, ref_column}...])]
            [match full]
        | check (search_condition)}
        | drop {column_name [, column_name]...
            | constraint constraint_name }
        | modify column_name datatype [null | not null]
            [, next_column]...
        | replace column_name
            default { constant_expression | user | null}
        | partition number_of_partitions
        | unpartition
        | { enable | disable } trigger
        | lock {allpages | datarows | datapages } }
        | with exp_row_size=num_bytes
```

Parameters

table_name
is the name of the table to change. Specify the database name if the table is in another database, and specify the owner's name if more than one table of that name exists in the database. The default value for *owner* is the current user, and the default value for *database* is the current database.

add
specifies the name of the column or constraint to add to the table. If Component Integration Services is enabled, you cannot use add for remote servers.

column_name
is the name of a column in that table. If Java is enabled in the database, the column can be a Java-SQL column.

datatype
is any system datatype except bit or any user-defined datatype except those based on bit.

If Java is enabled in the database, can be the name of a Java class installed in the database, either a system class or a user-defined class. Refer to *Java in Adaptive Server Enterprise* for more information.

default
specifies a default value for a column. If you specify a default and the user does not provide a value for this column when inserting data, Adaptive Server inserts this value. The default can be a *constant_expression*, user (to insert the name of the user who is inserting the data), or null (to insert the null value).

Adaptive Server generates a name for the default in the form of *tabname_colname_objid*, where *tabname* is the first 10 characters of the table name, *colname* is the first 5 characters of the column name, and *objid* is the object ID number for the default. Setting the default to null drops the default.

If Component Integration Services is enabled, you cannot use default for remote servers.

constant_expression
is a constant expression to use as a default value for a column. It cannot include global variables, the name of any columns, or other database objects, but can include built-in functions. This default value must be compatible with the datatype of the column.

user
: specifies that Adaptive Server should insert the user name as the default if the user does not supply a value. The datatype of the column must be either char(30), varchar(30), or a type that Adaptive Server implicitly converts to *char*; however, if the datatype is not char(30) or varchar(30), truncation may occur.

null | not null
: specifies Adaptive Server's behavior during data insertion if no default exists.

  null specifies that a column is added that allows nulls. Adaptive Server assigns a null value during inserts if a user does not provide a value.

  not null specifies that a column is added that does not allow nulls. Users must provide a non-null value during inserts if no default exists.

  If you do not specify null or not null, Adaptive Server uses not null by default. However, you can switch this default using sp_dboption to make the default compatible with the SQL standards. If you specify (or imply) not null for the newly added column, a default clause is required. The default value is used for all existing rows of the newly added column, and applies to future inserts as well.

identity
: indicates that the column has the IDENTITY property. Each table in a database can have one IDENTITY column of type numeric and scale zero. IDENTITY columns are not updatable and do not allow nulls.

  IDENTITY columns store sequential numbers, such as invoice numbers or employee numbers, automatically generated by Adaptive Server. The value of the IDENTITY column uniquely identifies each row in a table.

  If Component Integration Services is enabled, you cannot use identity for remote servers.

off row | in row
: specifies whether the Java-SQL column is stored separate from the row or in storage allocated directly in the row.

  The storage for an in row column must not exceed 16K bytes, depending on the page size of the database server and other variables. The default value is off row.

constraint
: introduces the name of an integrity constraint. If Component Integration Services is enabled, you cannot use constraint for remote servers.

constraint_name
is the name of the constraint. It must conform to the rules for identifiers and be unique in the database. If you do not specify the name for a table-level constraint, Adaptive Server generates a name in the form of *tabname_colname_objectid*, where *tabname* is the first 10 characters of the table name, *colname* is the first 5 characters of the column name, and *objectid* is the object ID number for the constraint. If you do not specify the name for a unique or primary key constraint, Adaptive Server generates a name in the format *tabname_colname_tabindid*, where *tabindid* is a string concatenation of the table ID and index ID.

Constraints do not apply to the data that already exists in the table at the time the constraint is added.

unique
constrains the values in the indicated column or columns so that no two rows can have the same non-null value. This constraint creates a unique index that can be dropped only if the constraint is dropped. You cannot use this option along with the null option described above.

primary key
constrains the values in the indicated column or columns so that no two rows can have the same value and so that the value cannot be NULL. This constraint creates a unique index that can be dropped only if the constraint is dropped.

clustered | nonclustered
specifies that the index created by a unique or primary key constraint is a clustered or nonclustered index. clustered is the default (unless a clustered index already exists for the table) for primary key constraints; nonclustered is the default for unique constraints. There can be only one clustered index per table. See create index for more information.

asc | desc
specifies whether the index is to be created in ascending (asc) or descending (desc) order. The default is ascending order.

with fillfactor=*pct*

specifies how full to make each page when Adaptive Server creates a new index on existing data. "pct" stands for percentage. The fillfactor percentage is relevant only when the index is created. As the data changes, the pages are not maintained at any particular level of fullness.

Warning! Creating a clustered index with a fillfactor affects the amount of storage space your data occupies, since Adaptive Server redistributes the data as it creates the clustered index.

The default for fillfactor is 0; this is used when you do not include with fillfactor in the create index statement (unless the value has been changed with sp_configure). When specifying a fillfactor, use a value between 1 and 100.

A fillfactor of 0 creates clustered indexes with completely full pages and nonclustered indexes with completely full leaf pages. It leaves a comfortable amount of space within the index B-tree in both clustered and nonclustered indexes. There is seldom a reason to change the fillfactor.

If the fillfactor is set to 100, Adaptive Server creates both clustered and nonclustered indexes with each page 100 percent full. A fillfactor of 100 makes sense only for read-only tables—tables to which no additional data will ever be added.

fillfactor values smaller than 100 (except 0, which is a special case) cause Adaptive Server to create new indexes with pages that are not completely full. A fillfactor of 10 might be a reasonable choice if you are creating an index on a table that will eventually hold a great deal more data, but small fillfactor values cause each index (or index and data) to take more storage space.

max_rows_per_page=*num_rows*

limits the number of rows on data pages and the leaf level pages of indexes. Unlike fillfactor, the max_rows_per_page value is maintained until it is changed with sp_chgattribute.

If you do not specify a value for max_rows_per_page, Adaptive Server uses a value of 0 when creating the index. When specifying max_rows_per_page for data pages, use a value between 0 and 256. The maximum number of rows per page for nonclustered indexes depends on the size of the index key; Adaptive Server returns an error message if the specified value is too high.

For indexes created by constraints, a max_rows_per_page setting of 0 creates clustered indexes with full pages and nonclustered indexes with full leaf pages. A setting of 0 leaves a comfortable amount of space within the index B-tree in both clustered and nonclustered indexes.

If max_rows_per_page is set to 1, Adaptive Server creates both clustered and nonclustered leaf index pages with one row per page at the leaf level. You can use this to reduce lock contention on frequently accessed data.

Low max_rows_per_page values cause Adaptive Server to create new indexes with pages that are not completely full, use more storage space, and may cause more page splits.

Warning! Creating a clustered index with max_rows_per_page can affect the amount of storage space your data occupies, since Adaptive Server redistributes the data as it creates the clustered index.

---

reservepagegap = *num_pages*

specifies a ratio of filled pages to empty pages to be left during extent I/O allocation operations for the index created by the constraint. For each specified *num_pages*, an empty page is left for future expansion of the table. Valid values are 0 – 255. The default value, 0, leaves no empty pages.

on *segment_name*

specifies that the index is to be created on the named segment. Before the on *segment_name* option can be used, the device must be initialized with disk init, and the segment must be added to the database with the sp_addsegment system procedure. See your System Administrator or use sp_helpsegment for a list of the segment names available in your database.

If you specify clustered and use the on *segment_name* option, the entire table migrates to the segment you specify, since the leaf level of the index contains the actual data pages.

references
: specifies a column list for a referential integrity constraint. You can specify only one column value for a column-constraint. By including this constraint with a table that references another table, any data inserted into the *referencing* table must already exist in the *referenced* table.

  To use this constraint, you must have references permission on the referenced table. The specified columns in the referenced table must be constrained by a unique index (created by either a unique constraint or a create index statement). If no columns are specified, there must be a primary key constraint on the appropriate columns in the referenced table. Also, the datatypes of the referencing table columns must exactly match the datatype of the referenced table columns.

  If Component Integration Services is enabled, you cannot use references for remote servers.

foreign key
: specifies that the listed column(s) are foreign keys in this table whose matching primary keys are the columns listed in the references clause.

ref_table
: is the name of the table that contains the referenced columns. You can reference tables in another database. Constraints can reference up to 192 user tables and internally generated worktables. Use the system procedure sp_helpconstraint to check a table's referential constraints.

ref_column
: is the name of the column or columns in the referenced table.

match full
: specifies that if all values in the referencing columns of a referencing row are:

  - Null – the referential integrity condition is true.
  - Non-null values – if there is a referenced row where each corresponding column is equal in the referenced table, then the referential integrity condition is true.

  If they are neither, then the referential integrity condition is false when:

  - All values are non-null and not equal, or
  - Some of the values in the referencing columns of a referencing row are non-null values, while others are null.

check
specifies a *search_condition* constraint that Adaptive Server enforces for all the rows in the table. If Component Integration Services is enabled, you cannot use check for remote servers.

search_condition
is a boolean expression that defines the check constraint on the column values. These constraints can include:

- A list of constant expressions introduced with in.
- A set of conditions, which may contain wildcard characters, introduced with like.

  An expression can include arithmetic operations and Transact-SQL functions. The *search_condition* cannot contain subqueries, aggregate functions, parameters, or host variables.

next_column
includes additional column definitions (separated by commas) using the same syntax described for a column definition.

drop
specifies the name of a column or constraint to drop from the table. If Component Integration Services is enabled, you cannot use drop for remote servers.

modify
specifies the name of the column whose datatype or nullability you are changing.

replace
specifies the column whose default value you want to change with the new value specified by a following default clause. If Component Integration Services is enabled, you cannot use replace for remote servers.

partition *number_of_partitions*
creates multiple database page chains for the table. Adaptive Server can perform concurrent insertion operations into the last page of each chain. *number_of_partitions* must be a positive integer greater than or equal to 2. Each partition requires an additional control page; lack of disk space can limit the number of partitions you can create in a table. Lack of memory can limit the number of partitioned tables you can access. If Component Integration Services is enabled, you cannot use partition for remote servers.

unpartition
: creates a single page chain for the table by concatenating subsequent page chains with the first one. If Component Integration Services is enabled, you cannot use unpartition for remote servers.

enable | disable trigger
: Enables or disables a trigger. For more information, see the *System Administration Guide*.

lock datarows | datapages | allpages
: changes the locking scheme to be used for the table.

with exp_row_size=*num_bytes*
: specifies the expected row size. Applies only to datarows and datapages locking schemes, to tables with variable-length rows, and only when alter table performs a data copy. Valid values are 0, 1, and any value between the minimum and maximum row length for the table. The default value is 0, which means a server-wide setting is applied.

Examples

Example 1 Adds a column to a table. For each existing row in the table, Adaptive Server assigns a NULL column value:

```
alter table publishers
add manager_name varchar(40) null
```

Example 2 Adds an IDENTITY column to a table. For each existing row in the table, Adaptive Server assigns a unique, sequential column value. Note that the IDENTITY column has type numeric and a scale of zero. The precision determines the maximum value (10^5 - 1, or 99,999) that can be inserted into the column:

```
alter table sales_daily
add ord_num numeric(5,0) identity
```

Example 3 Adds a primary key constraint to the authors table. If there is an existing primary key or unique constraint on the table, the existing constraint must be dropped first (see Example 5):

```
alter table authors
add constraint au_identification
primary key (au_id, au_lname, au_fname)
```

Example 4 Creates an index on authors; the index has a reservepagegap value of 16, leaving 1 empty page in the index for each 15 allocated pages:

```
alter table authors
add constraint au_identification
primary key (au_id, au_lname, au_fname)
with reservepagegap = 16
```

Example 5 Drops the au_identification constraint:

```
alter table titles
    drop constraint au_identification
```

Example 6 Removes the default constraint on the phone column in the authors table. If the column allows NULL values, NULL is inserted if no column value is specified. If the column does not allow NULL values, an insert that does not specify a column value fails:

```
alter table authors
    replace phone default null
```

Example 7 Creates four new page chains for the titleauthor table. After the table is partitioned, existing data remains in the first partition. New rows, however, are inserted into all five partitions:

```
alter table titleauthor partition 5
```

Example 8 Concatenates all page chains of the titleauthor table, then repartitions it with six partitions:

```
alter table titleauthor unpartition
    alter table titleauthor partition 6
```

Example 9 Changes the locking scheme for the titles table to datarows locking:

```
alter table titles lock datarows
```

Example 10 Adds the not-null column author_type to the authors table with a default of primary_author:

```
alter table authors
    add author_type varchar(20)
    default "primary_author" not null
```

Example 11 Drops the advance, notes, and contract columns from the titles table:

```
alter table titles
    drop advance, notes, contract
```

Example 12 Modifies the city column of the authors table to be a varchar(30) with a default of NULL:

```
alter table authors
    modify city varchar(30) null
```

Example 13 Modifies the stor_name column of the stores table to be NOT NULL. Note that its datatype, varchar(40), remains unchanged:

```
alter table stores
```

```
    modify stor_name not null
```

Example 14 Modifies the type column of the titles table and changes the locking scheme of the titles table from allpages to datarows:

```
alter table titles
    modify type varchar(10)
    lock datarows
```

Example 15 Modifies the notes column of the titles table from varchar(200) to varchar(150), changes the default value from NULL to NOT NULL, and specifies an exp_row_size of 40:

```
alter table titles
    modify notes varchar(150) not null
    with exp_row_size = 40
```

Example 16 Adds, modifies, and drops a column, and then adds another column in one query. Alters the locking scheme and specifies the exp_row_size of the new column:

```
alter table titles
    add author_type varchar(30) null
    modify city varchar(30)
    drop notes
    add sec_advance money default 1000 not null
    lock datarows
    with exp_row_size = 40
```

Usage

- If stored procedures using select * reference a table that has been altered, no new columns appear in the result set, even if you use the with recompile option. You must drop the procedure and re-create it to include these new columns. Otherwise, the wrong results can be caused by the insert...select statement of insert into table1 select * from table2 in the procedure when the tables have been altered and new columns have been added to the tables.
- When the table owner uses alter table, Adaptive Server disables access rules during the execution of the command and enables them upon completion of the command. The access rules are disabled to avoid filtering of the table data during alter table.

Restrictions

Warning! Do not alter the system tables.

- You cannot add a column of datatype bit to an existing table.
- The maximum number of columns in a table is:

- 1024 for fixed-length columns in both all-pages-locked (APL) and data-only-locked (DOL) tables.
- 254 for variable-length columns in both APL and DOL tables.
- 1024 for variable-length columns in both APL and DOL tables.

- alter table raises an error if the number of variable-length columns in an APL table exceeds 254.
- The maximum length for in-row Java columns is determined by the maximum size of a variable-length column for the table's schema, locking style, and page size.
- When converting a table to a different locking scheme, the data in the source table cannot violate the limits of the target table. For example, if you attempt to convert a DOL with more than 254 variable-length columns to an APL table, alter table fails because an APL table is restricted to having no more than 254 columns.
- Columns with fixed-length data (for example char, binary, and so on) have the maximum sizes shown in the following table:

Table 1-2: Maximum row and column length—APL and DOL

Locking scheme	Page size	Maximum row length	Maximum column length
APL tables	2K (2048 bytes)	1962	1960 bytes
	4K (4096 bytes)	4010	4008 bytes
	8K (8192 bytes)	8106	8104 bytes
	16K (16384 bytes)	16298	16296 bytes
DOL tables	2K (2048 bytes)	1964	1958 bytes
	4K (4096 bytes)	4012	4006 bytes
	8K (8192 bytes)	8108	8102 bytes
	16K (16384 bytes)	16300	16294 bytes – if table does not include any variable length columns
	16K (16384 bytes)	16300 (subject to a max start offset of varlen = 8191)	8191-6-2 = 8183 bytes – if table includes at least on variable length column.*

* This size includes six bytes for the row overhead and two bytes for the row length field

- The maximum number of bytes of variable length data per row depends on the locking scheme for the table. The following describes the maximum size columns for an APL table:

Page size	Maximum row length	Maximum column length
2K (2048 bytes)	1960	1960

Page size	Maximum row length	Maximum column length
4K (4096 bytes)	4008	4008
8K (8192 bytes)	8104	8157
16K (16384 bytes)	16296	16227

The following describes the maximum size columns for a DOL table:

Page size	Maximum row length	Maximum column length
2K (2048 bytes)	1960	1958
4K (4096 bytes)	4008	4006
8K (8192 bytes)	8157	8102
16K (16384 bytes)	16294	16294

- You cannot partition a system table or a table that is already partitioned.
- You cannot issue the alter table command with a partition or unpartition clause within a user-defined transaction.
- The maximum value for max_rows_per_page is 256 bytes for APL tables. max_rows_per_page parameter is not used for DOL tables.
- You cannot partition a system table or a table that is already partitioned.
- You cannot issue the alter table command with a partition or unpartition clause within a user-defined transaction.
- You cannot use alter table to add a declarative or check constraint and then insert data into the table in the same batch or procedure. Either separate the alter and insert statements into two different batches or procedures, or use execute to perform the actions separately.
- You cannot use the following variable in alter table statements that include defaults:

```
declare @a int
select @a = 2
alter table t2 add c3 int
default @a
```

  Doing so results in error message 154, which says, “Variable is not allowed in default.”

Getting information about tables

- For information about a table and its columns, use sp_help.
- To rename a table, execute the system procedure sp_rename (do not rename the system tables).

- For information about integrity constraints (unique, primary key, references, and check) or the default clause, see create table in this chapter.

Specifying ascending or descending ordering in indexes

- Use the asc and desc keywords after index column names to specify the sort order for the index. Creating indexes so that columns are in the same order specified in the order by clause of queries eliminates the sorting step during query processing. For more information, see Chapter 8, "Indexing for Performance" in the *Performance and Tuning Guide*.

Using cross-database referential integrity constraints

- When you create a cross-database constraint, Adaptive Server stores the following information in the sysreferences system table of each database:

Table 1-3: Information stored about referential integrity constraints

Information stored in sysreferences	Columns with information about the referenced table	Columns with information about the referencing table
Key column IDs	refkey1 through refkey16	fokey1 through fokey16
Table ID	reftabid	tableid
Database ID	pmrydbid	frgndbid
Database name	pmrydbname	frgndbname

- When you drop a referencing table or its database, Adaptive Server removes the foreign key information from the referenced database.
- Because the referencing table depends on information from the referenced table, Adaptive Server does not allow you to:
  - Drop the referenced table,
  - Drop the external database that contains the referenced table, or
  - Rename either database with sp_renamedb.

  You must first remove the cross-database constraint with alter table.
- Each time you add or remove a cross-database constraint, or drop a table that contains a cross-database constraint, dump *both* of the affected databases.

Warning! Loading earlier dumps of these databases could cause database corruption.

- The sysreferences system table stores the name and the ID number of the external database. Adaptive Server cannot guarantee referential integrity if you use load database to change the database name or to load it onto a different server.

  Warning! Before dumping a database in order to load it with a different name or move it to another Adaptive Server, use alter table to drop all external referential integrity constraints.

Changing defaults

- You can create column defaults in two ways: by declaring the default as a column constraint in the create table or alter table statement or by creating the default using the create default statement and binding it to a column using sp_bindefault.
- You cannot replace a user-defined default bound to the column with sp_bindefault. Unbind the default with sp_unbindefault first.
- If you declare a default column value with create table or alter table, you cannot bind a default to that column with sp_bindefault. Drop the default by altering it to NULL, then bind the user-defined default. Changing the default to NULL unbinds the default and deletes it from the sysobjects table.
- Adaptive Server issues error message 154, "Variable is not allowed in default," if you use a variable as the argument to a default that is part of an alter table statement. For example:

  ```
  declare @a int
  select @a = 2
  alter table t2 add c3 int
  default @a
  ```

Setting space management properties for indexes

- The space management properties fillfactor, max_rows_per_page, and reservepagegap in the alter table statement apply to indexes that are created for primary key or unique constraints. The space management properties affect the data pages of the table if the constraint creates a clustered index on an allpages-locked table.
- Use sp_chgattribute to change max_rows_per_page or reservepagegap for a table or an index, to change the exp_row_size value for a table, or to store fillfactor values.
- Space management properties for indexes are applied:

  - When indexes are re-created as a result of an alter table command that changes the locking scheme for a table from allpages locking to data-only locking or vice versa. See “Changing locking schemes” on page 38 for more information.
  - When indexes are automatically rebuilt as part of a reorg rebuild command.

- To see the space management properties currently in effect for a table, use sp_help. To see the space management properties currently in effect for an index, use sp_helpindex.
- The space management properties fillfactor, max_rows_per_page, and reservepagegap help manage space usage for tables and indexes in the following ways:
  - fillfactor leaves extra space on pages when indexes are created, but the fillfactor is not maintained over time. It applies to all locking schemes.
  - max_rows_per_page limits the number of rows on a data or index page. Its main use is to improve concurrency in allpages-locked tables.
  - reservepagegap specifies the ratio of empty pages to full pages to apply for commands that perform extent allocation. It applies to all locking schemes.

  Space management properties can be stored for tables and indexes so that they are applied during alter table and reorg rebuild commands.
- The following table shows the valid combinations of space management properties and locking schemes. If an alter table command changes the table so that the combination is not compatible, the values stored in the stored in system tables remain there, but are not applied during operations on the table. If the locking scheme for a table changes so that the properties become valid, then they are used.

Parameter	allpages	datapages	datarows
max_rows_per_page	Yes	No	No
reservepagegap	Yes	Yes	Yes
fillfactor	Yes	Yes	Yes
exp_row_size	No	Yes	Yes

- The following table shows the default values and the effects of using the default values for the space management properties.

Parameter	Default	Effect of using the default
max_rows_per_page	0	Fits as many rows as possible on the page, up to a maximum of 255
reservepagegap	0	Leaves no gaps
fillfactor	0	Fully packs leaf pages

Conversion of *max_rows_per_page* to *exp_row_size*

- If a table has max_rows_per_page set, and the table is converted from allpages locking to data-only locking, the value is converted to an exp_row_size value before the alter table...lock command copies the table to its new location. The exp_row_size is enforced during the copy. The following table shows how the values are converted.

If max_rows_per_page is set to	Set exp_row_size to
0	Percentage value set by default exp_row_size percent
255	1, that is, fully packed pages
1–254	The smaller of: • maximum row size • 2002/max_rows_per_page value

Using *reservepagegap*

- Commands that use large amounts of space allocate new space by allocating an extent rather than allocating single pages. The reservepagegap keyword causes these commands to leave empty pages so that future page allocations take place close to the page that is being split or to the page from which a row is being forwarded.
- The reservepagegap value for a table is stored in sysindexes, and is applied when the locking scheme for a table is changed from allpages locking to data-only locking or vice versa. To change the stored value, use the system procedure sp_chgattribute before running alter table.
- reservepagegap specified with the clustered keyword on an allpages-locked table overwrites any value previously specified with create table or alter table.

Partitioning tables for improved insert performance

- Partitioning a table with the partition clause of the alter table command creates additional page chains, making multiple last pages available at any given time for concurrent insert operations. This improves insert performance by reducing page contention and, if the segment containing the table is spread over multiple physical devices, by reducing I/O contention while the server flushes data from cache to disk.
- If you are copying data into or out of a partitioned table, the Adaptive Server must be configured for parallel processing.
- When you partition a table, Adaptive Server allocates a control page for each partition, including the first partition. The existing page chain becomes part of the first partition. Adaptive Server creates a first page for each subsequent partition. Since each partition has its own control page, partitioned tables require slightly more disk space than unpartitioned tables.
- You can partition both empty tables and those that contain data. Partitioning a table does *not* move data; existing data remains where it was originally stored, in the first partition. For best performance, partition a table *before* inserting data.
- You cannot partition a system table or a table that is already partitioned. You can partition a table that contains text and image columns; however, partitioning has no effect on the way Adaptive Server stores the text and image columns.
- After you have partitioned a table, you cannot use the truncate table command or the sp_placeobject system procedure on it.
- To change the number of partitions in a table, use the unpartition clause of alter table to concatenate all existing page chains, then use the partition clause of alter table to repartition the table.
- If you unpartition a table, recompile the query plans of any dependent procedures. Unpartitioning does not automatically recompile procedures.
- When you unpartition a table with the unpartition clause of the alter table command, Adaptive Server deallocates all control pages, including that of the first partition, and concatenates the page chains. The resulting single page chain contains no empty pages, with the possible exception of the first page. Unpartitioning a table does *not* move data.

Adding IDENTITY columns

- When adding an IDENTITY column to a table, make sure the column precision is large enough to accommodate the number of existing rows. If the number of rows exceeds $10^{precision} - 1$, Adaptive Server prints an error message and does not add the column.
- When adding an IDENTITY column to a table, Adaptive Server:
  - Locks the table until all the IDENTITY column values have been generated. If a table contains a large number of rows, this process may be time-consuming.
  - Assigns each existing row a unique, sequential IDENTITY column value, beginning with the value 1.
  - Logs each insert operation into the table. Use dump transaction to clear the database's transaction log before adding an IDENTITY column to a table with a large number of rows.
- Each time you insert a row into the table, Adaptive Server generates an IDENTITY column value that is one higher than the last value. This value takes precedence over any defaults declared for the column in the alter table statement or bound to it with sp_bindefault.

Altering table schema

- add, drop, or modify, and lock sub-clauses are useful to change an existing table's schema. A single statement can contain any number of these sub-clauses, in any order, as long as the same column name is not referenced more than once in the statement.
- If stored procedures using select * reference a table that has been altered, no new columns appear in the result set, even if you use the with recompile option. You must drop the procedure and re-create it to include these new columns.
- You cannot drop all the columns in a table. Also, you cannot drop the last remaining column from a table (for example, if you drop four columns from a five-column table, you cannot then drop the remaining column). To remove a table from the database, use drop table.
- Data copy is required:
  - To drop a column
  - To add a NOT NULL column
  - For most alter table ... modify commands

Use showplan to determine if a data copy is required for a particular alter table command.

- You can specify a change in the locking scheme for the modified table with other alter table commands (add, drop, or modify) when the other alter table command requires a data copy.
- If alter table performs a data copy, select into /bulkcopy/pllsort must be turned on in the database that includes the table whose schema you are changing.
- Adaptive Server must be configured for parallel processing when you alter the schema of a partitioned table and the change requires a data copy.
- The modified table retains the existing space management properties (max_rows_per_page, fillfactor, and so on) and indexes of the table.
- alter table that requires a data copy does not fire any triggers.
- You can use alter table to change the schema of remote proxy tables created and maintained by Component Integration Services (CIS). For information about CIS, see the *Component Integration Services User's Guide*.
- You cannot perform a data copy and add a table level or referential integrity constraint in the same statement.
- You cannot perform a data copy and create a clustered index in the same statement.
- If you add a NOT NULL column, you must also specify a default clause. This rule has one exception: if you add a user-defined type column, and the type has a default bound to it, you do not need to specify a default clause.
- You can always add, drop, or modify a column in an all-pages locked tables. However, there are restrictions for adding, dropping, or modifying a column in a data-only locked table, which are described in the following table:

Type of index	All pages locked, partitioned table	All pages locked, unpartitioned table	Data-only locked, partitioned table	Data-only locked, unpartitioned table
Clustered	Yes	Yes	No	Yes
Non-clustered	Yes	Yes	Yes	Yes

If you need to add, drop, or modify a column in a data-only locked table partitioned table with a clustered index, you can:

a Drop the clustered index.

b Alter the (data-only locked) table.

c Re-create the clustered index.

- You cannot add a NOT NULL Java object as a column. By default, all Java columns always have a default value of NULL, and are stored as either varbinary strings or as image datatypes.
- You cannot modify a partitioned table that contains a Java column if the modification requires a data copy. Instead, first unpartition the table, run the alter table command, then repartition the table.
- You cannot drop the key column from an index or a referential integrity constraint. To drop a key column, first drop the index or referential integrity constraint, then drop the key column. See the *Transact-SQL User's Guide* for more information.
- You can drop columns that have defaults or rules bound to them. Any column-specific defaults are also dropped when you drop the column. You cannot drop columns that have check constraints or referential constraints bound to them. Instead, first drop the check constraint or referential constraint, then drop the column. Use sp_helpconstraint to identify any constraints on a table, and use sp_depends to identify any column- level dependencies.
- You cannot drop a column from a system table. Also, you cannot drop columns from user tables that are created and used by Sybase-provided tools and stored procedures.
- You can generally modify the datatype of an existing column to any other datatype if the table is empty. If the table is not empty, you can modify the datatype to any datatype that is explicitly convertible to the original datatype.
- You can:
  - Add a new IDENTITY column.
  - Drop an existing IDENTITY column.
  - Modify the size of an existing IDENTITY.

  See the *Transact-SQL User's Guide* for more information.

- Altering the schema of a table increments the schema count, causing existing stored procedures that access this table to be renormalized the next time they are executed. Changes in datatype-dependent stored procedures or views may fail with datatype normalization type errors. You must update these dependent objects so they refer to the modified schema of the table.

Restrictions for modifying a table schema

- You cannot run alter table from inside a transaction.
- Altering a table's schema can invalidate backups that you made using bcp. These backups may use a tables schema that is no longer compatible with the table's current schema.
- You can add NOT NULL columns with check constraints, however, Adaptive Server does not validate the constraint against existing data.
- You cannot change the locking scheme of a table using the alter table . . . add, drop, or modify commands if the table has a clustered index and the operation requires a data copy. Instead you can

  a Drop the clustered index.

  b Alter the table's schema.

  c Re-create the clustered index.
- You cannot alter a table's schema if there are any active open cursors on the table.

Restrictions for modifying *text* and *image* columns

- You can only add text or image columns that accept null values.

  To add a text or image column so it contains only non-null values, first add a column that only accepts null values and then update it to the non-null values.
- You can only modify a column from text datatype to the following datatypes:
  - char
  - varchar
  - unichar
  - univarchar
  - nchar

  - nvarchar
- You can only modify a column from image datatype to a varbinary datatype, and the column can only include non-null data.
- You can modify text or image columns to any other datatypes only if the table is empty.
- You cannot add a new text or image column and then drop an existing text or image column in the same statement.
- You cannot modify a column to either text or image datatype.

Changing locking schemes

- alter table supports changing from any locking scheme to any other locking scheme. You can change:
  - From allpages to datapages or vice versa
  - From allpages to datarows or vice versa
  - From datapages to datarows or vice versa
- Before you change from allpages locking to a data-only locking scheme, or vice versa, use sp_dboption to set the database option select into/bulkcopy/pllsort to true, then run checkpoint in the database if any of the tables are partitioned and the sorts for the indexes require a parallel sort.
- After changing the locking scheme from allpages-locking to data-only locking or vice versa, the use of the dump transaction command to back up the transaction log is prohibited; you must first perform a full database dump.
- When you use alter table...lock to change the locking scheme for a table from allpages locking to data-only locking or vice versa, Adaptive Server makes a copy of the table's data pages. There must be enough room on the segment where the table resides for a complete copy of the data pages. There must be space on the segment where the indexes reside to rebuild the indexes.

  Clustered indexes for data-only-locked tables have a leaf level above the data pages. If you are altering a table with a clustered index from allpages-locking to a data-only-locking, the resulting clustered index requires more space. The additional space required depends on the size of the index keys.

Use sp_spaceused to determine how much space is currently occupied by the table, and use sp_helpsegment to see the space available to store the table.

- When you change the locking scheme for a table from allpages locking to datapages locking or vice versa, the space management properties are applied to the tables, as the data rows are copied, and to the indexes, as they are re-created. When you change from one data-only locking scheme to another, the data pages are not copied, and the space management properties are not applied.
- If a table is partitioned, changing the locking scheme performs a partition-to-partition copy of the rows. It does not balance the data on the partitions during the copy.
- When you change the locking scheme for a table, the alter table...lock command acquires an exclusive lock on the table until the command completes.
- When you use alter table...lock to change from datapages locking to datarows locking, the command does not copy data pages or rebuild indexes. It only updates system tables.
- Changing the locking scheme while other users are active on the system may have the following effects on user activity:
  - Query plans in the procedure cache that access the table will be recompiled the next time they are run.
  - Active multi-statement procedures that use the table are recompiled before continuing with the next step.
  - Ad hoc batch transactions that use the table are terminated.

Warning! Changing the locking scheme for a table while a bulk copy operation is active can cause table corruption. Bulk copy operates by first obtaining information about the table and does not hold a lock between the time it reads the table information and the time it starts sending rows, leaving a small window of time for an alter table...lock command to start.

Adding Java-SQL columns

- If Java is enabled in the database, you can add Java-SQL columns to a table. For more information, see *Java in Adaptive Server Enterprise*.
- The declared class (*datatype*) of the new Java-SQL column must implement either the Serializable or Externalizable interface.

- When you add a Java-SQL column to a table, the Java-SQL column cannot be specified:
  - As a foreign key
  - In a references clause
  - As having the UNIQUE property
  - As the primary key
- If in row is specified, then the value stored cannot exceed 16K bytes, depending on the page size of the data server.
- If off row is specified, then:
  - The column cannot be referenced in a check constraint.
  - The column cannot be referenced in a select that specifies distinct.
  - The column cannot be specified in a comparison operator, in a predicate, or in a group by clause.

Standards

ANSI SQL – Compliance level: Transact-SQL extension.

See Chapter 1, "System and User-Defined Datatypes" in *Reference Manual: Building Blocks* for datatype compliance information.

Permissions

alter table permission defaults to the table owner; it cannot be transferred except to the Database Owner, who can impersonate the table owner by running the setuser command. A System Administrator can also alter user tables.

See also

Commands create index, create table, dbcc, drop database, dump transaction, insert, setuser

System procedures sp_chgattribute, sp_help, sp_helpartition, sp_rename

begin...end

Description

Encloses a series of SQL statements so that control-of-flow language, such as if...else, can affect the performance of the whole group.

Syntax

```
begin
        statement block
end
```

Parameters

statement block
is a series of statements enclosed by begin and end.

Examples

Example 1 Without begin and end, the if condition would cause execution of only one SQL statement:

```
if (select avg(price) from titles) < $15
begin
    update titles
    set price = price * $2
    select title, price
    from titles
    where price > $28
end
```

Example 2 Without begin and end, the print statement would not execute:

```
create trigger deltitle
on titles
for delete
as
if (select count(*) from deleted, salesdetail
 where salesdetail.title_id = deleted.title_id) > 0
    begin
        rollback transaction
        print "You can't delete a title with sales."
    end
else
    print "Deletion successful--no sales for this
        title."
```

Usage

- begin...end blocks can nest within other begin...end blocks.

Standards

ANSI SQL – Compliance level: Transact-SQL extension.

Permissions

begin...end permission defaults to all users. No permission is required to use it.

See also

Commands if...else

begin transaction

Description — Marks the starting point of a user-defined transaction.

Syntax — begin tran[saction] [*transaction_name*]

Parameters — *transaction_name*
is the name assigned to this transaction. Transaction names must conform to the rules for identifiers. Use transaction names only on the outermost pair of nested begin transaction/commit or begin transaction/rollback statements.

Examples — Explicitly begins a transaction for the insert statement:

```
begin transaction
    insert into publishers (pub_id) values ("9999")
commit transaction
```

Usage

- Define a transaction by enclosing SQL statements and/or system procedures within the phrases begin transaction and commit. If you set chained transaction mode, Adaptive Server implicitly invokes a begin transaction before the following statements: delete, insert, open, fetch, select, and update. You must still explicitly close the transaction with a commit.
- To cancel all or part of a transaction, use the rollback command. The rollback command must appear within a transaction; you cannot roll back a transaction after it is committed.

Standards — ANSI SQL – Compliance level: Transact-SQL extension.

Permissions — begin transaction permission defaults to all users. No permission is required to use it.

See also — **Commands** commit, rollback, save transaction

break

Description

Causes an exit from a while loop. break is often activated by an if test.

Syntax

while *logical_expression*
    statement
break
    statement
continue

Parameters

logical_expression
is an expression (a column name, constant, any combination of column names and constants connected by arithmetic or bitwise operators, or a subquery) that returns TRUE, FALSE, or NULL. If the logical expression contains a select statement, enclose the select statement in parentheses.

Examples

If the average price is less than $30, double the prices. Then, select the maximum price. If it is less than or equal to $50, restart the while loop and double the prices again. If the maximum price is more than $50, exit the while loop and print a message:

```
while (select avg(price) from titles) < $30
 begin
    update titles
    set price = price * 2
    select max(price) from titles
  if (select max(price) from titles) > $50
       break
    else
       continue
 end
 begin
  print "Too much for the market to bear"
 end
```

Usage

- break causes an exit from a while loop. Statements that appear after the keyword end, which marks the end of the loop, are then executed.
- If two or more while loops are nested, the inner break exits to the next outermost loop. First, all the statements after the end of the inner loop run; then, the next outermost loop restarts.

Standards

ANSI SQL – Compliance level: Transact-SQL extension.

Permissions

break permission defaults to all users. No permission is required to use it.

See also

Commands continue, while

case

Description

Supports conditional SQL expressions; can be used anywhere a value expression can be used.

Syntax

```
case
        when search_condition then expression
        [when search_condition then expression]...
        [else expression]
end
```

case and values syntax:

```
case expression
        when expression then expression
        [when expression then expression]...
        [else expression]
end
```

Parameters

case
begins the case expression.

when
precedes the search condition or the expression to be compared.

search_condition
is used to set conditions for the results that are selected. Search conditions for case expressions are similar to the search conditions in a where clause. Search conditions are detailed in the *Transact-SQL User's Guide*.

then
precedes the expression that specifies a result value of case.

expression
is a column name, a constant, a function, a subquery, or any combination of column names, constants, and functions connected by arithmetic or bitwise operators. For more information about expressions, see "Expressions" on page 249 in Chapter 4, "Expressions, Identifiers, and Wildcard Characters" of *Reference Manual: Building Blocks*.

Examples

Example 1 Selects all the authors from the authors table and, for certain authors, specifies the city in which they live:

```
select au_lname, postalcode,
     case
            when postalcode = "94705"
                then "Berkeley Author"
            when postalcode = "94609"
                then "Oakland Author"
            when postalcode = "94612"
```

```
                then "Oakland Author"
            when postalcode = "97330"
                then "Corvallis Author"
        end
from authors
```

Example 2 Returns the first occurrence of a non-NULL value in either the lowqty or highqty column of the discounts table:

```
select stor_id, discount,
        coalesce (lowqty, highqty)
from discounts
```

Example 3 This is an alternative way of writing Example 2:

```
select stor_id, discount,
        case
            when lowqty is not NULL then lowqty
            else highqty
        end
from discounts
```

Example 4 Selects the *titles* and *type* from the *titles* table. If the book type is UNDECIDED, nullif returns a NULL value:

```
select title,
        nullif(type, "UNDECIDED")
from titles
```

Example 5 This is an alternative way of writing Example 4:

```
select title,
        case
            when type = "UNDECIDED" then NULL
            else type
        end
from titles
```

Usage

- case expression simplifies standard SQL expressions by allowing you to express a search condition using a when...then construct instead of an if statement.
- case expressions can be used anywhere an expression can be used in SQL.
- At least one expression must be something other than the null keyword. This example produces the following error message:

```
select price, coalesce (NULL, NULL, NULL)
from titles

All result expressions in a CASE expression must not be NULL.
```

- If your query produces a variety of datatypes, the datatype of a case expression result is determined by datatype hierarchy, as described in "Datatype of mixed-mode expressions" on page 6 in Chapter 1, "System and User-Defined Datatypes" of *Reference Manual: Building Blocks*. If you specify two datatypes that Adaptive Server cannot implicitly convert (for example, *char* and *int*), the query fails.
- coalesce is an abbreviated form of a case expression. Example 3 describes an alternative way of writing the coalesce statement.
- coalesce must be followed by at least two expressions. This example produces the following error message:

```
select stor_id, discount, coalesce (highqty)
from discounts

A single coalesce element is illegal in a COALESCE expression.
```

- nullif is an abbreviated form of a case expression. Example 5 describes an alternative way of writing nullif.

Standards ANSI SQL – Compliance level: Transact-SQL extension.

Permissions case permission defaults to all users. No permission is required to use it.

See also **Commands** coalesce, nullif, if...else, select, where clause

checkpoint

Description

Writes all **dirty** pages (pages that have been updated since they were last written) to the database device.

Syntax

checkpoint [all | [*dbname*[, *dbname*, *dbname*, ...]]

Examples

Writes all dirty pages in the current database to the database device, regardless of the system checkpoint schedule:

```
checkpoint
```

Usage

- Use checkpoint only as a precautionary measure in special circumstances. For example, Adaptive Server instructs you to issue the checkpoint command after resetting database options.
- Use checkpoint each time you change a database option with the system procedure sp_dboption.
- You can specify the database or databases to run checkpoint.
- If you want checkpoint all to run against all databases, including system and temp databases, you have to have the sa_role or oper_role.
- If you do not have the sa_role or oper_role, the checkpoint all will only run against those databases you own.

Automatic checkpoints

- Checkpoints caused by the checkpoint command supplement automatic checkpoints, which occur at intervals calculated by Adaptive Server on the basis of the configurable value for maximum acceptable recovery time.
- The checkpoint shortens the automatic recovery process by identifying a point at which all completed transactions are guaranteed to have been written to the database device. A typical checkpoint takes about 1 second, although checkpoint time varies depending on the amount of activity on Adaptive Server.
- The automatic checkpoint interval is calculated by Adaptive Server on the basis of system activity and the recovery interval value in the system table syscurconfigs. The recovery interval determines checkpoint frequency by specifying the maximum amount of time it should take for the system to recover. Reset this value by executing the system procedure sp_configure.
- If the housekeeper task can flush all active buffer pools in all configured caches during the server's idle time, it wakes up the checkpoint task. The checkpoint task determines whether it can checkpoint the database.

Checkpoints that occur as a result of the housekeeper task are known as **free checkpoints**. They do not involve writing many dirty pages to the database device, since the housekeeper task has already done this work. They may improve recovery speed for the database.

Standards — ANSI SQL – Compliance level: Transact-SQL extension.

Permissions — checkpoint permission defaults to the Database Owner. It cannot be transferred.

See also — **System procedures** sp_configure, sp_dboption

close

Description	Deactivates a cursor.
Syntax	close *cursor_name*
Parameters	*cursor_name* is the name of the cursor to close.
Examples	Closes the cursor named authors_crsr: `close authors_crsr`
Usage	• The close command essentially removes the cursor's result set. The cursor position within the result set is undefined for a closed cursor. • Adaptive Server returns an error message if the cursor is already closed or does not exist.
Standards	ANSI SQL – Compliance level: Entry-level compliant.
Permissions	close permission defaults to all users. No permission is required to use it.
See also	**Commands** deallocate cursor, declare cursor, fetch, open

coalesce

Description

Supports conditional SQL expressions; can be used anywhere a value expression can be used; alternative for a case expression.

Syntax

coalesce(*expression*, *expression* [, *expression*]...)

Parameters

coalesce

evaluates the listed expressions and returns the first non-null value. If all the expressions are null, coalesce returns a null.

expression

is a column name, a constant, a function, a subquery, or any combination of column names, constants, and functions connected by arithmetic or bitwise operators. For more information about expressions, see "Expressions" on page 249 in Chapter 4, "Expressions, Identifiers, and Wildcard Characters" of *Reference Manual: Building Blocks*.

Examples

Example 1 Returns the first occurrence of a non-NULL value in either the lowqty or highqty column of the discounts table:

```
select stor_id, discount,
        coalesce (lowqty, highqty)
from discounts
```

Example 2 This is an alternative way of writing Example 1:

```
select stor_id, discount,
        case
            when lowqty is not NULL then lowqty
            else highqty
        end
from discounts
```

Usage

- coalesce expression simplifies standard SQL expressions by allowing you to express a search condition as a simple comparison instead of using a when...then construct.
- coalesce expressions can be used anywhere an expression can be used in SQL.
- At least one result of the coalesce expression must return a non-null value. This example produces the following error message:

```
select price, coalesce (NULL, NULL, NULL)
from titles

All result expressions in a CASE expression must not be NULL.
```

- If your query produces a variety of datatypes, the datatype of a case expression result is determined by datatype hierarchy, as described in "Datatype of mixed-mode expressions" on page 6 in Chapter 1, "System and User-Defined Datatypes" of *Reference Manual: Building Blocks*. If you specify two datatypes that Adaptive Server cannot implicitly convert (for example, *char* and *int*), the query fails.
- coalesce is an abbreviated form of a caseexpression. Example 2 describes an alternative way of writing the coalesce statement.
- coalesce must be followed by at least two expressions. This example produces the following error message:

```
select stor_id, discount, coalesce (highqty)
from discounts

A single coalesce element is illegal in a COALESCE expression.
```

Standards	ANSI SQL – Compliance level: Transact-SQL extension.
Permissions	coalesce permission defaults to all users. No permission is required to use it.
See also	**Commands** case, nullif, select, if...else, where clause

commit

Description

Marks the ending point of a user-defined transaction.

Syntax

commit [tran | transaction | work] [*transaction_name*]

Parameters

tran | transaction | work

specifies that you want to commit the transaction or the work. If you specify tran, transaction, or work, you can also specify the *transaction_name*.

transaction_name

is the name assigned to the transaction. It must conform to the rules for identifiers. Use transaction names only on the outermost pair of nested begin transaction/commit or begin transaction/rollback statements.

Examples

After updating the royaltyper entries for the two authors, insert the savepoint percentchanged, then determine how a 10 percent increase in the book's price would affect the authors' royalty earnings. The transaction is rolled back to the savepoint with the rollback transaction command:

```
begin transaction royalty_change

update titleauthor
set royaltyper = 65
from titleauthor, titles
where royaltyper = 75
and titleauthor.title_id = titles.title_id
and title = "The Gourmet Microwave"

update titleauthor
set royaltyper = 35
from titleauthor, titles
where royaltyper = 25
and titleauthor.title_id = titles.title_id
and title = "The Gourmet Microwave"

save transaction percentchanged

update titles
set price = price * 1.1
where title = "The Gourmet Microwave"

select (price * total_sales) * royaltyper
from titles, titleauthor
where title = "The Gourmet Microwave"
and titles.title_id = titleauthor.title_id

rollback transaction percentchanged
```

```
commit transaction
```

Usage

- Define a transaction by enclosing SQL statements and/or system procedures with the phrases begin transaction and commit. If you set the chained transaction mode, Adaptive Server implicitly invokes a begin transaction before the following statements: delete, insert, open, fetch, select, and update. You must still explicitly enclose the transaction with a commit.
- To cancel all or part of an entire transaction, use the rollback command. The rollback command must appear within a transaction. You cannot roll back a transaction after the commit has been entered.
- If no transaction is currently active, the commit or rollback statement has no effect on Adaptive Server.

Standards

ANSI SQL – Compliance level: Entry-level compliant.

The commit transaction and commit tran forms of the statement are Transact-SQL extensions.

Permissions

commit permission defaults to all users.

See also

Commands begin transaction, rollback, save transaction

compute clause

Description

Generates summary values that appear as additional rows in the query results.

Syntax

start_of_select_statement
compute *row_aggregate* (*column_name*)
[, row_aggregate(*column_name*)]...
[by *column_name* [, *column_name*]...]

Parameters

row_aggregate
is one of the following:

Function	Meaning
sum	Total of values in the (numeric) column
avg	Average of values in the (numeric) column
min	Lowest value in the column
max	Highest value in the column
count	Number of values in the column

column_name
is the name of a column. It must be enclosed in parentheses. Only numeric columns can be used with sum and avg.

One compute clause can apply several aggregate functions to the same set of grouping columns (see Examples 2 and 3). To create more than one group, use more than one compute clause (see Example 5).

by
calculates the row aggregate values for subgroups. Whenever the value of the by item changes, row aggregate values are generated. If you use by, you must use order by.

Listing more than one item after by breaks a group into subgroups and applies a function at each level of grouping.

Examples

Example 1 Calculates the sum of the prices of each type of cook book that costs more than $12:

```
select type, price
from titles
where price > $12
    and type like "%cook"
    order by type, price
compute sum(price) by type

type       price
---------  ------------
mod_cook          19.99
```

```
           sum
           ------------
                  19.99
type       price
---------  ------------
trad_cook         14.99
trad_cook         20.95
           sum
           ------------
                  35.94
(5 rows affected)
```

Example 2 Calculates the sum of the prices and advances for each type of cook book that costs more than $12:

```
select type, price, advance
from titles
where price > $12
    and type like "%cook"
    order by type, price
compute sum(price), sum(advance) by type
```

```
type       price      advance
---------  ---------  ------------
mod_cook       19.99          0.00
          sum         sum
           ---------  ------------
               19.99          0.00

type       price      advance
---------  ---------  ------------
trad_cook      14.99      8,000.00
trad_cook      20.95      7,000.00
           sum         sum
           ---------  ------------
               35.94     15,000.00
(5 rows affected)
```

Example 3 Calculates the sum of the prices and maximum advances of each type of cook book that costs more than $12:

```
select type, price, advance
from titles
where price > $12
    and type like "%cook"
    order by type, price
compute sum(price), max(advance) by type
```

```
type      price     advance
```

```
--------- --------- -------------
mod_cook      19.99          0.00
          sum
          ---------
              19.99
                    max
                    -------------
                             0.00

type      price     advance
--------- --------- -------------
trad_cook     14.99      8,000.00
trad_cook     20.95      7,000.00
          sum
          ---------
              35.94
                     max
                     -------------
                          8,000.00
(5 rows affected)
```

Example 4 Breaks on type and pub_id and calculates the sum of the prices of psychology books by a combination of type and publisher ID:

```
select type, pub_id, price
from titles
where price > $10
    and type = "psychology"
    order by type, pub_id, price
compute  sum(price) by type, pub_id

type         pub_id    price
------------ --------- -----------
psychology   0736          10.95
psychology   0736          19.99
                         sum
                         ---------
                            30.94

type         pub_id    price
------------ --------- ---------
psychology   0877          21.59
                        sum
                        ---------
                            21.59
(5 rows affected)
```

Example 5 Calculates the grand total of the prices of psychology books that cost more than $10 in addition to calculating sums by type and pub_id:

```
select type, pub_id, price
from titles
where price > $10
    and type = "psychology"
order by type, pub_id, price
compute  sum(price) by type, pub_id
compute  sum(price) by type

type         pub_id    price
------------ --------- ---------
psychology   0736          10.95
psychology   0736          19.99
                        sum
                        ---------
                            30.94

type         pub_id    price
------------ --------- ---------
psychology   0877          21.59
                        sum
                        ---------
                            21.59
                        sum
                        ---------
                            52.53
(6 rows affected)
```

Example 6 Calculates the grand totals of the prices and advances of cook books that cost more than $10:

```
select type, price, advance
from titles
where price > $10
    and type like "%cook"
compute sum(price), sum(advance)

type       price        advance
---------  -----------  --------------
mod_cook         19.99            0.00
trad_cook        20.95        8,000.00
trad_cook        11.95        4,000.00
trad_cook        14.99        7,000.00
            sum          sum
           -----------  --------------
                 67.88       19,000.00
(5 rows affected)
```

Example 7 Calculates the sum of the price of cook books and the sum of the price used in an expression:

```
select type, price, price*2
from titles
    where type like "%cook"
compute sum(price), sum(price*2)

type         price
------------ --------------  ------------
mod_cook               19.99         39.98
mod_cook                2.99          5.98
trad_cook              20.95         41.90
trad_cook              11.95         23.90
trad_cook              14.99         29.98
             sum               sum
             ==============    ============
                     70.87         141.74
```

Usage

- The compute clause allows you to see the detail and summary rows in one set of results. You can calculate summary values for subgroups, and you can calculate more than one aggregate for the same group.
- compute can be used without by to generate grand totals, grand counts, and so on. order by is optional if you use the compute keyword without by. See Example 6.
- If you use compute by, you must also use an order by clause. The columns listed after compute by must be identical to or a subset of those listed after order by and must be in the same left-to-right order, start with the same expression, and not skip any expressions. For example, if the order by clause is order by a, b, c, the compute by clause can be any (or all) of these:

  ```
  compute by a, b, c
  compute by a, b
  compute by a
  ```

  Restrictions

  - You cannot use more than 127 aggregate columns in a compute clause.
  - You cannot use a compute clause in a cursor declaration.
  - Summary values can be computed for both expressions and columns. Any expression or column that appears in the compute clause must appear in the select list.
  - Aliases for column names are not allowed as arguments to the row aggregate in a compute clause, although they can be used in the select list, the order by clause, and the by clause of compute.
  - You cannot use select into in the same statement as a compute clause, because statements that include compute do not generate normal tables.

- If a compute clause includes a group by clause:
  - The compute clause cannot contain more than 255 aggregates
  - The group by clause cannot contain more than 255 columns
- Columns included in a compute clause cannot be longer than 255 bytes.

compute results appear as a new row or rows

- The aggregate functions ordinarily produce a single value for all the selected rows in the table or for each group, and these summary values are shown as new columns. For example:

```
select type, sum(price), sum(advance)
from titles
where type like "%cook"
group by type
type
-------------  ---------  ----------
mod_cook           22.98  15,000.00
trad_cook          47.89  19,000.00

(2 rows affected)
```

- The compute clause makes it possible to retrieve detail and summary rows with one command. For example:

```
select type, price, advance
from titles
where type like "%cook"
order by type
compute sum(price), sum(advance) by type
type        price       advance
----------  ----------  ----------------
mod_cook          2.99         15,000.00
mod_cook         19.99              0.00

Compute Result:
---------------------- -----------------
                 22.98         15,000.00
type         price         advance
----------  ----------  ----------------
trad_cook        11.95          4,000.00
trad_cook        14.99          8,000.00
trad_cook        20.95          7,000.00

Compute Result:
---------------------- -----------------
```

```
                        47.89          19,000.00
(7 rows affected)
```

- Table 1-4 lists the output and grouping of different types of compute clauses.

Table 1-4: compute by clauses and detail rows

Clauses and grouping	Output	Examples
One compute clause, same function	One detail row	1, 2, 4, 6, 7
One compute clause, different functions	One detail row per type of function	3
More than one compute clause, same grouping columns	One detail row per compute clause; detail rows together in the output	Same results as having one compute clause with different functions
More than one compute clause, different grouping columns	One detail row per compute clause; detail rows in different places, depending on the grouping	5

Case sensitivity

- If your server has a case-insensitive sort order installed, compute ignores the case of the data in the columns you specify. For example, given this data:

```
select * from groupdemo
lname      amount
---------- ------------------
Smith                  10.00
smith                   5.00
SMITH                   7.00
Levi                    9.00
Lévi                   20.00
```

compute by on lname produces these results:

```
select lname, amount from groupdemo
order by lname
compute sum(amount) by lname
lname      amount
---------- ------------------------
Levi                           9.00

Compute Result:
------------------------
                     9.00

lname      amount
---------- ------------------------
```

```
 Lévi                          20.00

Compute Result:
 ------------------------
                     20.00

 lname      amount
 ---------- ------------------------
 smith                      5.00
 SMITH                      7.00
 Smith                     10.00

Compute Result:
 ------------------------
                     22.00
```

The same query on a case- and accent-insensitive server produces these results:

```
 lname      amount
 ---------- ------------------------
 Levi                       9.00
 Lévi                      20.00

 Compute Result:
 ------------------------
                     29.00

 lname      amount
 ---------- ------------------------
 smith                      5.00
 SMITH                      7.00
 Smith                     10.00

 Compute Result:
 ------------------------
                     22.00
```

Standards — ANSI SQL – Compliance level: Transact-SQL extension.

See also — **Commands** group by and having clauses, select

Functions avg, count, max, min, sum

connect to...disconnect

Description

Component Integration Services only Connects to the specified server and disconnects the connected server.

Syntax

connect to *server_name*
disconnect

Parameters

server_name
is the server to which a passthrough connection is required.

Examples

Example 1 Establishes a passthrough connection to the server named SYBASE:

```
connect to SYBASE
```

Example 2 Disconnects the connected server:

```
disconnect
```

Usage

- connect to specifies the server to which a passthrough connection is required. Passthrough mode enables you to perform native operations on a remote server.
- *server_name* must be the name of a server in the sysservers table, with its server class and network name defined.
- When establishing a connection to *server_name* on behalf of the user, Component Integration Services uses one of the following identifiers:
  - A remote login alias described in sysattributes, if present
  - The user's name and password

  In either case, if the connection cannot be made to the specified server, Adaptive Server returns an error message.
- For more information about adding remote servers, see sp_addserver.
- After making a passthrough connection, Component Integration Services bypasses the Transact-SQL parser and compiler when subsequent language text is received. It passes statements directly to the specified server, and converts the results into a form that can be recognized by the Open Client interface and returned to the client program.
- To close the connection created by the connect to command, use the disconnect command. You can use this command only after the connection has been made using connect to.
- The disconnect command can be abbreviated to disc.

- The disconnect command returns an error unless connect to has been previously issued and the server is connected to a remote server.

Standards

ANSI SQL – Compliance level: Transact-SQL extension.

Permissions

Permission to use the connect to command must be explicitly granted by the System Administrator. The syntax is:

grant connect to *user_name*

The System Administrator can grant or revoke connect permission to public globally while in the master database. If the System Administrator wants to grant or revoke connect to permission for a particular user, the user must be a valid user of the master database, and the System Administrator must first revoke permission from public as follows:

```
use master
go
revoke connect from public
go
sp_adduser fred
go
grant connect to fred
go
```

See also

Commands create existing table, grant

System procedures sp_addserver, sp_autoconnect, sp_helpserver, sp_passthru, sp_remotesql, sp_serveroption

continue

Description

Restarts the while loop. continue is often activated by an if test.

Syntax

```
while boolean_expression
        statement
    break
        statement
continue
```

Examples

If the average price is less than $30, double the prices. Then, select the maximum price. If it is less than or equal to $50, restart the while loop and double the prices again. If the maximum price is more than $50, exit the while loop and print a message:

```
while (select avg(price) from titles) < $30
begin
  update titles
  set price = price * 2
  select max(price) from titles

  if (select max(price) from titles) > $50
     break
  else
     continue
end

begin
print "Too much for the market to bear"
end
```

Usage

- continue restarts the while loop, skipping any statements after continue.

Standards

ANSI SQL – Compliance level: Transact-SQL extension.

Permissions

continue permission defaults to all users. No permission is required to use it.

See also

Commands break, while

create database

Description

Creates a new database.

Syntax

```
create [temporary] database database_name
        [on {default | database_device} [= size]
            [, database_device [= size]]...]
        [log on database_device [= size]
            [, database_device [= size]]...]
        [with {override | default_location = "pathname"}]
        [for {load | proxy_update}]
```

Parameters

temporary
indicates that the you are creating a temporary database.

database_name
is the name of the new database. It must conform to the rules for identifiers and cannot be a variable.

on
indicates a location and size for the database.

default
indicates that create database can put the new database on any default database device(s), as shown in sysdevices.status. To specify a size for the database without specifying a location, use this command:

```
on default = size
```

To change a database device's status to "default," use sp_diskdefault.

database_device
is the logical name of the device on which to locate the database. A database can occupy different amounts of space on each of several database devices. To add database devices to Adaptive Server, use disk init.

size
is the amount of space to allocate to the database extension. Size can be in the following unit specifiers: 'k' or 'K' (kilobytes), 'm' or 'M' (megabytes), and 'g' or 'G' (gigabytes). Sybase recommends that you always include a unit specifier. Quotes are optional if you do not include a unit specifier. However, you must use quotes if you include a unit specifier.

log on
specifies the logical name of the device for the database logs. You can specify more than one device in the log on clause.

with override
: forces Adaptive Server to accept your device specifications, even if they mix data and transaction logs on the same device, thereby endangering up-to-the-minute recoverability for your database. If you attempt to mix log and data on the same device without using this clause, the create database command fails. If you mix log and data, and use with override, you are warned, but the command succeeds.

for load
: invokes a streamlined version of create database that can be used only for loading a database dump. See “Using the for load option” on page 70 for more information.

with default_location
: specifies the storage location of new tables. If you also specify the for proxy_update clause, one proxy table for each remote table or view is automatically created from the specified location.

for proxy_update
: automatically gets metadata from the remote location and creates proxy tables. You cannot use for proxy_update unless you also specify with default_location.

Examples

Example 1 Creates a database named pubs:

```
create database pubs
```

Example 2 Creates a 4MB database named pubs:

```
create database pubs
on default = 4
```

If you do not provide a unit specifier for *size*, the value provided for pubs is presumed to be in megabytes.

Example 3 Creates a database named pubs with 3MB on the datadev device and 2MB on the moredatadev device:

```
create database pubs
on datadev = "3M", moredatadev = '2.0m'
```

You can use both single and double quotes, and both “m” and “M” as size specifiers.

Example 4 Creates a database named pubs with 3MB of data on the datadev device and a 0.5Gb log on the logdev device:

```
create database pubs
on datadev = '0.3g'
log on logdev = '0.05G'
```

Example 5 Creates a proxy database named proxydb but does not automatically create proxy tables:

```
create database proxydb
with default_location
"UNITEST.pubs.dbo."
```

Example 6 Creates a proxy database named proxydb and automatically creates proxy tables:

```
create database proxydb
on default = "4M"
with default_location
"UNITEST.pubs2.dbo."
for proxy_update
```

Example 7 Creates a proxy database named proxydb and,and brings over all remote tables from a remote database regardless of who created them:

```
create database proxydb
on default = 4
with default_location
"UNITEST.pubs2.."
for proxy_update
```

Example 8 Creates a temporary database called mytempdb1, with 3MB of data on the datadev device and 1MB of log on the logdev device:

```
create temporary database mytempdb1
    on datadev = '3m' log on logdev = '1M'
```

Usage

- Use create database from the master database.
- You can specify the *size* as a float datatype, however, the size is rounded down to the nearest multiple of the allocation unit.
- If the size of the database is not explicitly stated, the size is determined by the size of the model database. The minimum size that you can create a database is four allocation units.
- Because Adaptive Server allocates space for databases for create database and alter database in chunks of 256 logical pages, these commands round the specified size down to the nearest multiple of allocation units.
- If you do not include a unit specifier, Adaptive Server interprets the size in terms of megabytes of disk space, and this number is converted to the logical page size the server uses.

- If you do not specify a location and size for a database, the default location is any default database device(s) indicated in master..sysdevices. The default size is the larger of the size of the model database or the default database size parameter in sysconfigures.

  System Administrators can increase the default size by using sp_configure to change the value of default database size and restarting Adaptive Server. The default database size parameter must be at least as large as the model database. If you increase the size of the model database, the default size must also be increased.

  If Adaptive Server cannot give you as much space as you want where you have requested it, it comes as close as possible, on a per-device basis, and prints a message telling how much space was allocated and where it was allocated. The maximum size of a database is system-dependent.

- If a proxy database is created using:

  ```
  create database mydb on my_device
  with default_location = "pathname" for proxy_update
  ```

  The presence of the device name is enough to bypass size calculation, and this command may fail if the default database size (the size of the model database) isn't large enough to contain all of the proxy tables.

  To allow CIS to estimate database size, do not include any device name or other option with the command:

  ```
  create database mydb
  with default_location = "pathname" for proxy_update
  ```

Restrictions

- Adaptive Server can manage as many as 32,767 databases.
- Adaptive Server can create only one database at a time. If two database creation requests collide, one user sees this message:

  ```
  model database in use: cannot create new database
  ```

- Each time you allocate space on a database device with create database or alter database, that allocation represents a device fragment, and the allocation is entered as a row in sysusages.
- The maximum number of named segments for a database is 32. Segments are named subsets of database devices available to a particular Adaptive Server. For more information on segments, see the *System Administration Guide*.

Temporary databases

- The temporary status of a database, which is set during the creation of the temporary database, is indicated by value 0x00000100 (256 decimal) of the status3 field of a sysdatabases entry.
- In addition to all options inherited from model, a temporary database, like the system tempdb, has the following database options set:
  - select into/bulkcopy
  - trunc log on chkpt
- As with system tempdb, the guest user is added to the temporary database, and create table permission is granted to PUBLIC.
- Unused pages are not cleared during creation of the temporary database, since a temporary database is re-created every time the server is restarted.

New databases created from *model*

- Adaptive Server creates a new database by copying the model database.
- You can customize model by adding tables, stored procedures, user-defined datatypes, and other objects, and by changing database option settings. New databases inherit these objects and settings from model.
- To guarantee recoverability, create database must clear every page that was not initialized when the model database was copied. This may take several minutes, depending on the size of the database and the speed of your system.

  If you are creating a database to load a database dump into it, you can use the for load option to skip the page-clearing step. This makes database creation considerably faster.

Ensuring database recoverability

- Back up the master database each time you create a new database. This makes recovery easier and safer if master is damaged.

  Note If you create a database and fail to back up master, you may be able to recover the changes with disk reinit.

- The with override clause allows you to mix log and data segments on a single device. However, for full recoverability, the device or devices specified in log on should be different from the physical device that stores the data. In the event of a hard disk crash, the database can be recovered from database dumps and transaction logs.

  You can create a small database on a single device that is used to store both the transaction log and the data, but you *must* rely on the dump database command for backups.

- The size of the device required for the transaction log varies according to the amount of update activity and the frequency of transaction log dumps. As a rule of thumb, allocate to the log device 10 – 25 percent of the space you allocate to the database itself. It is best to start small, since space allocated to a transaction log device cannot be reclaimed and cannot be used for storing data.

Using the *for load* option

You can use the for load option for recovering from media failure or for moving a database from one machine to another, if you have not added to the database with sp_addsegment. Use alter database for load to create a new database in the image of the database from which the database dump to be loaded was made. For a discussion of duplicating space allocation when loading a dump into a new database, see the *System Administration Guide*.

- When you create a database using the for load option, you can run only the following commands in the new database before loading a database dump:
  - alter database for load
  - drop database
  - load database

  After you load the database dump into the new database, you can also use some dbcc diagnostic commands in the databases. After you issue the online database command, there are no restrictions on the commands you can use.

- A database created with the for load option has a status of "don't recover" in the output from sp_helpdb.

Getting information about databases

- To get a report on a database, execute the system procedure sp_helpdb.
- For a report on the space used in a database, use sp_spaceused.

Using *with default_location* and *for proxy_update*

Without the for proxy_update clause, the behavior of the with default_location clause is the same as that provided by the stored procedure sp_defaultloc — a default storage location is established for new and existing table creation, but automatic import of proxy table definitions is not done during the processing of the create database command.

- If for proxy_update is specified with no default_location, an error is reported.
- When a proxy database is created (using the for proxy_update option), Component Integration Services will be called upon to:
  - Provide an estimate of the database size required to contain all proxy tables representing the actual tables and views found in the primary server's database. This estimate is the number of database pages needed to contain all proxy tables and indexes. The estimate is used if no size is specified, and no database devices are specified.
  - Create all proxy tables representing the actual tables and views found in the companion server's database.
  - Grant all permissions on proxy tables to public.
  - Add the guest user to the proxy database.
  - The database status will be set to indicate that this database 'Is_A_Proxy'. This status is contained in master.dbo.sysdatabases.status4.

Standards

ANSI SQL – Compliance level: Transact-SQL extension.

Permissions

create database permission defaults to System Administrators, who can transfer it to users listed in the sysusers table of the master database. However, create database permission is often centralized in order to maintain control over database storage allocation.

If you are creating the sybsecurity database, you must be a System Security Officer.

create database permission is not included in the grant all command.

See also

Commands alter database, disk init, drop database, dump database, load database, online database

System procedures sp_changedbowner, sp_diskdefault, sp_helpdb, sp_logdevice, sp_renamedb, sp_spaceused

create default

Description

Specifies a value to insert in a column (or in all columns of a user-defined datatype) if no value is explicitly supplied at insert time.

Syntax

create default [*owner*.]*default_*name
as *constant_expression*

Parameters

default_name

is the name of the default. It must conform to the rules for identifiers and cannot be a variable. Specify the owner's name to create another default of the same name owned by a different user in the current database. The default value for *owner* is the current user.

constant_expression

is an expression that does not include the names of any columns or other database objects. It cannot include global variables, but can include built-in functions that do not reference database objects. Enclose character and date constants in quotes and use a "0x" prefix for binary constants.

Examples

Example 1 Defines a default value. Now, you need to bind it to the appropriate column or user-defined datatype with sp_bindefault:

```
create default phonedflt as "UNKNOWN"

sp_bindefault phonedflt, "authors.phone"
```

The default takes effect only if there is no entry in the phone column of the authors table. No entry is different from a null value entry. To get the default, issue an insert command with a column list that does not include the column that has the default.

Example 2 Creates a default value, todays_date, that inserts the current date into the columns to which it is bound:

```
create default todays_date as getdate()
```

Usage

- Bind a default to a column or user-defined datatype—but not a Adaptive Server-supplied datatype—with sp_bindefault.
- You can bind a new default to a datatype without unbinding the old one. The new default overrides and unbinds the old one.
- To hide the source test of a default, use sp_hidetext.

Restrictions

- You can create a default only in the current database.
- You cannot combine create default statements with other statements in a single batch.

- You must drop a default with drop default before you create a new one of the same name; you must unbind a default with sp_unbindefault, before you drop it.

Datatype compatibility

- Adaptive Server generates an error message when it tries to insert a default value that is not compatible with the column's datatype. For example, if you bind a character expression such as "N/A" to an integer column, any *insert* that does not specify the column value fails.
- If a default value is too long for a character column, Adaptive Server either truncates the string or generates an exception, depending on the setting of the *string_rtruncation* option. For more information, see the set command.

Getting information about defaults

- Default definitions are stored in syscomments.
- After a default is bound to a column, its object ID is stored in syscolumns. After a default is bound to a user-defined datatype, its object ID is stored in systypes.
- To rename a default, use sp_rename.
- For a report on the text of a default, use sp_helptext.

Defaults and rules

- If a column has both a default and a rule associated with it, the default value must not violate the rule. A default that conflicts with a rule cannot be inserted. Adaptive Server generates an error message each time it attempts to insert such a default.

Defaults and NULLs

- If a column does not allow nulls, and you do not create a default for the column, when a user attempts to insert a row but does not include a value for that column, the insert fails and Adaptive Server generates an error message.

  Table 1-5 illustrates the relationship between the existence of a default and the definition of a column as NULL or NOT NULL.

Table 1-5: Relationship between nulls and column defaults

Column null type	No entry, no default	No entry, default exists	Entry Is null, No default	Entry Is null, default exists
NULL	Null inserted	Default value inserted	Null inserted	Null inserted
NOT NULL	Error, command fails	Default value inserted	Error, command fails	Error, command fails

Specifying a default value in *create table*

- You can define column defaults using the *default* clause of the create table statement as an alternative to using create default. However, these column defaults are specific to that table; you cannot bind them to other tables. See create table and alter table for information about integrity constraints.

Standards

ANSI SQL – Compliance level: Transact-SQL extension.

Use the default clause of the create table statement to create ANSI SQL-compliant defaults.

Permissions

create default permission defaults to the Database Owner, who can transfer it to other users.

See also

Commands alter table, create rule, create table, drop default, drop rule

System procedures sp_bindefault, sp_help, sp_helptext, sp_rename, sp_unbindefault

create existing table

Description

Component Integration Services only Creates a proxy table, then retrieves and stores metadata from a remote table and places the data into the proxy table. Allows you to map the proxy table to a table, view, or procedure at a remote location.

Syntax

create existing table *table_name* (*column_list*)
[on *segment_name*]
[[external {table | procedure | file}] at *pathname*
[column delimiter "*string*"]]

Parameters

table_name
specifies the name of the table for which you want to create a proxy table.

column_list
specifies the name of the column list that stores information about the remote table.

on *segment_name*
specifies the segment that contains the remote table.

external
specifies that the object is a remote object.

table
specifies that the remote object is a table or a view. The default is external table.

procedure
specifies that the remote object is a stored procedure.

file
specifies that the remote object is a file.

at *pathname*
specifies the location of the remote object. *pathname* takes the form: *server_name.dbname.owner.object*, where:

- *server_name* (required) – is the name of the server that contains the remote object.
- *dbname* (optional) – is the name of the database managed by the remote server that contains this object.
- *owner* (optional) – is the name of the remote server user that owns the remote object.
- *object* (required) – is the name of the remote table, view, or procedure.

column delimiter
used to separate fields within each record when accesssing flat files, column delimiters The column delimiter can be up to 16 bytes long.

string
The column delimiter string can be any character sequencer, but if the string is longer than 16 bytes, only the first 16 bytes are used. The use of column delimiter for proxy tables mapped to anything but files will result in a syntax error.

Examples

Example 1 Creates the proxy table authors:

```
sp_addobjectdef
create existing table authors
(
au_id        id,
au_lname     varchar(40)    NOT NULL,
au_fname     varchar(20)    NOT NULL,
phone        char(12),
address      varchar(40)    NULL,
city         varchar(20)    NULL,
state        char(2)        NULL,
zip          char(5)        NULL,
contract     bit
)
```

Example 2 Creates the proxy table syb_columns:

```
sp_addobjectdef
create existing table syb_columns
(
id          int,
number      smallint,
colid       tinyint,
status      tinyint,
type        tinyint,
length      tinyint,
offset      smallint,
usertype    smallint,
cdefault    int,
domain      int,
name        varchar(30),
printfmt    varchar(255)    NULL,
prec        tinyint         NULL,
scale       tinyint         NULL
)
```

Example 3 Creates a proxy table named blurbs for the blurbs table at the remote server SERVER_A:

```
create existing table blurbs
(author_id                id        not null,
copy                text        not null)
at "SERVER_A.db1.joe.blurbs"
```

Example 4 Creates a proxy table named rpc1 for the remote procedure named p1:

```
create existing table rpc1
(column_1                int,
column_2                int)
external procedure
at "SERVER_A.db1.joe.p1"
```

Usage

- create existing table does not create a new table, unless the remote object is a file. Instead, Component Integration Services checks the table mapping to confirm that the information in *column_list* matches the remote table, verifies the existence of the underlying object, and retrieves and stores metadata about the remote table.
- If the host data file or remote server object does not exist, the command is rejected with an error message.
- If the object exists, the system tables sysobjects, syscolumns, and sysindexes are updated. The verification operation requires these steps:
  a The nature of the existing object is determined. For host data files, this requires determining file organization and record format. For remote server objects, this requires determining whether the object is a table, a view, or an RPC.
  b For remote server objects (other than RPCs), column attributes obtained for the table or view are compared with those defined in the column_list.
  c Index information from the host data file or remote server table is extracted and used to create rows for the system table sysindexes. This defines indexes and keys in Adaptive Server terms and enables the query optimizer to consider any indexes that might exist on this table.
- The on *segment_name* clause is processed locally and is not passed to a remote server.
- After successfully defining an existing table, issue an update statistics command for the table. This allows the query optimizer to make intelligent choices regarding index selection and join order.

- Component Integration Services allows you to create a proxy table with a column defined as NOT NULL even though the remote column is defined as NULL. It displays a warning to notify you of the mismatch.
- The location information provided by the at keyword is the same information that is provided by the sp_addobjectdef system procedure. The information is stored in the sysattributes table.
- Component Integration Services inserts or updates a record in the systabstats catalog for each index of the remote table. Since detailed structural statistics are irrelevant for remote indexes, only a minimum number of columns are set in the systabstats record—id, indid, and rowcnt.
- External files cannot be of datatypes text, image or Java ADTs.

Datatype conversions

- When using create existing table, you must specify all datatypes with recognized Adaptive Server datatypes. If the remote server tables reside on a class of server that is heterogeneous, the datatypes of the remote table are automatically converted into the specified Adaptive Server types when the data is retrieved. If the conversion cannot be made, Component Integration Services does not allow the table to be defined.
- The *Component Integration Services User's Guide* contains a section for each supported server class and identifies all possible datatype conversions that are implicitly performed by Component Integration Services.

Changes by server class

- All server classes allow you to specify fewer columns than there are in the table on the remote server.
- All server classes match the columns by name.
- All server classes allow the column type to be any datatype that can be converted to and from the datatype of the column in the remote table.

Remote procedures

- When the proxy table is a procedure-type table, you must provide a column list that matches the description of the remote procedure's result set. create existing table does *not* verify the accuracy of this column list.
- No indexes are created for procedures.

- Component Integration Services treats the result set of a remote procedure as a virtual table that can be sorted, joined with other tables, or inserted into another table using insert or select. However, a procedure type table is considered read-only, which means you cannot issue the following commands against the table:
  - alter table
  - create index
  - delete
  - insert
  - truncate table
  - update
- Begin the column name with an underscore (_) to specify that the column is not part of the remote procedure's result set. These columns are referred to as parameter columns. For example:

```
create existing table rpc1
(
    a        int,
    b        int,
    c        int,
    _p1        int null,
    _p2        int null
)
external procedure
at "SYBASE.sybsystemprocs.dbo.myproc"
```

  In this example, the parameter columns _p1 and _p2 are input parameters. They are not expected in the result set, but can be referenced in the query:

```
select a, b, c from t1
where _p1 = 10 and _p2 = 20
```

  Component Integration Services passes the search arguments to the remote procedure as parameters, using the names *@p1* and *@p2*.
- Parameter column definitions in a create existing table statement must follow these rules:
  - Parameter column definitions must allow a null value.
  - Parameter columns cannot precede regular result columns—they must appear at the end of the column list.

- If a parameter column is included in a select list *and* is passed to the remote procedure as a parameter, the return value is assigned by the where clause.
- If a parameter column is included in a select list, but does not appear in the where clause or cannot be passed to the remote procedure as a parameter, its value is NULL.
- A parameter column can be passed to a remote procedure as a parameter if the Adaptive Server query processor considers it a searchable argument. A parameter column is considered a searchable argument if it is not included in any or predicates. For example, the or predicate in the second line of the following query prevents the parameter columns from being used as parameters:

```
select a, b, c from t1
where _p1 = 10 or _p2 = 20
```

Standards — ANSI SQL – Compliance level: Transact-SQL extension.

Permissions — create existing table permission defaults to the table owner and is not transferable.

See also — **Commands** alter table, create table, create proxy_table, drop index, insert, order by clause, set, update

create function (SQLJ)

Description

Creates a user-defined function by adding a SQL wrapper to a Java static method. Can return a value defined by the method.

Syntax

```
create function [owner.]sql_function_name
        ( [ sql_parameter_name sql_datatype
            [( length)| (precision[, scale ]) ]
        [ [, sql_parameter_name sql_datatype
            [( length )| ( precision[, scale ]) ]]
        ... ] ] )
    returns sql_datatype
        [ ( length)| (precision[, scale ]) ]
    [modifies sql data]
    [returns null on null input |
        called on null input]
    [deterministic | not deterministic]
    [exportable]
    language java
    parameter style java
    external name 'java_method_name
        [ ( [java_datatype[, java_datatype
        ...] ] ) ] '
```

Parameters

sql_function_name

is the Transact-SQL name of the function. It must conform to the rules for identifiers and cannot be a variable.

sql_parameter_name

is the name of an argument to the function. The value of each input parameter is supplied when the function is executed. Parameters are optional; a SQLJ function need not take arguments.

Parameter names must conform to the rules for identifiers. If the value of a parameter contains non-alphanumeric characters, it must be enclosed in quotes. This includes object names qualified by a database name or owner name, since they include a period. If the value of the parameter begins with a numeric character, it also must be enclosed in quotes.

sql_datatype [(*length*) | (*precision* [, *scale*])]

is the Transact-SQL datatype of the parameter. See create procedure on page 101 for more information about these parameters.

sql_datatype is the SQL procedure signature.

returns *sql_datatype*

specifies the result datatype of the function.

modifies sql data
: indicates that the Java method invokes SQL operations, reads, and modifies SQL data in the database. This is the default and only implementation. It is included for syntactic compatibility with the ANSI standard.

deterministic | not deterministic
: included for syntactic compatibility with the ANSI standard. Not currently implemented.

exportable
: specifies that the procedure is to be run on a remote server using the Adaptive Server OmniConnect™ feature. Both the procedure and the method it is built on must reside on the remote server.

language java
: specifies that the external routine is written in Java. This is a required clause for SQLJ functions.

parameter style java
: specifies that the parameters passed to the external routine at runtime are Java parameters. This is a required clause for SQLJ functions.

external
: indicates that create function defines a SQL name for an external routine written in a programming language other than SQL.

name
: specifies the name of the external routine (Java method). The specified name—'*java_method_name* [*java_datatype*[{, *java_datatype*} ...]]'—is a character-string literal and must be enclosed in single quotes.

java_method_name
: specifies the name of the external Java method.

java_datatype
: specifies a Java datatype that is mappable or result-set mappable. This is the Java method signature.

Examples

This example creates a function square_root that invokes the java.lang.Math.sqrt() method:

```
create function square_root
    (input_number double precision) returns
       double precision
    language java parameter style java
    external name 'java.lang.Math.sqrt'
```

Usage

- You cannot create a SQLJ function with the same name as an Adaptive Server built-in function.
- You can create user-defined functions (based on Java static methods) and SQLJ functions with the same class and method names.

  Note Adaptive Server's searching order ensures that the SQLJ function is always found first.

- You can include a maximum of 31 parameters in a create function statement.

Permissions

Only the Database Owner or user with sa role can execute create function. The Database Owner or sa cannot transfer permission for create function.

See also

See *Java in Adaptive Server Enterprise* for more information about create function.

Commands create function (SQLJ), drop function (SQLJ)

System procedures sp_depends, sp_help, sp_helpjava, sp_helprotect

create index

Description

Creates an index on one or more columns in a table.

Syntax

```
create [unique] [clustered | nonclustered]
        index index_name
    on [[database.]owner.]table_name
        (column_name [asc | desc]
            [, column_name [asc | desc]]...)
    [with { fillfactor = pct,
            max_rows_per_page = num_rows,
            reservepagegap = num_pages,
            consumers = x, ignore_dup_key, sorted_data,
            [ignore_dup_row | allow_dup_row],
             statistics using num_steps values  } ]
    [on segment_name]
```

Parameters

unique

prohibits duplicate index values (also called “key values”). The system checks for duplicate key values when the index is created (if data already exists), and each time data is added with an insert or update. If there is a duplicate key value or if more than one row contains a null value, the command fails, and Adaptive Server prints an error message giving the duplicate entry.

Warning! Adaptive Server does not detect duplicate rows if a table contains any non-null text or image columns.

---

update and insert commands that generate duplicate key values fail, unless the index was created with ignore_dup_row or ignore_dup_key.

Composite indexes (indexes in which the key value is composed of more than one column) can also be unique.

The default is nonunique. To create a nonunique clustered index on a table that contains duplicate rows, specify allow_dup_row or ignore_dup_row. See “Duplicate rows” on page 94.

clustered

means that the physical order of rows on the current database device is the same as the indexed order of the rows. The bottom, or **leaf level**, of the clustered index contains the actual data pages. A clustered index almost always retrieves data faster than a nonclustered index. Only one clustered index per table is permitted. See “Creating clustered indexes” on page 93.

If clustered is not specified, nonclustered is assumed.

nonclustered
: means that the physical order of the rows is not the same as their indexed order. The leaf level of a nonclustered index contains pointers to rows on data pages. You can have as many as 249 nonclustered indexes per table.

index_name
: is the name of the index. Index names must be unique within a table, but need not be unique within a database.

table_name
: is the name of the table in which the indexed column or columns are located. Specify the database name if the table is in another database, and specify the owner's name if more than one table of that name exists in the database. The default value for *owner* is the current user, and the default value for *database* is the current database.

column_name
: is the column or columns to which the index applies. Composite indexes are based on the combined values of as many as 16 columns. The sum of the maximum lengths of all the columns depends on the logical page size. See Table 1-6 on page 91 for actual values. List the columns to be included in the composite index (in the order in which they should be sorted) inside the parentheses following *table_name*.

asc | desc
: specifies whether the index is to be created in ascending or descending order for the column specified. The default is ascending order.

fillfactor

specifies how full Adaptive Server makes each page when it creates a new index on existing data. The fillfactor percentage is relevant only when the index is created. As the data changes, the pages are not maintained at any particular level of fullness.

The value you specify is not saved in sysindexes for display by sp_helpindex or for later use by the reorg command. Use sp_chgattribute to create stored fillfactor values.

The default for fillfactor is 0; this is used when you do not include with fillfactor in the create index statement (unless the value has been changed with sp_configure). When specifying a fillfactor, use a value between 1 and 100.

A fillfactor of 0 creates clustered indexes with completely full pages and nonclustered indexes with completely full leaf pages. It leaves a comfortable amount of space within the index B-tree in both the clustered and nonclustered indexes. There is seldom a reason to change the fillfactor.

If the fillfactor is set to 100, Adaptive Server creates both clustered and nonclustered indexes with each page 100 percent full. A fillfactor of 100 makes sense only for read-only tables—tables to which no additional data will ever be added.

fillfactor values smaller than 100 (except 0, which is a special case) cause Adaptive Server to create new indexes with pages that are not completely full. A fillfactor of 10 might be a reasonable choice if you are creating an index on a table that will eventually hold a great deal more data, but small fillfactor values cause each index (or index and data) to occupy more storage space.

Warning! Creating a clustered index with a fillfactor affects the amount of storage space your data occupies, since Adaptive Server redistributes the data as it creates the clustered index.

---

max_rows_per_page
: limits the number of rows on data pages and the leaf level pages of indexes. Unlike fillfactor, the max_rows_per_page value is maintained until it is changed with sp_chgattribute.

  If you do not specify a value for max_rows_per_page, Adaptive Server uses a value of 0 when creating the table. Values for tables and clustered indexes are between 0 and 256. The maximum number of rows per page for nonclustered indexes depends on the size of the index key. Adaptive Server returns an error message if the specified value is too high.

  A max_rows_per_page value of 0 creates clustered indexes with full pages and nonclustered indexes with full leaf pages. It leaves a comfortable amount of space within the index B-tree in both clustered and nonclustered indexes.

  If max_rows_per_page is set to 1, Adaptive Server creates both clustered and nonclustered indexes with one row per page at the leaf level. Use low values to reduce lock contention on frequently accessed data. However, low max_rows_per_page values cause Adaptive Server to create new indexes with pages that are not completely full, uses more storage space, and may cause more page splits.

  If Component Integration Services is enabled, you cannot use max_rows_per_page for remote servers.

Warning! Creating a clustered index with max_rows_per_page can affect the amount of storage space your data occupies, since Adaptive Server redistributes the data as it creates the clustered index.

---

with reservepagegap = *num_pages*
: specifies a ratio of filled pages to empty pages to be left during extent I/O allocation operations. For each specified *num_pages*, an empty page is left for future expansion of the index. Valid values are 0 – 255. The default is 0.

ignore_dup_key
: cancels attempts of duplicate key entry into a table that has a unique index (clustered or nonclustered). Adaptive Server cancels the attempted insert or update of a duplicate key with an informational message. After the cancellation, the transaction containing the duplicate key proceeds to completion.

  You cannot create a unique index on a column that includes duplicate values or more than one null value, whether or not ignore_dup_key is set. If you attempt to do so, Adaptive Server prints an error message that displays the first of the duplicate values. You must eliminate duplicates before Adaptive Server can create a unique index on the column.

ignore_dup_row
: allows you to create a new, nonunique clustered index on a table that includes duplicate rows. ignore_dup_row deletes the duplicate rows from the table, and cancels any insert or update that would create a duplicate row, but does not roll back the entire transaction. See “Duplicate rows” on page 94 for more information.

allow_dup_row
: allows you to create a nonunique clustered index on a table that includes duplicate rows, and allows you to duplicate rows with update and insert statements. See “Duplicate rows” on page 94 for an explanation of how to use these options.

sorted_data
: speeds creation of clustered indexes or unique nonclustered indexes when the data in the table is already in sorted order (for example, when you have used bcp to copy data that has already been sorted into an empty table). See “Using the sorted_data option to speed sorts” on page 95 for more information.

with statistics using *num_steps* values
: specifies the number of steps to generate for the histogram used to optimize queries. If you omit this clause:

  - The default value is 20, if no histogram is currently stored for the leading index column.
  - The current number of steps is used, if a histogram for the leading column of the index column already exists.

  If you specify 0 for *num_steps*, the index is re-created, but the statistics for the index are not overwritten in the system tables.

on *segment_name*
: creates the index on the named segment. Before using the on *segment_name* option, initialize the device with disk init, and add the segment to the database using sp_addsegment. See your System Administrator, or use sp_helpsegment for a list of the segment names available in your database.

with consumers
: specifies the number of consumer processes that should perform the sort operation for creating the index. The actual number of consumer processes used to sort the index may be smaller than the specified number, if fewer worker processes are available when Adaptive Server executes the sort.

Examples

Example 1 Creates an index named au_id_ind on the au_id column of the authors table:

```
create index au_id_ind on authors (au_id)
```

Example 2 Creates a unique clustered index named au_id_ind on the au_id column of the authors table:

```
create unique clustered index au_id_ind
on authors(au_id)
```

Example 3 Creates an index named ind1 on the au_id and title_id columns of the titleauthor table:

```
create index ind1 on titleauthor (au_id, title_id)
```

Example 4 Creates a nonclustered index named zip_ind on the zip column of the authors table, filling each index page one-quarter full and limiting the sort to 4 consumer processes:

```
create nonclustered index zip_ind
on authors(postalcode)
with fillfactor = 25, consumers = 4
```

Example 5 Creates an index with ascending ordering on pub_id and descending order on pubdate:

```
create index pub_dates_ix
on titles (pub_id asc, pubdate desc)
```

Example 6 Creates an index on title_id, using 50 histogram steps for optimizer statistics and leaving 1 empty page out of every 40 pages in the index:

```
create index title_id_ix
on titles (title_id)
with reservepagegap = 40,
statistics using 50 values
```

Usage

- Run update statistics periodically if you add data to the table that changes the distribution of keys in the index. The query optimizer uses the information created by update statistics to select the best plan for running queries on the table.
- If the table contains data when you create a nonclustered index, Adaptive Server runs update statistics on the new index. If the table contains data when you create a clustered index, Adaptive Server runs update statistics on all the table's indexes.
- Index all columns that are regularly used in joins.
- When Component Integration Services is enabled, the create index command is reconstructed and passed directly to the Adaptive Server associated with the table.

Restrictions

- You cannot create an index on a column with a datatype of bit, text, or image.
- Table 1-6 shows the maximum index row size limit for a given logical page size.

Table 1-6: Maximum index row size

Logical page size	Index column size limit
2K	600
4K	1250
8K	2600
16K	5300

- Although you can create a column that is larger than the maximum row size of an index for a given logical page size, this makes that column nonindexable. However, you can maintain statistics on such large columns up to the first 255 bytes.
- A table can have a maximum of 249 nonclustered indexes.
- A table can have a maximum of one clustered index.
- You can specify up to 31 columns (formerly 16) for the index key. The maximum total number of bytes must be within the limits shown in the table above.
- You can create an index on a temporary table. The index disappears when the table disappears.

- You can create an index on a table in another database, as long as you are the owner of that table.
- You cannot create an index on a view.
- create index runs more slowly while a dump database is taking place.
- You can create a clustered index on a partitioned table, or partition a table with a clustered index if all the following conditions are true:
  - The select into/bulkcopy/pllsort database option is turned on,
  - Adaptive Server is configured for parallel processing, and
  - There is one more worker process available than the number of partitions.

  For more information about clustered indexes on partitioned tables, see Chapter 24, "Parallel Sorting," in the *Performance and Tuning Guide*.
- The maximum number of indexes allowed on a data-only-locked table with a clustered index is 249. A table can have one clustered index and 248 nonclustered indexes.

create index and stored procedures

Adaptive Server automatically recompiles stored procedures after executing create index statements. Although adhoc queries that you start before executing create index still continue to work, they do not take advantage of the new index.

In Adaptive Server versions 12.5 and earlier, create index was ignored by cached stored procedures.

Creating indexes efficiently

- Indexes speed data retrieval, but can slow data updates. For better performance, create a table on one segment and create its nonclustered indexes on another segment, when the segments are on separate physical devices.
- Adaptive Server can create indexes in parallel if a table is partitioned and the server is configured for parallelism. It can also use sort buffers to reduce the amount of I/O required during sorting. For more information, see Chapter 24, "Parallel Sorting," in the *Performance and Tuning Guide*.
- Create a clustered index before creating any nonclustered indexes, since nonclustered indexes are automatically rebuilt when a clustered index is created.

- When using parallel sort for data-only-locked tables, the number of worker processes must be configured to equal or exceed the number of partitions, even for empty tables. The database option select into/bulkcopy/pllsort must also be enabled.

Creating clustered indexes

- A table "follows" its clustered index. When you create a table, use the on *segment_name* extension to create clustered index, the table migrates to the segment where the index is created.

  If you create a table on a specific segment, then create a clustered index without specifying a segment, Adaptive Server moves the table to the default segment when it creates the clustered index there.

  Because text and image data is stored in a separate page chain, creating a clustered index with on *segment_name* does not move text and image columns.

- To create a clustered index, Adaptive Server duplicates the existing data; the server deletes the original data when the index is complete. Before creating a clustered index, use sp_spaceused to make sure that the database has at least 120 percent of the size of the table available as free space.

- The clustered index is often created on the table's primary key (the column or columns that uniquely identify the row). The primary key can be recorded in the database (for use by front-end programs and sp_depends) using sp_primarykey.

- To allow duplicate rows in a clustered index, specify allow_dup_row.

Specifying ascending or descending ordering in indexes

- Use the asc and desc keywords after index column names to specify the sorting order for the index keys. Creating indexes so that columns are in the same order specified in the order by clause of queries eliminates the sorting step during query processing. For more information, see Chapter 8, "Indexing for Performance," in the *Performance and Tuning Guide*.

Space requirements for indexes

- Space is allocated to tables and indexes in increments of one extent, or eight pages, at a time. Each time an extent is filled, another extent is allocated. Use sp_spaceused to display the amount of space allocated and used by an index..

- In some cases, using the sorted_data option allows Adaptive Server to skip copying the data rows as described in Table 1-9 on page 96. In these cases, you need only enough additional space for the index structure itself. Depending on key size, this is usually about 20 percent of the size of the table.

Duplicate rows

- The ignore_dup_row and allow_dup_row options are not relevant when you are creating a nonunique, nonclustered index. Adaptive Server attaches a unique row identification number internally in each nonclustered index; duplicate rows are not a problem even for identical data values.
- ignore_dup_row and allow_dup_row are mutually exclusive.
- A nonunique clustered index allows duplicate keys, but does not allow duplicate rows unless you specify allow_dup_row.
- allow_dup_row allows you to create a nonunique, clustered index on a table that includes duplicate rows. If a table has a nonunique, clustered index that was created without the allow_dup_row option, you cannot create new duplicate rows using the insert or update command.

  If any index in the table is unique, the requirement for uniqueness takes precedence over the allow_dup_row option. You cannot create an index with allow_dup_row if a unique index exists on any column in the table.
- The ignore_dup_row option is also used with a nonunique, clustered index. The ignore_dup_row option eliminates duplicates from a batch of data. ignore_dup_row cancels any insert or update that would create a duplicate row, but does not roll back the entire transaction.
- Table 1-7 illustrates how allow_dup_row and ignore_dup_row affect attempts to create a nonunique, clustered index on a table that includes duplicate rows and attempts to enter duplicate rows into a table.

Table 1-7: Duplicate row options for nonunique clustered indexes

Option setting	Create an index on a table that has duplicate rows	Insert duplicate rows into a table with an index
Neither option set	create index fails.	insert fails.
allow_dup_row set	create index completes.	insert completes.
ignore_dup_row set	Index is created but duplicate rows are deleted; error message.	All rows are inserted except duplicates; error message.

Table 1-8 shows which index options can be used with the different types of indexes:

Table 1-8: Index options

Index type	Options
Clustered	ignore_dup_row | allow_dup_row
Unique, clustered	ignore_dup_key
Nonclustered	None
Unique, nonclustered	ignore_dup_key

Using unique constraints in place of indexes

- As an alternative to create index, you can implicitly create unique indexes by specifying a unique constraint with the create table or alter table statement. The unique constraint creates a clustered or nonclustered unique index on the columns of a table. These *implicit* indexes are named after the constraint, and they follow the same rules for indexes created with create index.
- You cannot drop indexes supporting unique constraints using the drop index statement. They are dropped when the constraints are dropped through an alter table statement or when the table is dropped. See create table for more information about unique constraints.

Using the *sorted_data* option to speed sorts

- The sorted_data option can reduce the time needed to create an index by skipping the sort step and by eliminating the need to copy the data rows to new pages in certain cases. The speed increase becomes significant on large tables and increases to several times faster in tables larger than 1GB.

  If sorted_data is specified, but data is not in sorted order, Adaptive Server displays an error message, and the command fails.

  Creating a nonunique, nonclustered index succeeds, unless there are rows with duplicate keys. If there are rows with duplicate keys, Adaptive Server displays an error message, and the command fails.
- The effects of sorted_data for creating a clustered index depend on whether the table is partitioned and whether certain other options are used in the create index command. Some options require data copying, if used at all, for nonpartitioned tables and sorts plus data copying for partitioned tables, while others require data copying only if you:
  - Use the ignore_dup_row option
  - Use the fillfactor option
  - Use the on *segmentname* clause to specify a segment that is different from the segment where the table data is located

- Use the max_rows_per_page clause to specify a value that is different from the value associated with the table

- Table 1-9 shows when the sort is required and when the table is copied for partitioned and nonpartitioned tables.

Table 1-9: Using the sorted_data option for creating a clustered index

Options	Partitioned table	Unpartitioned table
No options specified	Parallel sort; copies data, distributing evenly on partitions; creates index tree.	Either parallel or nonparallel sort; copies data, creates index tree.
with sorted_data only or with sorted_data on *same_segment*	Creates index tree only. Does not perform the sort or copy data. Does not run in parallel.	Creates index tree only. Does not perform the sort or copy data. Does not run in parallel.
with sorted_data and ignore_dup_row or fillfactor or on *other_segment* or max_rows_per_page	Parallel sort; copies data, distributing evenly on partitions; creates index tree.	Copies data and creates the index tree. Does not perform the sort. Does not run in parallel.

Specifying the number of histogram steps

- Use the with statistics clause to specify the number of steps for a histogram for the leading column of an index. Histograms are used during query optimization to determine the number of rows that match search arguments for a column.

- To re-create an index without updating the values in sysstatistics for a column, use 0 for the number of steps. This avoids overwriting statistics that have been changed with optdiag.

Space management properties

- fillfactor, max_rows_per_page, and reservepagegap help manage space on index pages in different ways:

  - fillfactor applies to indexes for all locking schemes. For clustered indexes on allpages-locked tables, it affects the data pages of the table. On all other indexes, it affects the leaf level of the index.

  - max_rows_per_page applies only to index pages of allpages-locked tables.

  - reservepagegap applies to tables and indexes for all locking schemes.

- reservepagegap affects space usage in indexes when

  - The index is created

  - reorg commands on indexes are executed

  - Nonclustered indexes are rebuilt after creating a clustered index

- When a reservepagegap value is specified in a create clustered index command, it applies to:
  - The data and index pages of allpages-locked tables
  - Only the index pages of data-only-locked tables
- The *num_pages* value specifies a ratio of filled pages to empty pages on the leaf level of the index so that indexes can allocate space close to existing pages, as new space is required. For example, a reservepagegap of 10 leaves 1 empty page for each 9 used pages.
- reservepagegap specified along with create clustered index on an allpages-locked table overwrites any value previously specified with create table or alter table.
- You can change the space management properties for an index with sp_chgattribute. Changing properties with sp_chgattribute does not immediately affect storage for indexes on the table. Future large scale allocations, such as reorg rebuild, use the sp_chgattribute value.
- The fillfactor value set by sp_chgattribute is stored in the fill_factor column in sysindexes. The fillfactor is applied when an index is recreated as a result of an alter table...lock command or a reorg rebuild command.

Index options and locking modes

- Table 1-10 shows the index options supported for allpages-locked and data-only-locked tables. On data-only-locked tables, the ignore_dup_row and allow_dup_row options are enforced during create index, but are not enforced during insert and update operations. Data-only-locked tables always allow the insertion of duplicate rows.

Table 1-10: create index options supported for locking schemes

Index type	Allpages-locked table	Data-only-locked table	
		During index creation	During inserts
Clustered	allow_dup_row, ignore_dup_row	allow_dup_row, ignore_dup_row	allow_dup_row
Unique clustered	ignore_dup_key	ignore_dup_key	ignore_dup_key
Nonclustered	None	None	None
Unique nonclustered	ignore_dup_key	ignore_dup_key	ignore_dup_key

Table 1-11 shows the behavior of commands that attempt to insert duplicate rows into tables with clustered indexes, and when the clustered indexes are dropped and re-created.

Table 1-11: Enforcement and errors for duplicate row options

Options	Allpages-locked table	Data-only-locked table
No options specified	Insert fails with error message 2615. Re-creating the index succeeds.	Insert succeeds. Re-creating the index fails with error message 1508.
allow_dup_row	Insert and re-creating the index succeed.	Insert and re-creating the index succeed.
ignore_dup_row	Insert fails with "Duplicate row was ignored" message. Re-creating the index succeeds.	Insert succeeds. Re-creating the index deletes duplicate rows.

Using the *sorted_data* option on data-only-locked tables

- The sorted_data option to create index can be used only immediately following a bulk copy operation into an empty table. Once data modifications to that table cause additional page allocations, the sorted_data option cannot be used.
- Specifying different values for space management properties may override the sort suppression functionality of the sorted_data.

Getting information about tables and indexes

- Each index—including composite indexes—is represented by one row in sysindexes.
- For information about the order of the data retrieved through indexes and the effects of an Adaptive Server's installed sort order, see the order by clause.
- For information about a table's indexes, execute sp_helpindex.

Standards

ANSI SQL – Compliance level: Transact-SQL extension.

Permissions

create index permission defaults to the table owner and is not transferable.

See also

Commands alter table, create table, drop index, insert, order by clause, set, update

System procedures sp_addsegment, sp_chgattribute, sp_helpindex, sp_helpsegment, sp_spaceused

Utilities optdiag

create plan

Description

Creates an abstract plan.

Syntax

create plan *query plan*
[into *group_name*]
[and set *@new_id*]

Parameters

query
is a string literal, parameter, or local variable containing the SQL text of a query.

plan
is a string literal, parameter, or local variable containing an abstract plan expression.

into *group_name*
specifies the name of an abstract plan group.

and set *@new_id*
returns the ID number of the abstract plan in the variable.

Examples

Example 1 Creates an abstract plan for the specified query:

```
create plan "select * from titles where price > $20"
"(t_scan titles)"
```

Example 2 Creates an abstract plan for the query in the dev_plans group, and returns the plan ID in the variable *@id*:

```
declare @id int
create plan "select au_fname, au_lname from authors
where au_id = '724-08-9931' "
"(i_scan au_id_ix authors)"
into dev_plans
and set @id
select @id
```

Usage

- create plan saves the abstract plan in the group specified with into. If no group name is specified, it saves the plan in the currently active plan group.
- Queries and abstract plans specified with create plan are not checked for valid SQL syntax and plans are not checked for valid abstract plan syntax. Also, the plan is not checked for compatibility with the SQL text. All plans created with create plan should be immediately checked for correctness by running the query specified in the create plan statement.

- If another query plan in the group has the same SQL text, the replace mode must be enabled with set plan replace on. Otherwise, the create plan command fails.
- You must declare *@new_id* before using it in the and set clause.
- The abstract plan group you specify with into must already exist.

Standards

ANSI SQL – Compliance level: Transact-SQL extension.

Permissions

create plan permission defaults to all users. No permission is required to use it.

See also

Commands set plan

System procedures sp_add_qpgroup, sp_find_qplan, sp_help_qplan, sp_set_qplan

create procedure

Description

Creates a stored procedure or an extended stored procedure (ESP) that can take one or more user-supplied parameters.

Note For syntax and usage information about the SQLJ command for creating procedures, see create function (SQLJ) on page 82.

Syntax

```
create procedure [owner.]procedure_name[;number]
        [[()@parameter_name
            datatype [(length ) | (precision  [, scale ])]
            [= default][output]
        [, @parameter_name
            datatype [(length ) | (precision  [, scale ])]
            [= default][output]]...[)]]
        [with recompile]
        as {SQL_statements | external name dll_name}
```

Parameters

procedure_name

is the name of the procedure. It must conform to the rules for identifiers and cannot be a variable. Specify the owner's name to create another procedure of the same name owned by a different user in the current database. The default value for *owner* is the current user.

;number

is an optional integer used to group procedures of the same name so that they can be dropped together with a single drop procedure statement. Procedures used in the same application are often grouped this way. For example, if the procedures used with the application named orders are named orderproc;1, orderproc;2, and so on, the following statement drops the entire group:

```
drop proc orderproc
```

Once procedures have been grouped, individual procedures within the group cannot be dropped. For example, the following statement is not allowed:

```
drop procedure orderproc;2
```

You cannot group procedures if you are running Adaptive Server in the **evaluated configuration**. The evaluated configuration requires that you disallow procedure grouping so that every stored procedure has a unique object identifier and can be dropped individually. To disallow procedure grouping, a System Security Officer must use sp_configure to reset allow procedure grouping. For more information about the evaluated configuration, see the *System Administration Guide*.

parameter_name

is the name of an argument to the procedure. The value of each parameter is supplied when the procedure is executed. Parameter names are optional in create procedure statements—a procedure is not required to take any arguments.

Parameter names must be preceded by the @ sign and conform to the rules for identifiers. A parameter name, including the @ sign, can be a maximum of 30 characters. Parameters are local to the procedure: the same parameter names can be used in other procedures.

If the value of a parameter contains nonalphanumeric characters, it must be enclosed in quotes. This includes object names qualified by a database name or owner name, since they include a period. If the value of a character parameter begins with a numeric character, it also must be enclosed in quotes.

datatype[(*length*) | (*precision* [*, scale*])]

is the datatype of the parameter. See "User-defined datatypes" on page 44 in Chapter 1, "System and User-Defined Datatypes"of *Reference Manual: Building Blocks*. for more information about datatypes. Stored procedure parameters cannot have a datatype of text or image or a user-defined datatype whose underlying type is text or image.

The char, varchar, unichar, univarchar, nchar, nvarchar, binary, and varbinary datatypes should include a *length* in parentheses. If you omit the length, Adaptive Server truncates the parameter value to 1 character.

The float datatype expects a binary *precision* in parentheses. If you omit the precision, Adaptive Server uses the default precision for your platform.

The numeric and decimal datatypes expect a *precision* and *scale*, enclosed in parentheses and separated by a comma. If you omit the precision and scale, Adaptive Server uses a default precision of 18 and a scale of 0.

default

defines a default value for the procedure's parameter. If a default is defined, a user can execute the procedure without giving a parameter value. The default must be a constant. It can include the wildcard characters (%, _, [ ], and [^]) if the procedure uses the parameter name with the keyword like (see Example 2).

The default can be NULL. The procedure definition can specify that some action be taken if the parameter value is NULL (see Example 3).

output
: indicates that the parameter is a return parameter. Its value can be returned to the execute command that called this procedure. Use return parameters to return information to the calling procedure (see Example 5).

  To return a parameter value through several levels of nested procedures, each procedure must include the output option with the parameter name, including the execute command that calls the highest level procedure.

  The output keyword can be abbreviated to out.

with recompile
: means that Adaptive Server never saves a plan for this procedure; a new plan is created each time it is executed. Use this optional clause when you expect that the execution of a procedure will be atypical—that is, when you need a new plan. The with recompile clause has no impact on the execution of an extended stored procedure.

SQL_statements
: specify the actions the procedure is to take. Any number and kind of SQL statements can be included, with the exception of create view, create default, create rule, create procedure, create trigger, and use.

  create procedure SQL statements often include control-of-flow language, including one or more of the following: declare; if...else; while; break; continue; begin...end; goto label; return; waitfor; /* *comment* */. They can also refer to parameters defined for the procedure.

  The SQL statements can reference objects in another database, as long as they are properly qualified.

external name
: creates an extended stored procedure. If the as external name syntax is used, you cannot use the *number* parameter with as external name.

dll_name
: specifies the name of the dynamic link library (DLL) or shared library containing the functions that implement the extended stored procedure. The *dll_name* can be specified with no extension or with a platform-specific extension, such as *.dll* on Windows NT or *.so* on Sun Solaris. If you specify the extension, enclose the entire *dll_name* in quotation marks.

Examples

Example 1 Given a table name, the procedure showind displays its name and the names and identification numbers of any indexes on any of its columns:

```
create procedure showind @tabname varchar(30)
as
  select sysobjects.name, sysindexes.name, indid
```

```
  from sysindexes, sysobjects
  where sysobjects.name = @tabname
  and sysobjects.id = sysindexes.id
```

Here are the acceptable syntax forms for executing showind:

```
execute showind titles
execute showind @tabname = "titles"
```

Or, if this is the first statement in a file or batch:

```
showind titles
```

Example 2 This procedure displays information about the system tables if the user does not supply a parameter:

```
create procedure
showsysind @table varchar(30) = "sys%"
as
  select sysobjects.name, sysindexes.name, indid
  from sysindexes, sysobjects
  where sysobjects.name like @table
  and sysobjects.id = sysindexes.id
```

Example 3 This procedure specifies an action to be taken if the parameter is NULL (that is, if the user does not give a parameter):

```
create procedure
showindnew @table varchar(30) = null
as
  if @table is null
   print "Please give a table name"
  else
   select sysobjects.name, sysindexes.name, indid
   from sysindexes, sysobjects
   where sysobjects.name = @table
   and sysobjects.id = sysindexes.id
```

Example 4 This procedure multiplies two integer parameters and returns the product in the output parameter, *@result*:

```
create procedure mathtutor @mult1 int, @mult2 int,
  @result int output
as
select @result = @mult1 * @mult2
```

If the procedure is executed by passing it 3 integers, the select statement performs the multiplication and assigns the values, but does not print the return parameter:

```
mathtutor 5, 6, 32
```

```
(return status 0)
```

Example 5 In this example, both the procedure and the execute statement include `output` with a parameter name so that the procedure can return a value to the caller:

```
declare @guess int
select @guess = 32
exec mathtutor 5, 6, @result = @guess output

(1 row affected)
(return status = 0)

Return parameters:

@result
-----------
         30
```

The output parameter and any subsequent parameters in the execute statement, *@result*, *must* be passed as:

```
@parameter = value
```

- The value of the return parameter is always reported, whether or not its value has changed.
- *@result* does not need to be declared in the calling batch because it is the name of a parameter to be passed to `mathtutor`.
- Although the changed value of *@result* is returned to the caller in the variable assigned in the execute statement (in this case, *@guess*), it is displayed under its own heading (*@result*).

Example 6 Return parameters can be used in additional SQL statements in the batch or calling procedure. This example shows how to use the value of *@guess* in conditional clauses after the execute statement by storing it in another variable name, *@store*, during the procedure call. When return parameters are used in an execute statement that is part of a SQL batch, the return values are printed with a heading before subsequent statements in the batch are executed.

```
declare @guess int
declare @store int
select @guess = 32
select @store = @guess
execute mathtutor 5, 6, @result = @guess output
select Your_answer = @store, Right_answer = @guess
if @guess = @store
```

```
    print "Right-o"
else
    print "Wrong, wrong, wrong!"

(1 row affected)
(1 row affected)
(return status = 0)

Return parameters:

@result
-----------
         30
Your_answer Right_answer
----------- ------------
         32           30

(1 row affected)
Wrong, wrong, wrong!
```

Example 7 Creates an extended stored procedure named xp_echo, which takes an input parameter, *@in*, and echoes it to an output parameter, *@out*. The code for the procedure is in a function named xp_echo, which is compiled and linked into a DLL named *sqlsrvdll.dll*:

```
create procedure xp_echo @in varchar(255),
        @out varchar(255) output
as external name "sqlsrvdll.dll"
```

Usage

- After a procedure is created, you can run it by issuing the execute command along with the procedure's name and any parameters. If a procedure is the first statement in a batch, you can give its name without the keyword execute.
- You can use sp_hidetext to hide the source text for a procedure, which is stored in syscomments.
- When a stored procedure batch executes successfully, Adaptive Server sets the *@@error* global variable to 0.

Restrictions

- The maximum number of parameters that a stored procedure can have is 255.
- The maximum number of local and global variables in a procedure is limited only by available memory.
- The maximum amount of text in a stored procedure is 16MB.

- A create procedure statement cannot be combined with other statements in a single batch.
- You can create a stored procedure only in the current database, although the procedure can reference objects from other databases. Any objects referenced in a procedure must exist at the time you create the procedure. You can create an object within a procedure, then reference it, provided the object is created before it is referenced.

  You cannot use alter table in a procedure to add a column and then refer to that column within the procedure.
- If you use select * in your create procedure statement, the procedure (even if you use the with recompile option to execute) does not pick up any new columns you may have added to the table. You must drop the procedure and re-create it. and re-create it. Otherwise, the wrong results can be caused by the insert...select statement of insert into table1 select * from table2 in the procedure when new columns have been added to the both tables.
- Within a stored procedure, you cannot create an object (including a temporary table), drop it, then create a new object with the same name. Adaptive Server creates the objects defined in a stored procedure when the procedure is executed, not when it is compiled.

Warning! Certain changes to databases, such as dropping and re-creating indexes, can cause object IDs to change. When object IDs change, stored procedures recompile automatically, and can increase slightly in size. Leave some space for this increase.

Extended stored procedures

- If the as *external name* syntax is used, create procedure registers an extended stored procedure (ESP). Extended stored procedures execute procedural language functions rather than Transact-SQL commands.
- *On Windows NT* – an ESP function should not call a C runtime signal routine. This can cause XP Server to fail, because Open Server™ does not support signal handling on Windows NT.
- To support multithreading, ESP functions should use the Open Server srv_yield function, which suspends and reschedules the XP Server thread to allow another thread of the same or higher priority to execute.
- The DLL search mechanism is platform-dependent. On Windows NT, the sequence of a DLL file name search is as follows:

a The directory from which the application is loaded

b The current directory

c The system directory (SYSTEM32)

d Directories listed in the PATH environment variable

If the DLL is not in the first three directories, set the PATH to include the directory in which it is located.

On UNIX platforms, the search method varies with the particular platform. If it fails to find the DLL or shared library, it searches *$SYBASE/lib*.

Absolute path names are not supported.

System procedures

- System Administrators can create new system procedures in the sybsystemprocs database. System procedure names must begin with the characters "sp_". These procedures can be executed from any database by specifying the procedure name; it is not necessary to qualify it with the sybsystemprocs database name. For more information about creating system procedures, see the *System Administration Guide*.
- System procedure results may vary depending on the context in which they are executed. For example, sp_foo, which executes the db_name() system function, returns the name of the database from which it is executed. When executed from the pubs2 database, it returns the value "pubs2":

```
use pubs2
sp_foo
------------------------------
pubs2
```

When executed from sybsystemprocs, it returns the value "sybsystemprocs":

```
use sybsystemprocs
sp_foo
------------------------------
sybsystemprocs
```

Nested procedures

- Procedure nesting occurs when one stored procedure calls another.
- If you execute a procedure that calls another procedure, the called procedure can access objects created by the calling procedure.

- The nesting level increments when the called procedure begins execution and decrements when the called procedure completes execution. Exceeding the maximum of 16 levels of nesting causes the transaction to fail.
- You can call another procedure by name or by a variable name in place of the actual procedure name.
- The current nesting level is stored in the *@@nestlevel* global variable.

Procedure return status

- Stored procedures can return an integer value called a *return status*. The return status either indicates that the procedure executed successfully or specifies the type of error that occurred.
- When you execute a stored procedure, it automatically returns the appropriate status code. Adaptive Server currently returns the following status codes:

Code	Meaning
0	Procedure executed without error
-1	Missing object
-2	Datatype error
-3	Process was chosen as deadlock victim
-4	Permission error
-5	Syntax error
-6	Miscellaneous user error
-7	Resource error, such as out of space
-8	Non-fatal internal problem
-9	System limit was reached
-10	Fatal internal inconsistency
-11	Fatal internal inconsistency
-12	Table or index is corrupt
-13	Database is corrupt
-14	Hardware error

  Codes -15 through -99 are reserved for future use.

- Users can generate a user-defined return status with the return statement. The status can be any integer other than 0 through -99. The following example returns “1” when a book has a valid contract and “2” in all other cases:

```
create proc checkcontract @titleid tid
```

```
as
if (select contract from titles where
        title_id = @titleid) = 1
   return 1
else
   return 2
checkcontract @titleid = "BU1111"
(return status = 1)
checkcontract @titleid = "MC3026"
(return status = 2)
```

- If more than one error occurs during execution, the code with the highest absolute value is returned. User-defined return values take precedence over system-defined values.

Object identifiers

- To change the name of a stored procedure, use sp_rename.
- To change the name of an extended stored procedure, drop the procedure, rename and recompile the supporting function, then re-create the procedure.
- If a procedure references table names, column names, or view names that are not valid identifiers, you must *set quoted_identifier on* before the *create procedure* command and enclose each such name in double quotes. The *quoted_identifier* option does *not* need to be on when you execute the procedure.
- You must drop and re-create the procedure if any of the objects it references have been renamed.
- Inside a stored procedure, object names used with the create table and dbcc commands must be qualified with the object owner's name if other users are to make use of the stored procedure. For example, user "mary," who owns the table marytab, should qualify the name of her table inside a stored procedure (when it is used with these commands) if she wants other users to be able to execute it. This is because the object names are resolved when the procedure is run. When another user tries to execute the procedure, Adaptive Server looks for a table called marytab owned by the user "mary" and not a table called marytab owned by the user executing the stored procedure.

  Object names used with other statements (for example, select or insert) inside a stored procedure need not be qualified because the names are resolved when the procedure is compiled.

Temporary tables and procedures

- You can create a procedure to reference a temporary table if the temporary table is created in the current session. A temporary table created within a procedure disappears when the procedure exits. For more information, see the *Transact-SQL User's Guide*.
- System procedures such as sp_help work on temporary tables, but only if you use them from tempdb.

Setting options in procedures

- You can use the set command inside a stored procedure. Most set options remain in effect during the execution of the procedure, then revert to their former settings.

  However, if you use a set option (such as identity_insert) which requires the user to be the object owner, a user who is not the object owner cannot execute the stored procedure.

Getting information about procedures

- For a report on the objects referenced by a procedure, use sp_depends.
- To display the text of a create procedure statement, which is stored in syscomments, use sp_helptext with the procedure name as the parameter. You must be using the database where the procedure resides when you use sp_helptext. To display the text of a system procedure, execute sp_helptext from the sybsystemprocs database.
- To see a list of system extended stored procedures and their supporting DLLs, use sp_helpextendedproc from the sybsystemprocs database.

Standards

ANSI SQL – Compliance level: Transact-SQL extension.

Permissions

create procedure permission defaults to the Database Owner, who can transfer it to other users.

Permission to use a procedure must be granted explicitly with the grant command and may be revoked with the revoke command.

Permissions on objects at procedure creation When you create a procedure, Adaptive Server makes no permission checks on objects, such as tables and views, that are referenced by the procedure. Therefore, you can create a procedure successfully even though you do not have access to its objects. All permission checks occur when a user executes the procedure.

Permissions on objects at procedure execution When the procedure is executed, permission checks on objects depend upon whether the procedure and all referenced objects are owned by the same user.

- If the procedure's objects are owned by different users, the invoker must have been granted direct access to the objects. For example, if the procedure performs a select from a table that the user cannot access, the procedure execution fails.
- If a procedure and its objects are owned by the same user, however, special rules apply. The invoker automatically has "implicit permission" to access the procedure's objects even though the invoker could not access them directly. Without having to grant users direct access to your tables and views, you can give them restricted access with a stored procedure. In this way, a stored procedure can be a security mechanism. For example, invokers of the procedure might be able to access only certain rows and columns of your table.

  A detailed description of the rules for implicit permissions is discussed in the *System Administration Guide*.

See also

Commands begin...end, break, continue, declare, drop procedure, execute, goto label, grant, if...else, return, select, waitfor, while

System procedures sp_addextendedproc, sp_helpextendedproc, sp_helptext, sp_hidetext, sp_rename

create procedure (SQLJ)

Description

Creates a SQLJ stored procedure by adding a SQL wrapper to a Java static method. Can accept user-supplied parameters and return result sets and output parameters.

Note For syntax and usage information about the Transact-SQL command for creating procedures, see create procedure on page 101.

Syntax

```
create procedure [owner.]sql_procedure_name
        ([ [ in | out | inout ] sql_parameter_name
            sql_datatype [( length) |
            (precision[, scale]) ]
        [, [ in | out | inout ] sql_parameter_name
            sql_datatype [( length) |
            (precision[, scale ]) ] ]
        ...])
        [modifies sql data ]
        [dynamic result sets integer]
        [deterministic | not deterministic]
        language java
        parameter style java
        external name 'java_method_name
            [ ( [java_datatype[, java_datatype
            ...]] ) ]'
```

Parameters

sql_procedure_name

is the Transact-SQL name of the procedure. It must conform to the rules for identifiers and cannot be a variable. Specify the owner's name to create another procedure of the same name owned by a different user in the current database. The default value for *owner* is the current user.

in | out | inout

specifies the mode of the listed parameter. in indicates an input parameter; out indicates an output parameter; and inout indicates a parameter that is both an input and an output parameter. The default mode is in.

sql_parameter_name

is the name of an argument to the procedure. The value of each input parameter is supplied when the procedure is executed. Parameters are optional; a SQLJ stored procedure need not take arguments.

Parameter names must conform to the rules for identifiers. If the value of a parameter contains nonalphanumeric characters, it must be enclosed in quotes. This includes object names qualified by a database name or owner name, since they include a period. If the value of the parameter begins with a numeric character, it also must be enclosed in quotes.

sql_datatype [(*length*) | (*precision* [, *scale*])]
is the Transact-SQL datatype of the parameter.

sql_datatype is the SQL procedure signature.

modifies sql data
indicates that the Java method invokes SQL operations, reads, and modifies SQL data in the database. This is the default and only implementation. It is included for syntactic compatibility with the ANSI standard.

dynamic result sets *integer*
specifies that the Java method can return SQL result sets. *integer* specifies the maximum number of result sets the method can return. This value is implementation-defined.

deterministic | not deterministic
this syntax is supported for compatibility with other SQLJ-compliant vendors.

language java
specifies that the external routine is written in Java. This is a required clause for SQLJ stored procedures.

parameter style java
specifies that the parameters passed to the external routine at runtime are Java parameters. This is a required clause for SQLJ stored procedures.

external
indicates that create procedure defines a SQL name for an external routine written in a programming language other than SQL.

name
specifies the name of the external routine (Java method). The specified name is a character-string literal and must be enclosed in single quotes:

```
'java_method_name [ java_datatype
          [{, java_datatype} ...]]'
```

java_method_name
specifies the name of the external Java method.

java_datatype
specifies a Java datatype that is mappable or result-set mappable. This is the Java method signature.

Examples

This example creates the SQLJ procedure java_multiply, which multiplies two integers and returns an integer.

```
create procedure java_multiply (param1 integer,
```

```
    param2 integer, out result integer)
language java parameter style java
external name 'MathProc.multiply'
```

Usage

- You can include a maximum of 31 in, inout, and out parameters in a create procedure statement.
- To comply with the ANSI standard, do not precede parameter names with the @ sign. When executing a SQLJ stored procedure from isql or other non-Java client, however, you must precede parameter names with the @ sign, which preserves the naming order.
- The SQLJ create procedure syntax differs from the Transact-SQL create procedure syntax for compatibility with the SQLJ ANSI standard. Adaptive Server executes each type of stored procedure in the same way.

Permissions

create procedure permission defaults to the Database Owner, who can transfer it to other users. Permission to use a procedure must be granted explicitly with the grant command and may be revoked with the revoke command.

See also

Commands create function (SQLJ), drop procedure

System procedures sp_depends, sp_help, sp_helpjava, sp_helprotect

create proxy_table

Description

Component Integration Services only Creates a proxy table without specifying a column list. Component Integration Services derives the column list from the metadata it obtains from the remote table.

Syntax

create proxy_table *table_name*
[on *segment_name*]
[external [table | directory | file]]
at *pathname*
[column delimiter “<string>”]

Parameters

table_name
specifies the local proxy table name to be used by subsequent statements. *table_name* takes the form *dbname.owner.object*, where *dbname* and *owner* are optional and represent the local database and owner name. If *dbname* is not specified, the table is created in the current database; if *owner* is not specified, the table is owned by the current user. If either *dbname* or *owner* is specified, the entire *table_name* must be enclosed in quotes. If only *dbname* is present, a placeholder is required for *owner*.

on *segment_name*
specifies the segment that contains the remote table.

external table
specifies that the object is a remote table or view. external table is the default, so this clause is optional.

external directory
specifies that the object is a directory with a path in the following format: "*/tmp/directory_name* [;R]". “R” indicates “recursive.”

external file
specifies that the object is a file with a path in the following format: "*/tmp/filename*".

at *pathname*
specifies the location of the remote object. *pathname* takes the form *server_name.dbname.owner.object*, where:

- *server_name* (required) – is the name of the server that contains the remote object.
- *dbname* (optional) – is the name of the database managed by the remote server that contains this object.
- *owner* (optional) – is the name of the remote server user that owns the remote object.
- *object* (required) – is the name of the remote table or view.

column delimiter
used to separate fields within each record when accesssing flat files, column delimiters The column delimiter can be up to 16 bytes long.

string
The column delimiter string can be any character sequencer, but if the string is longer than 16 bytes, only the first 16 bytes are used. The use of column delimiter for proxy tables mapped to anything but files will result in a syntax error.

Examples

This example creates a proxy table named t1 that is mapped to the remote table t1. Component Integration Services derives the column list from the remote table:

```
create proxy_table t1
at "SERVER_A.db1.joe.t1"
```

Usage

- create proxy_table is a variant of the create existing table command. You use create proxy_table to create a proxy table, but (unlike create existing table) you do not specify a column list. Component Integration Services derives the column list from the metadata it obtains from the remote table.
- The location information provided by the at keyword is the same information that is provided by sp_addobjectdef. The information is stored in the sysattributes table.
- If the remote server object does not exist, the command is rejected with an error message.
- If the object exists, the local system tables are updated. Every column is used. Columns and their attributes are obtained for the table or view.

- Component Integration Services automatically converts the datatype of the column into an Adaptive Server datatype. If the conversion cannot be made, the create proxy_table command does not allow the table to be defined.
- Index information from the remote server table is extracted and used to create rows for the system table sysindexes. This defines indexes and keys in Adaptive Server terms and enables the query optimizer to consider any indexes that may exist on the table.
- After defining the proxy table, issue an update statistics command for the table. This allows the query optimizer to make intelligent choices regarding join order.
- When executing create proxy_table *table_name* at *pathname*, the table and column names will assume the same case as *table_name*, if the server identified by *pathname* is case insensitive (such as DB2 and Oracle).

  The columns returned by a case insensitive server (typically in upper case), will be stored in Adaptive Server as lower case, if *table_name* is lower case. If *table_name* is uppercase, then the column names will be stored as uppercase values. If *table_name* is in mixed case, then all column names will be stored as received from the remote site.

Proxy tables and extents

Proxy tables in earlier versions of Adaptive Server occupy one extent (8 pages), as well as one extent for each index on a proxy table. In a pre-12.5.0.1 server with 16K logical page size, each proxy table uses 128K worth of space.

In Adaptive Server 12.5.0.1, proxy tables and indexes do not use extents; they use space only in the system catalogs, which Sybase estimates to be 1MB per 100 proxy tables (assuming an average of two indexes per table). The normal upgrade does not reclaim this unused space. To reclaim this space, first drop, then re-create the proxy table.

Standards

ANSI SQL – Compliance level: Transact-SQL extension.

Permissions

create proxy_table permission defaults to the table owner and is not transferable.

See also

Commands create existing table, create table

create role

Description

Creates a user-defined role; specifies the password expiration interval, the minimum password length, and the maximum number of failed logins allowed for a specified role at creation.

Syntax

create role *role_name* [with passwd "*password*"
[, {passwd expiration | min passwd length |
max failed_logins} *option_value*]]

Parameters

role_name
is the name of the new role. It must be unique to the server and conform to the rules for identifiers. It cannot be a variable.

with passwd
attaches a password the user must enter to activate the role.

password
is the password to attach to the role. Passwords must be at least 6 characters in length and must conform to the rules for identifiers. You cannot use variables for passwords.

passwd expiration
specifies the password expiration interval in days. It can be any value between 0 and 32767, inclusive.

min passwd length
specifies the minimum password length required for the specified role.

max failed_logins
specifies the number of allowable failed login attempts for the specified login.

option_value
specifies the value for passwd expiration, min passwd length, or max failed_logins.

Examples

Example 1 Creates a role named doctor_role:

```
create role doctor_role
```

Example 2 Creates a role named doctor_role with the password physician:

```
create role doctor_role with passwd "physician"
```

Example 3 Sets the password expiration for intern_role:

```
create role intern_role, with passwd "temp244",
passwd expiration 7
```

Example 4 Sets the maximum number of failed logins allowed for intern_role:

```
create role intern_role with passwd "temp244",
max failed_logins 20
```

Example 5 Sets the minimum password length for intern_role:

```
create role intern_role with passwd "temp244",
min passwd length 0
```

Usage

- The create role command creates a role with privileges, permissions, and limitations that you design. For more information on how to use create role, see the *System Administration Guide*.

  For information on monitoring and limiting access to objects, see the set role command.

- Use create role from the master database.

- Use the with passwd *password* clause to attach a password to a role at creation. If you attach a password to the role, the user granted this role must specify the password to activate the role.

  For information on adding a password to a role after creation, see the alter role command.

  Note Passwords attached to user-defined roles do not expire.

- Role names must be unique to the server.

- Role names cannot be the same as user names. You can create a role with the same name as a user, but when you grant privileges, Adaptive Server resolves naming conflicts by making the grant to the user instead of the role.

  For more information on naming conflicts, see the grant role command.

Restrictions

- The maximum number of roles that can be created per server session is 1024. However, 32 roles are reserved for Sybase system roles, such as sa_role and sso_role. Therefore, the maximum number of user-defined roles that can be created per server session is 992.

- If you create a role with an attached password, a user cannot activate that role by default at login. Do not create a role with an attached password if the user to whom you grant that role needs to activate the role by default at login.

Standards

ANSI SQL – Compliance level: Transact-SQL extension.

Permissions

You must be a System Security Officer to use create role.

create role permission is not included in the grant all command.

See also

Commands alter role, drop role, grant, revoke, set

System procedures sp_activeroles, sp_displaylogin, sp_displayroles, sp_helprotect, sp_modifylogin

create rule

Description

Specifies the domain of acceptable values for a particular column or for any column of a user-defined datatype and creates access rules.

Syntax

```
create [ [ and | or ] access]] rule
        [owner.]rule_name
        as condition_expression
```

Parameters

access

specifies that you are creating an access rule. For information on access rules, see Chapter 11, "Managing User Permissions" in the *System Administration Guide*.

rule_name

is the name of the new rule. It must conform to the rules for identifiers and cannot be a variable. Specify the owner's name to create another rule of the same name owned by a different user in the current database. The default value for *owner* is the current user.

condition_expression

specifies the conditions that define the rule. It can be any expression that is valid in a where clause, and can include arithmetic operators, relational operators, in, like, between, and so on. However, it cannot reference a column or any other database object. Built-in functions that do not reference database objects *can* be included.

A *condition_expression* takes one argument. The argument is prefixed by the @ sign and refers to the value that is entered via the update or insert command. You can use any name or symbol to represent the value when you write the rule, but the first character must be the @ sign. Enclose character and date constants in quotes, and precede binary constants with "0x".

Examples

Example 1 Creates a rule named limit, which limits the value of advance to less than $1000:

```
create rule limit
as @advance < $1000
```

Example 2 Creates a rule named pubid_rule, which restricts the values of pub_id to 1389, 0736, or 0877:

```
create rule pubid_rule
as @pub_id in ('1389', '0736', '0877')
```

Example 3 Creates a rule named picture, which restricts the value of value to always begin with the indicated characters:

```
create rule picture
```

```
as @value like '_-%[0-9]'
```

Usage

- To hide the text of a rule, use sp_hidetext.
- To rename a rule, use sp_rename.

Restrictions

- You can create a rule only in the current database.
- Rules do not apply to the data that already exists in the database at the time the rules are created.
- create rule statements cannot be combined with other statements in a single batch.
- You cannot bind a rule to a Adaptive Server-supplied datatype or to a column of type text, image, or timestamp.
- You must drop a rule before you create a new one of the same name, and you must unbind a rule before you drop it. Use:

  ```
  sp_unbindrule objname [, futureonly]
  ```

Binding rules

- Use sp_bindrule to bind a rule to a column or user-defined datatype. Its syntax is:

  ```
  sp_bindrule rulename, objname [, futureonly]
  ```

- A rule that is bound to a user-defined datatype is activated when you insert a value into, or update, a column of that type. Rules do *not* test values inserted into variables of that type.
- The rule must be compatible with the datatype of the column. For example, you cannot use:

  ```
  @value like A%
  ```

  as a rule for an exact or approximate numeric column. If the rule is not compatible with the column to which it is bound, Adaptive Server generates an error message when it tries to insert a value, not when you bind it.
- You can bind a rule to a column or datatype without unbinding an existing rule.
- Rules bound to columns always take precedence over rules bound to user-defined datatypes, regardless of which rule was most recently bound. Table 1-12 indicates the precedence when binding rules to columns and user-defined datatypes where rules already exist.

Table 1-12: Rule binding precedence

New rule bound to	Old rule bound to user-defined datatype	Old rule bound to column
User-defined datatype	New rule replaces old	No change
Column	New rule replaces old	New rule replaces old

Rules and NULLs

- Rules do not override column definitions. If a rule is bound to a column that allows null values, you can insert NULL into the column, implicitly or explicitly, even though NULL is not included in the text of the rule. For example, if you create a rule specifying "@val in (1,2,3)" or "@amount > 10000", and bind this rule to a table column that allows null values, you can still insert NULL into that column. The column definition overrides the rule.

Defaults and rules

- If a column has both a default and a rule associated with it, the default must fall within the domain defined by the rule. A default that conflicts with a rule will never be inserted. Adaptive Server generates an error message each time it attempts to insert the default.

Using integrity constraints in place of rules

- You can define rules using check with the create table statement, which creates integrity constraints. However, these constraints are specific for that table; you cannot bind them to other tables. See create table and alter table for information about integrity constraints.

Getting information about rules

- To get a report on a rule, use sp_help.
- To display the text of a rule, which is stored in the syscomments system table, execute sp_helptext with the rule name as the parameter.
- After a rule is bound to a particular column or user-defined datatype, its ID is stored in the syscolumns or systypes system tables.

Standards

ANSI SQL – Compliance level: Entry-level compliant.

To create rules using ANSI SQL-compliant syntax, use the check clause of the create table statement.

Permissions

create rule permission defaults to the Database Owner, who can transfer it to other users.

See also

Commands alter table, create default, create table, drop rule, drop table

System procedures sp_bindrule, sp_help, sp_helptext, sp_hidetext, sp_rename, sp_unbindrule

create schema

Description

Creates a new collection of tables, views, and permissions for a database user.

Syntax

create schema authorization *authorization_name*
create_oject_statement
[create_object_statement ...]
[*permission_statement* ...]

Parameters

authorization_name
must be the name of the current user in the database.

create_object_statement
is a create table or create view statement.

permission_statement
is a grant or revoke command.

Examples

Creates the newtitles, newauthors, newtitleauthors tables, the tit_auth_view view, and the corresponding permissions:

```
create schema authorization pogo
    create table newtitles (
        title_id tid not null,
        title varchar(30) not null)

    create table newauthors (
        au_id id not null,
        au_lname varchar(40) not null,
        au_fname varchar(20) not null)

    create table newtitleauthors (
        au_id id not null,
        title_id tid not null)

    create view tit_auth_view
    as
        select au_lname, au_fname
            from newtitles, newauthors,
                newtitleauthors
        where
        newtitleauthors.au_id = newauthors.au_id
        and
        newtitleauthors.title_id =
             newtitles.title_id

    grant select on tit_auth_view to public
    revoke select on tit_auth_view from churchy
```

Usage

- Schemas can be created only in the current database.

- The *authorization_name*, also called the **schema authorization identifier**, must be the name of the current user.
- The user must have the correct command permissions (create table and/or create view). If the user creates a view on tables owned by another database user, permissions on the view are checked when a user attempts to access data through the view, not when the view is created.
- The create schema command is terminated by:
  - The regular command terminator ("go" is the default in isql).
  - Any statement other than create table, create view, grant, or revoke.
- If any of the statements within a create schema statement fail, the entire command is rolled back as a unit, and none of the commands take effect.
- create schema adds information about tables, views, and permissions to the system tables. Use the appropriate drop command (drop table or drop view) to drop objects created with create schema. Permissions granted or revoked in a schema can be changed with the standard grant and revoke commands outside the schema creation statement.

Standards

ANSI SQL – Compliance level: Transact-SQL extension.

Permissions

create schema can be executed by any user of a database. The user must have permission to create the objects specified in the schema; that is, create table and/or create view permission.

See also

Commands create table, create view, grant, revoke

Utilities isql

create table

Description

Creates new tables and optional integrity constraints.

Syntax

```
create table [database .[owner ].]table_name (column_name datatype
        [default {constant_expression  | user | null}]
        {[{identity | null | not null}]
            [off row | [ in row [ (size_in_bytes) ] ]
        [[constraint constraint_name ]
            {{unique | primary key}
            [clustered | nonclustered] [asc | desc]
            [with { fillfactor = pct,
                    max_rows_per_page = num_rows, }
                    reservepagegap = num_pages }]
            [on segment_name]
            | references [[database .]owner .]ref_table
                [(ref_column )]
                [match full]
                | check (search_condition)}]}
                [match full]...
        | [constraint constraint_name]
            {{unique | primary key}
                [clustered | nonclustered]
                (column_name [asc | desc]
                    [{, column_name [asc | desc]}...])
                [with { fillfactor = pct
                    max_rows_per_page = num_rows ,
                    reservepagegap = num_pages } ]
                [on segment_name]
            |foreign key (column_name [{,column_name}...])
                references [[database.]owner.]ref_table
                    [(ref_column [{, ref_column}...])]
                    [match full]
            | check (search_condition) ... }
        [{, {next_column | next_constraint}}...])
        [lock {datarows | datapages | allpages }]
        [with { max_rows_per_page = num_rows,
                exp_row_size = num_bytes,
                reservepagegap = num_pages,
                identity_gap = value } ]
        [on segment_name ]
        [ [ external table ] at pathname ]
```

Parameters

table_name

is the explicit name of the new table. Specify the database name if the table is in another database, and specify the owner's name if more than one table of that name exists in the database. The default value for *owner* is the current user, and the default value for *database* is the current database.

You cannot use a variable for the table name. The table name must be unique within the database and to the owner. If you have set quoted_identifier on, you can use a delimited identifier for the table name. Otherwise, it must conform to the rules for identifiers. For more information about valid table names, see "Identifiers" on page 259 in Chapter 4, "Expressions, Identifiers, and Wildcard Characters," of *Reference Manual: Building Blocks*.

You can create a temporary table by preceding the table name with either a pound sign (#) or "tempdb..". For more information, see "Tables beginning with # (temporary tables)" on page 260 in Chapter 4, "Expressions, Identifiers, and Wildcard Characters," of *Reference Manual: Building Blocks*.

You can create a table in a different database, as long as you are listed in the sysusers table and have create table permission for that database. For example, you can use either of the following to create a table called newtable in the database otherdb:

```
create table otherdb..newtable
create table otherdb.yourname.newtable
```

column_name

is the name of the column in the table. It must be unique in the table. If you have set quoted_identifier on, you can use a delimited identifier for the column. Otherwise, it must conform to the rules for identifiers. For more information about valid column names, see Chapter 4, "Expressions, Identifiers, and Wildcard Characters," of *Reference Manual: Building Blocks*.

datatype

is the datatype of the column. System or user-defined datatypes are acceptable. Certain datatypes expect a length, *n*, in parentheses:

```
datatype(n)
```

Others expect a precision, *p*, and scale, *s*:

```
datatype(p,s)
```

See “Datatypes” for more information.

If Java is enabled in the database, *datatype* can be the name of a Java class, either a system class or a user-defined class, that has been installed in the database. Refer to *Java in Adaptive Server Enterprise* for more information.

default
: specifies a default value for a column. If you specify a default, and the user does not provide a value for the column when inserting data, Adaptive Server inserts the default value. The default can be a constant expression, user, to insert the name of the user who is performing the insert, or null, to insert the null value. Adaptive Server generates a name for the default in the form of *tabname_colname_objid*, where *tabname* is the first 10 characters of the table name, *colname* is the first 5 characters of the column name, and *objid* is the object ID number for the default. Defaults declared for columns with the IDENTITY property have no effect on column values.

constant_expression
: is a constant expression to use as a default value for the column. It cannot include global variables, the name of any columns, or other database objects, but can include built-in functions that do not reference database objects. This default value must be compatible with the datatype of the column, or Adaptive Server generates a datatype conversion error when attempting to insert the default.

user | null
: specifies that Adaptive Server should insert the user name or the null value as the default if the user does not supply a value. For user, the datatype of the column must be either char(30) or varchar(30). For null, the column must allow null values.

identity
: indicates that the column has the IDENTITY property. Each table in a database can have one IDENTITY column with a type of numeric and a scale of 0. IDENTITY columns are not updatable and do not allow nulls.

  IDENTITY columns are used to store sequential numbers, such as invoice numbers or employee numbers, that are generated automatically by Adaptive Server. The value of the IDENTITY column uniquely identifies each row in a table.

null | not null
specifies Adaptive Server's behavior during data insertion if no default exists.

null specifies that Adaptive Server assigns a null value if a user does not provide a value.

not null specifies that a user must provide a non-null value if no default exists.

If you do not specify null or not null, Adaptive Server uses not null by default. However, you can switch this default using sp_dboption to make the default compatible with the SQL standards.

off row | in row
specifies whether a Java-SQL column is stored separate from the row (off row) or in storage allocated directly in the row (in row).

The default value is off row. For more information, see *Java in Adaptive Server Enterprise*.

size_in_bytes
specifies the maximum size of the in-row column. An object stored in-row can occupy up to approximately 16K bytes, depending on the page size of the database server and other variables. The default value is 255 bytes.

constraint
introduces the name of an integrity constraint.

constraint_name
is the name of the constraint. It must conform to the rules for identifiers and be unique in the database. If you do not specify the name for a referential or check constraint, Adaptive Server generates a name in the form *tabname_colname_objectid* where *tabname* is the first 10 characters of the table name, *colname* is the first 5 characters of the column name, and *objectid* is the object ID number for the constraint. If you do not specify the name for a unique or primary key constraint, Adaptive Server generates a name in the format *tabname_colname_tabindid* where *tabindid* is a string concatenation of the table ID and index ID.

unique
constrains the values in the indicated column or columns so that no two rows have the same value. This constraint creates a unique index that can be dropped only if the constraint is dropped using alter table.

primary key
: constrains the values in the indicated column or columns so that no two rows have the same value, and so that the value cannot be NULL. This constraint creates a unique index that can be dropped only if the constraint is dropped using alter table.

clustered | nonclustered
: specifies that the index created by a unique or primary key constraint is a clustered or nonclustered index. clustered is the default for primary key constraints; nonclustered is the default for unique constraints. There can be only one clustered index per table. See create index for more information.

asc | desc
: specifies whether the index created for a constraint is to be created in ascending or descending order for each column. The default is ascending order.

fillfactor

specifies how full Adaptive Server makes each page when it creates a new index on existing data. The fillfactor percentage is relevant only when the index is created. As the data changes, the pages are not maintained at any particular level of fullness.

The default for fillfactor is 0; this is used when you do not include with fillfactor in the create index statement (unless the value has been changed with sp_configure). When specifying a fillfactor, use a value between 1 and 100.

A fillfactor of 0 creates clustered indexes with completely full pages and nonclustered indexes with completely full leaf pages. It leaves a comfortable amount of space within the index B-tree in both the clustered and nonclustered indexes. There is seldom a reason to change the fillfactor.

If the fillfactor is set to 100, Adaptive Server creates both clustered and nonclustered indexes with each page 100 percent full. A fillfactor of 100 makes sense only for read-only tables—tables to which no additional data will ever be added.

fillfactor values smaller than 100 (except 0, which is a special case) cause Adaptive Server to create new indexes with pages that are not completely full. A fillfactor of 10 might be a reasonable choice if you are creating an index on a table that will eventually hold a great deal more data, but small fillfactor values cause each index (or index and data) to take more storage space.

If Component Integration Services is enabled, you cannot use fillfactor for remote servers.

Warning! Creating a clustered index with a fillfactor affects the amount of storage space your data occupies, since Adaptive Server redistributes the data as it creates the clustered index.

max_rows_per_page
: limits the number of rows on data pages and the leaf-level pages of indexes. Unlike fillfactor, the max_rows_per_page value is maintained when data is inserted or deleted.

  If you do not specify a value for max_rows_per_page, Adaptive Server uses a value of 0 when creating the table. Values for tables and clustered indexes are between 0 and 256. The maximum number of rows per page for nonclustered indexes depends on the size of the index key; Adaptive Server returns an error message if the specified value is too high.

  A max_rows_per_page of 0 creates clustered indexes with full data pages and nonclustered indexes with full leaf pages. It leaves a comfortable amount of space within the index B-tree in both clustered and nonclustered indexes.

  Using low values for max_rows_per_page reduces lock contention on frequently accessed data. However, using low values also causes Adaptive Server to create new indexes with pages that are not completely full, uses more storage space, and may cause more page splits.

  If Component Integration Services is enabled, and you create a proxy table, then max_rows_per_page is ignored. Proxy tables do not contain any data. If max_rows_per_page is used to create a table, and later a proxy table is created to reference that table, then the max_rows_per_page limits apply when you insert or delete through the proxy table.

on *segment_name*
: specifies that the index is to be created on the named segment. Before the on *segment_name* option can be used, the device must be initialized with disk init, and the segment must be added to the database with sp_addsegment. See your System Administrator or use sp_helpsegment for a list of the segment names available in your database.

  If you specify clustered and use the on *segment_name* option, the entire table migrates to the segment you specify, since the leaf level of the index contains the actual data pages.

references
: specifies a column list for a referential integrity constraint. You can specify only one column value for a column constraint. By including this constraint with a table that references another table, any data inserted into the *referencing* table must already exist in the *referenced* table.

  To use this constraint, you must have references permission on the referenced table. The specified columns in the referenced table must be constrained by a unique index (created by either a unique constraint or a create index statement). If no columns are specified, there must be a primary key constraint on the appropriate columns in the referenced table. Also, the datatypes of the referencing table columns must match the datatype of the referenced table columns.

foreign key
: specifies that the listed column(s) are foreign keys in this table whose target keys are the columns listed in the following references clause. The foreign key syntax is permitted only for table-level constraints, not for column-level constraints.

ref_table
: is the name of the table that contains the referenced columns. You can reference tables in another database. Constraints can reference as many as 192 user tables and internally generated worktables.

ref_column
: is the name of the column or columns in the referenced table.

match full
: specifies that if all values in the referencing columns of a referencing row are:

  - Null – the referential integrity condition is true.
  - Non-null values – if there is a referenced row where each corresponding column is equal in the referenced table, then the referential integrity condition is true.

  If they are neither, then the referential integrity condition is false when:

  - All values are non-null and not equal, or
  - Some of the values in the referencing columns of a referencing row are non-null values, while others are null.

check
: specifies a *search_condition* constraint that Adaptive Server enforces for all the rows in the table. You can specify check constraints as table or column constraints; create table allows multiple check constraints in a column definition.

search_condition
: is the check constraint on the column values. These constraints can include:

  - A list of constant expressions introduced with in
  - A set of conditions introduced with like, which may contain wildcard characters

  Column and table check constraints can reference any columns in the table.

  An expression can include arithmetic operators and functions. The *search_condition* cannot contain subqueries, aggregate functions, host variables, or parameters.

next_column | *next_constraint*
: indicates that you can include additional column definitions or table constraints (separated by commas) using the same syntax described for a column definition or table constraint definition.

lock datarows | datapages | allpages
: specifies the locking scheme to be used for the table. The default is the server-wide setting for the configuration parameter lock scheme.

exp_row_size = *num_bytes*
: specifies the expected row size; applies only to datarows and datapages locking schemes, and only to tables with variable-length rows. Valid values are 0, 1, and any value between the minimum and maximum row length for the table. The default value is 0, which means a server-wide setting is applied.

reservepagegap = *num_pages*
: specifies the ratio of filled pages to empty pages that are to be left during extent I/O allocation operations. For each specified *num_pages*, an empty page is left for future expansion of the table. Valid values are 0 – 255. The default value is 0.

with identity_gap
: specifies the identity gap for the table. This value overrides the system identity gap setting for this table only.

value
is the identity gap amount. For more information about setting the identity gap, see IDENTITY columns.

external table
specifies that the object is a remote table or view. external table is the default, so specifying this is optional.

at *pathname*
specifies the location of the remote object. *pathname* takes the form *server_name.dbname.owner.object;aux1.aux2*, where:

- *server_name* (required) – is the name of the server that contains the remote object.
- *dbname* (optional) – is the name of the database managed by the remote server that contains this object.
- *owner* (optional) – is the name of the remote server user that owns the remote object.
- *object* (required) – is the name of the remote table or view.
- *aux1.aux2* (optional) – is a string of characters that is passed to the remote server during a create table or create index command. This string is used only if the server is class db2. aux1 is the DB2 database in which to place the table, and aux2 is the DB2 table space in which to place the table.

on *segment_name*
specifies the name of the segment on which to place the table. When using on *segment_name*, the logical device must already have been assigned to the database with create database or alter database, and the segment must have been created in the database with sp_addsegment. See your System Administrator or use sp_helpsegment for a list of the segment names available in your database.

Examples

Example 1 Creates the titles table:

```
create table titles
(title_id tid not null,
title varchar(80) not null,
type char(12) not null,
pub_id char(4) null,
price money null,
advance money null,
total_sales int null,
notes varchar(200) null,
```

```
pubdate datetime not null,
contract bit not null)
```

Example 2 Creates the compute table. The table name and the column names, max and min, are enclosed in double quotes because they are reserved words. The total score column name is enclosed in double quotes because it contains an embedded blank. Before creating this table, you must set quoted_identifier on:

```
create table "compute"
("max" int, "min" int, "total score" int)
```

Example 3 Creates the sales table and a clustered index in one step with a unique constraint. (In the pubs2 database installation script, there are separate create table and create index statements):

```
create table sales
(stor_id         char(4)      not null,
ord_num          varchar(20)  not null,
date             datetime     not null,
unique clustered (stor_id, ord_num))
```

Example 4 Creates the salesdetail table with two referential integrity constraints and one default value. There is a table-level, referential integrity constraint named salesdet_constr and a column-level, referential integrity constraint on the title_id column without a specified name. Both constraints specify columns that have unique indexes in the referenced tables (titles and sales). The default clause with the qty column specifies 0 as its default value:

```
create table salesdetail
(stor_id    char(4)                  not null,
ord_num     varchar(20)              not null,
title_id     tid                     not null
             references titles(title_id),
qty          smallint default 0      not null,
discount    float                    not null,

constraint salesdet_constr
    foreign key (stor_id, ord_num)
    references sales(stor_id, ord_num))
```

Example 5 Creates the table publishers with a check constraint on the pub_id column. This column-level constraint can be used in place of the pub_idrule included in the pubs2 database:

```
create rule pub_idrule
as @pub_id in ("1389", "0736", "0877", "1622",
    "1756")
```

```
or @pub_id like "99[0-9][0-9]"

create table publishers
(pub_id char(4) not null
    check (pub_id in ("1389", "0736", "0877", "1622",
        "1756")
    or pub_id like "99[0-9][0-9]"),
pub_name     varchar(40)  null,
city     varchar(20)  null,
state     char(2)  null)
```

Example 6 Specifies the ord_num column as the IDENTITY column for the sales_daily table. The first time you insert a row into the table, Adaptive Server assigns a value of 1 to the IDENTITY column. On each subsequent insert, the value of the column increments by 1:

```
create table sales_daily
(stor_id         char(4)         not null,
ord_num          numeric(10,0)   identity,
ord_amt          money           null)
```

Example 7 Specifies the datapages locking scheme for the new_titles table and an expected row size of 200:

```
create table new_titles (
      title_id    tid,
      title       varchar(80) not null,
      type        char(12) ,
      pub_id      char(4) null,
      price       money null,
      advance     money null,
      total_sales int null,
      notes       varchar(200) null,
      pubdate     datetime,
      contract    bit                              )
lock datapages
with exp_row_size = 200
```

Example 8 Specifies the datarows locking scheme and sets a reservepagegap value of 16 so that extent I/O operations leave 1 blank page for each 15 filled pages:

```
create table new_publishers (
pub_id          char(4) not null,
pub_name        varchar(40) null,
city            varchar(20) null,
state           char(2) null )
lock datarows
with reservepagegap = 16
```

Example 9 Creates a constraint supported by a unique clustered index; the index order is ascending for stor_id and descending for ord_num:

```
create table sales_south
(stor_id         char(4)      not null,
ord_num          varchar(20)  not null,
date             datetime     not null,
unique clustered (stor_id asc, ord_num desc))
```

Example 10 Creates a table named t1 at the remote server SERVER_A and creates a proxy table named t1 that is mapped to the remote table:

```
create table t1
(a        int,
 b        char(10))
at "SERVER_A.db1.joe.t1"
```

Example 11 Creates a table named employees. name is of type varchar, home_addr is a Java-SQL column of type Address, and mailing_addr is a Java-SQL column of type Address2Line. Both Address and Address2Line are Java classes installed in the database:

```
create table employees
(name varchar(30),
home_addr Address,
mailing_addr Address2Line)
```

Example 12 Creates a table named mytable with an identity column. The identity gap is set to 10, which means ID numbers are allocated in memory in blocks of ten. If the server fails or is shut down with no wait, the maximum gap between the last ID number assigned to a row and the next ID number assigned to a row is ten numbers:

```
create table mytable
(IdNum numeric(12,0) identity)
with identity_gap = 10
```

Example 13 Creates a table named mytable with an identity column. The identity gap is set to 10, which means ID numbers will be allocated in memory in blocks of ten. If the server fails or is shut down with no wait, the maximum gap between the last ID number assigned to a row and the next ID number assigned to a row is ten numbers:

```
create table mytable
(IdNum numeric(12,0) identity)
with identity_gap = 10
```

For more information about identity gaps, see the section "Managing Identity Gaps in Tables" in Chapter 7, "Creating Databases and Tables" in the *Transact-SQL User's Guide*.

Usage

- create table creates a table and optional integrity constraints. The table is created in the currently open database unless you specify a different database in the create table statement. You can create a table or index in another database, if you are listed in the sysusers table and have create table permission in the database.
- Space is allocated to tables and indexes in increments of one extent, or eight pages, at a time. Each time an extent is filled, another extent is allocated. To see the amount of space allocated and used by a table, use sp_spaceused.
- The maximum length for in-row Java columns is determined by the maximum size of a variable-length column for the table's schema, locking style, and page size.
- When using create table from Component Integration Services with a column defined as char(*n*) NULL, Component Integration Services creates the column as varchar(*n*) on the remote server.

Restrictions

- The maximum number of columns in a table depends on the width of the columns and the server's logical page size:
  - The sum of the columns' sizes cannot exceed the server's logical page size.
  - The maximum number of columns per table cannot exceed 1024.
  - The maximum number of variable length columns for an APL table is 254.

    For example, if your server uses a 2K logical page size and includes a table of integer columns, the maximum number of columns in the table would be far fewer than 1024. (1024 * 4 bytes exceeds a 2K logical page size.)

    You can mix variable- and fixed-length columns in a single table as long as the maximum number of columns does not exceed 1024. For example, if your server uses a 8K logical page size, a table configured for APL can have 254 nullable integer columns (these are variable length columns) and 770 non-nullable integers, for a total of 1024 columns.

- There can be as many as 2,000,000,000 tables per database and 250 user-defined columns per table. The number of rows per table is limited only by available storage.
- Adaptive Server issues error message 154, "Variable is not allowed in default," if you use a variable in a default that is part of a create table statement. For example:

  ```
  declare @p int
  select @p = 2
  create table t1 (c1 int default @p, c2 int)
  ```

- Although Adaptive Server does create tables in the following circumstances, you will receive errors about size limitations when you perform DML operations:
  - If the total row size for rows with variable-length columns exceeds the maximum column size.
  - If the length of a single variable-length column exceeds the maximum column size.
  - For DOL tables, if the offset of any variable-length column other than the initial column exceeds the limit of 8191 bytes.
- Adaptive Server reports an error if the total size of all fixed-length columns, plus the row overhead, is greater than the table's locking scheme and page size allows. These limits are described in Table 1-13.

Table 1-13: Maximum row and column length - APL and DOL

Locking scheme	Page size	Maximum row length	Maximum column length
APL tables	2K (2048 bytes)	1962	1960 bytes
	4K (4096 bytes)	4010	4008 bytes
	8K (8192 bytes)	8106	8104 bytes
	16K (16384 bytes)	16298	16296 bytes
DOL tables	2K (2048 bytes)	1964	1958 bytes
	4K (4096 bytes)	4012	4006 bytes
	8K (8192 bytes)	8108	8102 bytes
	16K (16384 bytes)	16300	16294 bytes if table does not include any variable length columns
	16K (16384 bytes)	16300 (subject to a max start offset of varlen = 8191)	8191-6-2 = 8183 bytes if table includes at least on variable length column.*
	* This size includes six bytes for the row overhead and two bytes for the row length field		

- The maximum number of bytes of variable length data per row depends on the locking scheme for the table. Table 1-14 describes the maximum size columns for an APL table:

Table 1-14: Maximum size for variable-length columns in an APL table

Page size	Maximum row length	Maximum column length
2K (2048 bytes)	1962	1960
4K (4096 bytes)	4010	4008
8K (8192 bytes)	8096	8104
16K (16384 bytes)	16298	16296

Table 1-15 describes the maximum size of columns for a DOL table:

Table 1-15: Maximum size for variable-length columns in an DOL table

Page size	Maximum row length	Maximum column length
2K (2048 bytes)	1964	1958
4K (4096 bytes)	4012	4006
8K (8192 bytes)	8108	8102
16K (16384 bytes)	16300	16294

- If you create a DOL table with a variable-length column that exceeds a 8191-byte offset, you cannot add any rows to the column.
- If you create tables with varchar, nvarchar, univarchar, or varbinary columns whose total defined width is greater than the maximum allowed row size, a warning message appears, but the table is created. If you try to insert more than the maximum number bytes into such a row, or to update a row so that its total row size is greater than the maximum length, Adaptive Server produces an error message, and the command fails.

Note When a create table command occurs within an if...else block or a while loop, Adaptive Server creates the schema for the table before determining whether the condition is true. This may lead to errors if the table already exists. To avoid this situation, either make sure a view with the same name does not already exist in the database or use an execute statement, as follows:

```
if not exists
    (select * from sysobjects where name="my table")
begin
execute "create table mytable(x int)"
end
```

- You cannot issue create table with a declarative default or check constraint and then insert data into the table in the same batch or procedure. Either separate the create and insert statements into two different batches or procedures, or use execute to perform the actions separately.
- You cannot use the following variable in create table statements that include defaults:

  ```
  declare @p int
  select @p = 2
  create table t1 (c1 int default @p, c2 int)
  ```

  Doing so results in error message 154, which says, "Variable is not allowed in default."

Column definitions

- When you create a column from a user-defined datatype:
  - You cannot change the length, precision, or scale.
  - You can use a NULL type to create a NOT NULL column, but not to create an IDENTITY column.
  - You can use a NOT NULL type to create a NULL column or an IDENTITY column.
  - You can use an IDENTITY type to create a NOT NULL column, but the column inherits the IDENTITY property. You cannot use an IDENTITY type to create a NULL column.
- Only columns with variable-length datatypes can store null values. When you create a NULL column with a fixed-length datatype, Adaptive Server automatically converts it to the corresponding variable-length datatype. Adaptive Server does not inform the user of the type change.

  The following table lists the fixed-length datatypes and the variable-length datatypes to which they are converted. Certain variable-length datatypes, such as moneyn, are reserved types that cannot be used to create columns, variables, or parameters:

Table 1-16: Variable-length datatypes used to store nulls

Original fixed-length datatype	Converted to
char	varchar
nchar	nvarchar
binary	varbinary
datetime	datetimn
float	floatn
int, smallint, and tinyint	intn
decimal	decimaln
numeric	numericn
money and smallmoney	moneyn

- You can create column defaults in two ways: by declaring the default as a column constraint in the create table or alter table statement, or by creating the default using the create default statement and binding it to a column using sp_bindefault.
- For a report on a table and its columns, execute the system procedure sp_help.

Temporary tables

- Temporary tables are stored in the temporary database, tempdb.
- The first 13 characters of a temporary table name must be unique per session. Such tables can be accessed only by the current Adaptive Server session. They are stored in tempdb..objects by their names plus a system-supplied numeric suffix, and they disappear at the end of the current session or when they are explicitly dropped.
- Temporary tables created with the "tempdb.." prefix are shareable among Adaptive Server user sessions. They exist until they are explicitly dropped by their owner or until Adaptive Server reboots. Create temporary tables with the "tempdb.." prefix from inside a stored procedure only if you intend to share the table among users and sessions. To avoid inadvertent sharing of temporary tables, use the "#" prefix when creating and dropping temporary tables in stored procedures.

- Temporary tables can be used by multiple users during an Adaptive Server session. However, the specific user session usually cannot be identified because temporary tables are created with the "guest" user ID of 2. If more than one user runs the process that creates the temporary table, each user is a "guest" user so the uid values are all the same. Therefore, there is no way to know which user session in the temporary table is for a specific user. It is possible that the SA can add the user to the temporary table using sp_addlogin, in which case the individual uid is available for that user's session in the temporary table, but this circumstance is unlikely.
- You can associate rules, defaults, and indexes with temporary tables, but you cannot create views on temporary tables or associate triggers with them.
- When you create a temporary table, you can use a user-defined datatype only if the type is in tempdb..systypes. To add a user-defined datatype to tempdb for the current session only, execute sp_addtype while using tempdb. To add the datatype permanently, execute sp_addtype while using model, then restart Adaptive Server so that model is copied to tempdb.

Using indexes

- A table "follows" its clustered index. If you create a table on one segment, and then create its clustered index on another segment, the table migrates to the segment where the index is created.
- You can make inserts, updates, and selects faster by creating a table on one segment and its nonclustered indexes on another segment, if the segments are on separate physical devices. For more information, see the *Performance and Tuning Guide*.

Renaming a table or its columns

- Use sp_rename to rename a table or column.
- After renaming a table or any of its columns, use sp_depends to determine which procedures, triggers, and views depend on the table, and redefine these objects.

Warning! If you do not redefine these dependent objects, they will no longer work after Adaptive Server recompiles them.

Specifying ascending or descending ordering in indexes

- Use the asc and desc keywords after index column names to specify the sort order for the index. Creating indexes so that columns are in the same order specified in the order by clause of queries eliminates the sorting step during query processing.

Defining integrity constraints

- The create table statement helps control a database's integrity through a series of integrity constraints as defined by the SQL standards. These integrity constraint clauses restrict the data that users can insert into a table. You can also use defaults, rules, indexes, and triggers to enforce database integrity.

  Integrity constraints offer the advantages of defining integrity controls in one step during the table creation process and of simplifying the process to create those integrity controls. However, integrity constraints are more limited in scope and less comprehensive than defaults, rules, indexes, and triggers.

- You must declare constraints that operate on more than one column as table-level constraints; declare constraints that operate on just one column as column-level constraints. Although the difference is rarely noticed by users, column-level constraints are only checked if a value in the column is being modified, while the table-level constraints are checked if there is any modification to a row, regardless of whether or not it changes the column in question.

  Place column-level constraints after the column name and datatype, before the delimiting comma (see Example 5). You enter table-level constraints as separate comma-delimited clauses (see Example 4). Adaptive Server treats table-level and column-level constraints the same way; neither way is more efficient than the other.

- You can create the following types of constraints at the table level or the column level:

  - A unique constraint requires that no two rows in a table have the same values in the specified columns. In addition, a primary key constraint requires that there be no null values in the column.

  - A **referential integrity** (references) constraint requires that the data being inserted or updated in specific columns has matching data in the specified table and columns.

  - A check constraint limits the values of the data inserted into the columns.

You can also enforce data integrity by restricting the use of null values in a column (the null or not null keywords) and by providing default values for columns (the default clause).

- You can use the system procedures sp_primarykey, sp_foreignkey, and sp_commonkey to save information in system tables, which can help clarify the relationships between tables in a database. These system procedures do not enforce the key relationships or duplicate the functions of the primary key and foreign key keywords in a create table statement. For a report on keys that have been defined, use sp_helpkey. For a report on frequently used joins, execute sp_helpjoins.
- Transact-SQL provides several mechanisms for integrity enforcement. In addition to the constraints you can declare as part of create table, you can create rules, defaults, indexes, and triggers. Table 1-17 summarizes the integrity constraints and describes the other methods of integrity enforcement:

Table 1-17: Methods of integrity enforcement

In create table	Other methods
unique constraint	create unique index (on a column that allows null values)
primary key constraint	create unique index (on a column that does not allow null values)
references constraint	create trigger
check constraint (table level)	create trigger
check constraint (column level)	create trigger or create rule and sp_bindrule
default clause	create default and sp_bindefault

The method you choose depends on your requirements. For example, triggers provide more complex handling of referential integrity (such as referencing other columns or objects) than those declared in create table. Also, the constraints defined in a create table statement are specific for that table; unlike rules and defaults, you cannot bind them to other tables, and you can only drop or change them using alter table. Constraints cannot contain subqueries or aggregate functions, even on the same table.

- The create table command can include many constraints, with these limitations:
  - The number of unique constraints is limited by the number of indexes that a table can have.
  - A table can have only one primary key constraint.
  - You can include only one default clause per column in a table, but you can define different constraints on the same column.

For example:

```
create table discount_titles
(title_id   varchar(6)   default "PS7777" not null
        unique clustered
        references titles(title_id)
        check (title_id like "PS%"),
            new_price   money)
```

Column title_id of the new table discount_titles is defined with each integrity constraint.

- You can create error messages and bind them to referential integrity and check constraints. Create messages with sp_addmessage and bind them to the constraints with sp_bindmsg. For more information, see sp_addmessage and sp_bindmsg.
- Adaptive Server evaluates check constraints before enforcing the referential constraints, and evaluates triggers after enforcing all the integrity constraints. If any constraint fails, Adaptive Server cancels the data modification statement; any associated triggers do not execute. However, a constraint violation *does not* roll back the current transaction.
- In a referenced table, you cannot update column values or delete rows that match values in a referencing table. Update or delete from the referencing table first, then try updating or deleting from the referenced table.
- You must drop the referencing table before you drop the referenced table; otherwise, a constraint violation occurs.
- For information about constraints defined for a table, use sp_helpconstraint.

Unique and primary key constraints

- You can declare unique constraints at the column level or the table level. unique constraints require that all values in the specified columns be unique. No two rows in the table can have the same value in the specified column.

- A primary key constraint is a more restrictive form of unique constraint. Columns with primary key constraints cannot contain null values.

Note The create table statement's unique and primary key constraints create indexes that define unique or primary key attributes of columns. sp_primarykey, sp_foreignkey, and sp_commonkey define logical relationships between columns. These relationships must be enforced using indexes and triggers.

- Table-level unique or primary key constraints appear in the create table statement as separate items and must include the names of one or more columns from the table being created.
- unique or primary key constraints create a unique index on the specified columns. The unique constraint in Example 3 creates a unique, clustered index, as does the statement:

```
create unique clustered index salesind
    on sales (stor_id, ord_num)
```

  The only difference is the index name, which you could set to salesind by naming the constraint.

- The definition of unique constraints in the SQL standard specifies that the column definition cannot allow null values. By default, Adaptive Server defines the column as not allowing null values (if you have not changed this using sp_dboption) when you omit null or not null in the column definition. In Transact-SQL, you can define the column to allow null values along with the unique constraint, since the unique index used to enforce the constraint allows you to insert a null value.
- unique constraints create unique, nonclustered indexes by default; primary key constraints create unique, clustered indexes by default. There can be only one clustered index on a table, so you can specify only one unique clustered or primary key clustered constraint.
- The unique and primary key constraints of create table offer a simpler alternative to the create index statement. However, they have the following limitations:
  - You cannot create nonunique indexes.
  - You cannot use all the options provided by create index.
  - You must drop these indexes using alter table drop constraint.

Referential integrity constraints

- Referential integrity constraints require that data inserted into a *referencing* table that defines the constraint must have matching values in a *referenced* table. A referential integrity constraint is satisfied for either of the following conditions:
  - The data in the constrained column(s) of the referencing table contains a null value.
  - The data in the constrained column(s) of the referencing table matches data values in the corresponding columns of the referenced table.

  Using the pubs2 database as an example, a row inserted into the salesdetail table (which records the sale of books) must have a valid title_id in the titles table. salesdetail is the referencing table and titles table is the referenced table. Currently, pubs2 enforces this referential integrity using a trigger. However, the salesdetail table could include this column definition and referential integrity constraint to accomplish the same task:

  ```
  title_id tid
      references titles(title_id)
  ```

- The maximum number of table references allowed for a query is 192. Use sp_helpconstraint to check a table's referential constraints.
- A table can include a referential integrity constraint on itself. For example, the store_employees table in pubs3, which lists employees and their managers, has the following self-reference between the emp_id and mgr_id columns:

  ```
  emp_id id primary key,
  mgr_id id null
          references store_employees(emp_id),
  ```

  This constraint ensures that all managers are also employees, and that all employees have been assigned a valid manager.
- You cannot drop the referenced table until the referencing table is dropped or the referential integrity constraint is removed (unless it includes only a referential integrity constraint on itself).
- Adaptive Server does not enforce referential integrity constraints for temporary tables.
- To create a table that references another user's table, you must have references permission on the referenced table. For information about assigning references permissions, see the grant command.

- Table-level, referential integrity constraints appear in the create table statement as separate items. They must include the foreign key clause and a list of one or more column names.

  Column names in the references clause are optional only if the columns in the referenced table are designated as a primary key through a primary key constraint.

  The referenced columns must be constrained by a unique index in that referenced table. You can create that unique index using either the unique constraint or the create index statement.

- The datatypes of the referencing table columns must match the datatypes of the referenced table columns. For example, the datatype of col1 in the referencing table (test_type) matches the datatype of pub_id in the referenced table (publishers):

  ```
  create table test_type
  (col1 char(4) not null
      references publishers(pub_id),
  col2 varchar(20) not null)
  ```

- The referenced table must exist at the time you define the referential integrity constraint. For tables that cross-reference one another, use the create schema statement to define both tables simultaneously. As an alternative, create one table without the constraint and add it later using alter table. See create schema or alter table for more information.

- The create table referential integrity constraints offer a simple way to enforce data integrity. Unlike triggers, they *cannot*:

  - Cascade changes through related tables in the database
  - Enforce complex restrictions by referencing other columns or database objects
  - Perform “what-if” analysis

Referential integrity constraints do not roll back transactions when a data modification violates the constraint. Triggers allow you to choose whether to roll back or continue the transaction depending on how you handle referential integrity.

Note Adaptive Server checks referential integrity constraints before it checks any triggers, so a data modification statement that violates the constraint does not also fire the trigger.

Using cross-database referential integrity constraints

- When you create a cross-database constraint, Adaptive Server stores the following information in the sysreferences system table of each database:

Table 1-18: Information stored for referential integrity constraints

Information stored in sysreferences	Columns with information about the referenced table	Columns with information about the referencing table
Key column IDs	refkey1 through refkey16	fokey1 through fokey16
Table ID	reftabid	tableid
Database ID	pmrydbid	frgndbid
Database name	pmrydbname	frgndbname

- You can drop the referencing table or its database without problems. Adaptive Server automatically removes the foreign key information from the referenced database.
- Because the referencing table depends on information from the referenced table, Adaptive Server does not allow you to:
  - Drop the referenced table,
  - Drop the external database that contains the referenced table, or
  - Rename either database with sp_renamedb.

  You must remove the cross-database constraint with alter table before you can do any of these actions.
- Each time you add or remove a cross-database constraint, or drop a table that contains a cross-database constraint, dump *both* of the affected databases.

Warning! Loading earlier dumps of databases containing cross-database constraints could cause database corruption.

- The sysreferences system table stores the *name* and the ID number of the external database. Adaptive Server cannot guarantee referential integrity if you use load database to change the database name or to load it onto a different server.

  Warning! Before dumping a database in order to load it with a different name or move it to another Adaptive Server, use alter table to drop all external referential integrity constraints.

check constraints

- A check constraint limits the values a user can insert into a column in a table. A check constraint specifies a *search_condition* that any non-null value must pass before it is inserted into the table. A *search_condition* can include:
  - A list of constant expressions introduced with in
  - A range of constant expressions introduced with between
  - A set of conditions introduced with like, which can contain wildcard characters

  An expression can include arithmetic operators and Transact-SQL built-in functions. The *search_condition* cannot contain subqueries, aggregate functions, or a host variable or parameter. Adaptive Server does not enforce check constraints for temporary tables.
- If the check constraint is a column-level check constraint, it can reference only the column in which it is defined; it cannot reference other columns in the table. Table-level check constraints can reference any column in the table.
- create table allows multiple check constraints in a column definition.
- check integrity constraints offer an alternative to using rules and triggers. They are specific to the table in which they are created, and cannot be bound to columns in other tables or to user-defined datatypes.
- check constraints do not override column definitions. If you declare a check constraint on a column that allows null values, you can insert NULL into the column, implicitly or explicitly, even though NULL is not included in the *search_condition*. For example, if you create a check constraint specifying “pub_id in (“1389”, “0736”, “0877”, “1622”, “1756”)” or “@amount > 10000” in a table column that allows null values, you can still insert NULL into that column. The column definition overrides the check constraint.

IDENTITY columns

- The first time you insert a row into the table, Adaptive Server assigns the IDENTITY column a value of 1. Each new row gets a column value that is 1 higher than the last value. This value takes precedence over any defaults declared for the column in the create table statement or bound to the column with sp_bindefault. The maximum value that can be inserted into the IDENTITY column is 10 ^{precision} - 1.
- Inserting a value into the IDENTITY column allows you to specify a seed value for the column or to restore a row that was deleted in error. The table owner, Database Owner, or System Administrator can explicitly insert a value into an IDENTITY column after using set identity_insert *table_name* on for the base table. Unless you have created a unique index on the IDENTITY column, Adaptive Server does not verify the uniqueness of the value. You can insert any positive integer.
- You can reference an IDENTITY column using the syb_identity keyword, qualified by the table name where necessary, in place of the actual column name.
- System Administrators can use the auto identity database option to automatically include a 10-digit IDENTITY column in new tables. To turn on this feature in a database, use:

```
sp_dboption database_name, "auto identity", "true"
```

Each time a user creates a table in the database without specifying either a primary key, a unique constraint, or an IDENTITY column, Adaptive Server automatically defines an IDENTITY column. This column, SYB_IDENTITY_COL, is not visible when you retrieve columns with the select * statement. You must explicitly include the column name in the select list.

- Server failures can create gaps in IDENTITY column values. Gaps can also occur due to transaction rollbacks, the deletion of rows, or the manual insertion of data into the IDENTITY column. The maximum size of the gap depends on the setting of the identity burning set factor and identity grab size configuration parameters, the identity_gap value given in the create table or select into statment. For details about using the different methods to set the identity gap, see "Managing Identity Gaps in Tables" in Chapter 7, "Creating Databases and Tables" in the *Transact-SQL User's Guide*.

Specifying a locking scheme

- To specify the locking scheme for a table, use the keyword lock and one of the following locking schemes:

- allpages locking, which locks data pages and the indexes affected by queries
- datapages locking, which locks only data pages
- datarows locking, which locks only data rows

If you do not specify a locking scheme, the default locking scheme for the server is used. The server-wide default is set with the configuration parameter lock scheme.

- The locking scheme for a table can be changed with the alter table command.

Space management properties

- The space management properties fillfactor, max_rows_per_page, exp_row_size, and reservepagegap help manage space usage for tables in the following ways:
  - fillfactor leaves extra space on pages when indexes are created, but the fillfactor is not maintained over time.
  - max_rows_per_page limits the number of rows on a data or index page. Its main use is to improve concurrency in allpages-locked tables, since reducing the number of rows can reduce lock contention. If you specify a max_rows_per_page value and datapages or datarows locking, a warning message is printed. The table is created, and the value is stored in sysindexes, but it is applied only if the locking scheme is changed later to allpages.
  - exp_row_size specifies the expected size of a data row. It applies only to data rows, not to indexes, and applies only to data-only-locked tables that have variable-length columns. It is used to reduce the number of forwarded rows in data-only-locked tables. It is needed mainly for tables where rows have null or short columns when first inserted, but increase in size as a result of subsequent updates. exp_row_size reserves space on the data page for the row to grow to the specified size. If you specify exp_row_size when you create an allpages-locked table, a warning message is printed. The table is created, and the value is stored in sysindexes, but it is only applied if the locking scheme is changed later to datapages or datarows.
  - reservepagegap specifies the ratio of empty pages to full pages to apply for commands that perform extent allocation. It applies to both data and index pages, in all locking schemes.

- Table 1-19 shows the valid combinations of space management properties and locking scheme. If a create table command includes incompatible combinations, a warning message is printed and the table is created. The values are stored in system tables, but are not applied. If the locking scheme for a table changes so that the properties become valid, then they are used.

Table 1-19: Space management properties and locking schemes

Property	*allpages*	*datapages*	*datarows*
max_rows_per_page	Yes	No	No
exp_row_size	No	Yes	Yes
reservepagegap	Yes	Yes	Yes
fillfactor	Yes	Yes	Yes

- Table 1-20 shows the default values and the effects of using default values for the space management properties.

Table 1-20: Defaults and effects of space management properties

Property	Default	Effect of using the default
max_rows_per_page	0	Fits as many rows as possible on the page, up to a maximum of 255
exp_row_size	0	Uses the server-wide default value, set with the configuration parameter default exp_row_size percent
reservepagegap	0	Leaves no empty pages during extent allocations
fillfactor	0	Fully packs leaf pages, with space left on index pages

Using *exp_row_size*

- If an application inserts short rows into a data-only-locked table and updates them later so that their length increases, use exp_row_size to reduce the number of times that rows in data-only-locked tables are forwarded to new locations.

Using *reservepagegap*

- Commands that use large amounts of space allocate new space by allocating an extent rather than allocating single pages. The reservepagegap keyword causes these commands to leave empty pages so that subsequent page allocations happen close to the page being split or close to the page from which a row is being forwarded. Table 1-21 shows when reservepagegap is applied.

Table 1-21: When reservepagegap is applied

Command	Applies to data pages	Applies to index pages
Fast bcp	Yes	Fast bcp is not used if indexes exist

Command	Applies to data pages	Applies to index pages
Slow bcp	Only for heap tables, not for tables with a clustered index	Extent allocation not performed
select into	Yes	No indexes exist on the target table
create index or alter table...constraint	Yes, for clustered indexes	Yes
reorg rebuild	Yes	Yes
alter table...lock (For allpages-locking to data-only locking, or vice versa)	Yes	Yes

- The reservepagegap value for a table is stored in sysindexes and is applied when any of the above operations on a table are executed. To change the stored value, use sp_chgattribute.
- reservepagegap is not applied to worktables or sorts on worktables.

Using *at*

- The location information provided by the at keyword is the same information that is provided by sp_addobjectdef. The information is stored in the sysattributes table.

Java-SQL columns

- If Java is enabled in the database, you can creates tables with Java-SQL columns. Refer to *Java in Adaptive Server Enterprise* for detailed information.
- The declared class (*datatype*) of the Java-SQL column must implement either the Serializable or Externalizable interface.
- When you create a table, a Java-SQL column cannot be specified:
  - As a foreign key
  - In a references clause
  - As having the UNIQUE property
  - As the primary key
- If in row is specified, the value stored cannot exceed 16K bytes, depending on the page size of the database server and other variables.
- If off row is specified:
  - The column cannot be referenced in a check constraint.
  - The column cannot be referenced in a select that specifies distinct.

- The column cannot be specified in a comparison operator, in a predicate, or in a group by clause.

Getting information about tables

- sp_help displays information about tables, listing any attributes (such as cache bindings) assigned to the specified table and its indexes, giving the attribute's class, name, integer value, character value, and comments.
- sp_depends displays information about the view(s), trigger(s), and procedure(s) in the database that depend on a table.
- sp_helpindex reports information about the indexes created on a table.

Standards

ANSI SQL – Compliance level: Entry-level compliant.

The following are Transact-SQL extensions:

- Use of a database name to qualify a table or column name
- IDENTITY columns
- The not null column default
- The asc and desc options
- The reservepagegap option
- The lock clause
- The on *segment_name* clause

  See Chapter 1, "System and User-Defined Datatypes"of *Reference Manual: Building Blocks* for datatype compliance information.

Permissions

create table permission defaults to the Database Owner, who can transfer it to other users. Any user can create temporary tables.

See also

Commands alter table, create existing table, create index, create rule, create schema, create view, drop index, drop rule, drop table

System procedures sp_addmessage, sp_addsegment, sp_addtype, sp_bindmsg, sp_chgattribute, sp_commonkey, sp_depends, sp_foreignkey, sp_help, sp_helpjoins, sp_helpsegment, sp_primarykey, sp_rename, sp_spaceused

create trigger

Description

Creates a trigger, a type of stored procedure that is often used for enforcing integrity constraints. A trigger executes automatically when a user attempts a specified data modification statement on a specified table.

Syntax

```
create trigger [owner .]trigger_name
        on [owner .]table_name
        for {insert , update , delete}
        as SQL_statements
```

Or, using the if update clause:

```
create trigger [owner .]trigger_name
    on [owner .]table_name
    for {insert , update}
    as
        [if update (column_name )
            [{and | or} update (column_name )]...]
            SQL_statements
        [if update (column_name )
            [{and | or} update (column_name )]...
            SQL_statements ]...
```

Parameters

trigger_name

is the name of the trigger. It must conform to the rules for identifiers and be unique in the database. Specify the owner's name to create another trigger of the same name owned by a different user in the current database. The default value for *owner* is the current user. If you use an owner name to qualify a trigger, you must explicitly qualify the table name the same way.

You cannot use a variable for a trigger name.

table_name

is the name of the table on which to create the trigger. If more than one table of the same name exists in the database, specify the owner's name. The default value for *owner* is the current user.

insert, update, delete

can be included in any combination. delete cannot be used with the if update clause.

SQL_statements
specify trigger conditions and trigger actions. Trigger conditions determine whether the attempted insert, update, or delete causes the trigger actions to be carried out. The SQL statements often include a subquery preceded by the keyword if. In Example 2, below, the subquery that follows the keyword if is the trigger condition.

Trigger actions take effect when the user action (insert, update, or delete) is attempted. If multiple trigger actions are specified, they are grouped with begin and end.

See Triggers and transactions for a list of statements that are not allowed in a trigger definition. See "The deleted and inserted logical tables" on page 163 for information about the deleted and inserted logical tables that can be included in trigger definitions.

if update
is used to test whether the specified column is included in the set list of an update statement or is affected by an insert. This allows specified trigger actions to be associated with updates to specified columns (see Example 3). More than one column can be specified, and you can use more than one if update statement in a create trigger statement (see Example 5).

Examples

Example 1 Prints a message when anyone tries to add data or change data in the titles table:

```
create trigger reminder
on titles
for insert, update as
print "Don't forget to print a report for accounting."
```

Example 2 Prevents insertion of a new row into titleauthor if there is no corresponding title_id in the titles table:

```
create trigger t1
on titleauthor
for insert as
if (select count(*)
    from titles, inserted
    where titles.title_id = inserted.title_id) = 0
begin
print "Please put the book's title_id in the
        titles table first."
rollback transaction
end
```

Example 3 If the pub_id column of the publishers table is changed, make the corresponding change in the titles table:

```
create trigger t2
on publishers
for update as
if update (pub_id) and @@rowcount = 1
begin
    update titles
    set titles.pub_id = inserted.pub_id
    from titles, deleted, inserted
    where deleted.pub_id = titles.pub_id
end
```

Example 4 Deletes title from the titles table if any row is deleted from titleauthor. If the book was written by more than one author, other references to it in titleauthor are also deleted:

```
create trigger t3
on titleauthor
for delete as
begin
    delete titles
    from titles, deleted
    where deleted.title_id = titles.title_id
    delete titleauthor
    from titleauthor, deleted
    where deleted.title_id = titleauthor.title_id
    print "All references to this title have been
    deleted from titles and titleauthor."
end
```

Example 5 Prevents updates to the primary key on weekends. Prevents updates to the price or advance of a title unless the total revenue amount for that title surpasses its advance amount:

```
create trigger stopupdatetrig
on titles
for update
as
if update (title_id)
  and datename(dw, getdate())
  in ("Saturday", "Sunday")
  begin
    rollback transaction
    print "We don't allow changes to"
    print "primary keys on the weekend!"
  end
if update (price) or update (advance)
  if (select count(*) from inserted
    where (inserted.price * inserted.total_sales)
```

```
< inserted.advance) > 0
begin
rollback transaction
print "We don't allow changes to price or"
print "advance for a title until its total"
print "revenue exceeds its latest advance."
end
```

Usage

- A trigger fires only once per data modification statement. A complex query containing a while loop may repeat an update or insert many times, and the trigger is fired each time.

Triggers and referential integrity

- Triggers are commonly used to enforce *referential integrity* (integrity rules about relationships between the primary and foreign keys of tables or views), to supply cascading deletes, and to supply cascading updates (see Examples 2, 3, and 4, respectively).
- A trigger fires only after the data modification statement has completed and Adaptive Server has checked for any datatype, rule, or integrity constraint violations. The trigger and the statement that fires it are treated as a single transaction that can be rolled back from within the trigger. If a severe error is detected, the entire transaction is rolled back.
- You can also enforce referential integrity using constraints defined with the create tablestatement as an alternative to using create trigger. See create table and alter table for information about integrity constraints.

The *deleted* and *inserted* logical tables

- deleted and inserted are logical (conceptual) tables. They are structurally identical to the table for which the trigger is defined—that is, the table on which the user action is attempted—and hold the old values or new values of the rows that would be changed by the user action.
- deleted and inserted tables can be examined by the trigger to determine whether or how the trigger action should be carried out, but the tables themselves cannot be altered by the trigger's actions.
- deleted tables are used with delete and update; inserted tables, with insert and update. An update is a delete followed by an insert: it affects the deleted table first, and then the inserted table.

Trigger restrictions

- You can create a trigger only in the current database. If you use an owner name to qualify a trigger, you must explicitly qualify the table name the same way. A trigger can reference objects outside the current database.

- A trigger cannot apply to more than one table. However, the same trigger action can be defined for more than one user action (for example, insert and update) in the same create trigger statement. A table can have a maximum of three triggers—one each for insert, update, and delete.
- Each new trigger in a table or column for the same operation (insert, update, or delete) overwrites the previous one. No warning message displays before the overwrite occurs.
- You cannot create a trigger on a temporary table.
- You cannot create a trigger on a view.
- You cannot create a trigger on a system table.
- You cannot use triggers that select from a text or image column of the inserted or deleted table.
- Sybase recommends that triggers not include select statements that return results to the user, since special handling for these returned results must be written into every application program that allows modifications to the trigger table.
- If a trigger references table names, column names, or view names that are not valid identifiers, you must set quoted_identifier on before the create trigger command and enclose each such name in double quotes. The quoted_identifier option does *not* need to be on when the trigger fires.

Triggers and performance

- In performance terms, trigger overhead is usually very low. The time involved in running a trigger is spent mostly in referencing other tables, which are either in memory or on the database device.
- The deleted and inserted tables often referenced by triggers are always in memory rather than on the database device, because they are logical tables. The location of other tables referenced by the trigger determines the amount of time the operation takes.

Setting options within triggers

- You can use the set command inside a trigger. The set option you invoke remains in effect during the execution of the trigger, then reverts to its former setting. In particular, the self_recursion option can be used inside a trigger so that data modifications by the trigger itself can cause the trigger to fire again.

Dropping a trigger

- You must drop and re-create the trigger if you rename any of the objects referenced by the trigger. You can rename a trigger with sp_rename.
- When you drop a table, any triggers associated with it are also dropped.

Actions that do not cause triggers to fire

- A truncate table command is not caught by a delete trigger. Although a truncate table statement is, in effect, like a delete without a where clause (it removes all rows), changes to the data rows are not logged, and so cannot fire a trigger.

  Since permission for the truncate table command defaults to the table owner and is not transferable, only the table owner need worry about inadvertently circumventing a delete trigger with a truncate table statement.
- The writetext command, whether logged or unlogged, does not cause a trigger to fire.

Triggers and transactions

- When a trigger is defined, the action it specifies on the table to which it applies is always implicitly part of a transaction, along with the trigger itself. Triggers are often used to roll back an entire transaction if an error is detected, or they can be used roll back the effects of a specific data modification:
  - When the trigger contains the rollback transaction command, the rollback aborts the entire batch, and any subsequent statements in the batch are not executed.
  - When the trigger contains the rollback trigger, the rollback affects only the data modification that caused the trigger to fire. The rollback trigger command can include a raiserror statement. Subsequent statements in the batch are executed.
- Since triggers execute as part of a transaction, the following statements and system procedures are not allowed in a trigger:
  - All create commands, including create database, create default, create index, create procedure, create rule, create table, create trigger, and create view
  - All drop commands
  - alter database and alter table
  - truncate table

- grant and revoke
- update statistics
- sp_configure
- load database and load transaction
- disk init, disk refit, disk reinit, disk remirror, disk remirror, disk unmirror
- select into

- If a desired result (such as a summary value) depends on the number of rows affected by a data modification, use *@@rowcount* to test for multirow data modifications (an insert, delete, or update based on a select statement), and take appropriate actions. Any Transact-SQL statement that does not return rows (such as an if statement) sets *@@rowcount* to 0, so the test of *@@rowcount* should occur at the beginning of the trigger.

Inserting and updating triggers

- When an insert or update command executes, Adaptive Server adds rows to both the trigger table and the inserted table at the same time. The rows in the inserted table are always duplicates of one or more rows in the trigger table.
- An update or insert trigger can use the if update command to determine whether the update or insert changed a particular column. if update(*column_name*) is true for an insert statement whenever the column is assigned a value in the select list or in the values clause. An explicit NULL or a default assigns a value to a column and thus activates the trigger. An implicit NULL, however, does not.

  For example, if you create the following table and trigger:

```
create table junk
(aaa int null,
bbb int not null)
create trigger trigtest on junk
for insert as
if update (aaa)
    print "aaa updated"
if update (bbb)
    print "bbb updated"
```

  Inserting values into either column or into both columns fires the trigger for both column aaa and column bbb:

```
insert junk (aaa, bbb)
values (1, 2)
```

```
aaa updated
bbb updated
```

Inserting an explicit NULL into column aaa also fires the trigger:

```
insert junk
values (NULL, 2)
aaa updated
bbb updated
```

If there was a default for column aaa, the trigger would also fire.

However, with no default for column aaa and no value explicitly inserted, Adaptive Server generates an implicit NULL and the trigger does not fire:

```
insert junk (bbb)
values(2)
bbb updated
```

if update is never true for a delete statement.

Nesting triggers and trigger recursion

- Adaptive Server allows nested triggers by default. To prevent triggers from nesting, use sp_configure to set the allow nested triggers option to 0 (off), as follows:

  ```
  sp_configure "allow nested triggers", 0
  ```

- Triggers can be nested to a depth of 16 levels. If a trigger changes a table on which there is another trigger, the second trigger fires and can then call a third trigger, and so forth. If any trigger in the chain sets off an infinite loop, the nesting level is exceeded and the trigger aborts, rolling back the transaction that contains the trigger query.

  Note Since triggers are put into a transaction, a failure at any level of a set of nested triggers cancels the entire transaction: all data modifications are rolled back. Supply your triggers with messages and other error handling and debugging aids to determine where the failure occurred.

- The global variable *@@nestlevel* contains the nesting level of the current execution. Each time a stored procedure or trigger calls another stored procedure or trigger, the nesting level is incremented. If the maximum of 16 is exceeded, the transaction aborts.

- If a trigger calls a stored procedure that performs actions that would cause the trigger to fire again, the trigger is reactivated only if nested triggers are enabled. Unless there are conditions within the trigger that limit the number of recursions, this causes a nesting-level overflow.

For example, if an update trigger calls a stored procedure that performs an update, the trigger and stored procedure execute once if allow nested triggers is off. If allow nested triggers is on, and the number of updates is not limited by a condition in the trigger or procedure, the procedure or trigger loop continues until it exceeds the 16-level maximum nesting value.

- By default, a trigger does not call itself in response to a second data modification to the same table within the trigger, regardless of the setting of the allow nested triggers configuration parameter. A set option, self_recursion, enables a trigger to fire again as a result of a data modification within the trigger. For example, if an update trigger on one column of a table results in an update to another column, the update trigger fires only once when self_recursion is disabled, but it can fire up to 16 times if self_recursion is set on. The allow nested triggers configuration parameter must also be enabled in order for self-recursion to take place.

Getting information about triggers

- The execution plan for a trigger is stored in sysprocedures.
- Each trigger is assigned an identification number, which is stored as a new row in sysobjects with the object ID for the table to which it applies in the deltrig column, and also as an entry in the deltrig, instrig, and updtrig columns of the sysobjects row for the table to which it applies.
- To display the text of a trigger, which is stored in syscomments, use sp_helptext.

  If the System Security Officer has reset the allow select on syscomments.text column parameter with the system procedure sp_configure (as required to run Adaptive Server in the evaluated configuration), you must be the creator of the trigger or a System Administrator to view the text of the trigger through sp_helptext.
- For a report on a trigger, use sp_help.
- For a report on the tables and views that are referenced by a trigger, use sp_depends.

Standards

ANSI SQL – Compliance level: Transact-SQL extension.

Permissions

Only a System Security Officer can grant or revoke permissions to create triggers. The Database Owner can create triggers on any user table. Users can create triggers only on tables that they own.

Permission to issue the create trigger command is granted to users by default.

When the System Security Officer revokes permission for a user to create triggers, a revoke row is added in the sysprotects table for that user. To grant permission to that user to issue create trigger, issue two grant commands: the first command removes the revoke row from sysprotects; the second inserts a grant row. If permission to create triggers is revoked, the user cannot create triggers even on tables that the user owns. Revoking permission to create triggers from a user affects only the database where the revoke command was issued.

Permissions on objects at trigger creation When you create a trigger, Adaptive Server makes no permission checks on objects such as tables or views that the trigger references. Therefore, you can create a trigger successfully, even though you do not have access to its objects. All permission checks occur when the trigger fires.

Permissions on objects at trigger execution When the trigger executes, permission checks on its objects depend on whether the trigger and its objects are owned by the same user.

- If the trigger and its objects are not owned by the same user, the user who caused the trigger to fire must have been granted direct access to the objects. For example, if the trigger performs a select from a table the user cannot access, the trigger execution fails. In addition, the data modification that caused the trigger to fire is rolled back.
- If a trigger and its objects are owned by the same user, special rules apply. The user automatically has implicit permission to access the trigger's objects, even though the user cannot access them directly. A detailed description of the rules for implicit permissions is discussed in the *System Administration Guide*.

See also

Commands alter table, create procedure, drop trigger, rollback trigger, set

System procedures sp_commonkey, sp_configure, sp_depends, sp_foreignkey, sp_help, sp_helptext, sp_primarykey, sp_rename, sp_spaceused

create view

Description

Creates a view, which is an alternative way of looking at the data in one or more tables.

Syntax

```
create view [owner .]view_name
        [(column_name [, column_name ]...)]
        as
        select [distinct] select_statement
        [with check option]
```

Parameters

view_name

is the name of the view. The name cannot include the database name. If you have set quoted_identifier on, you can use a delimited identifier. Otherwise, the view name cannot be a variable and must conform to the rules for identifiers. For more information about valid view names, see "Identifiers" on page 259 in Chapter 4, "Expressions, Identifiers, and Wildcard Characters," of *Reference Manual: Building Blocks*. Specify the owner's name to create another view of the same name owned by a different user in the current database. The default value for *owner* is the current user.

column_name

specifies names to be used as headings for the columns in the view. If you have set quoted_identifier on, you can use a delimited identifier. Otherwise, the column name must conform to the rules for identifiers. For more information about valid column names, see "Identifiers" on page 259 in Chapter 4, "Expressions, Identifiers, and Wildcard Characters," of *Reference Manual: Building Blocks*.

It is always legal to supply column names, but column names are required only in the following cases:

- When a column is derived from an arithmetic expression, function, string concatenation, or constant
- When two or more columns have the same name (usually because of a join)
- When you want to give a column in a view a different name than the column from which it is derived (see Example 3)

Column names can also be assigned in the select statement (see Example 4). If no column names are specified, the view columns acquire the same names as the columns in the select statement.

select

begins the select statement that defines the view.

distinct
specifies that the view cannot contain duplicate rows.

select_statement
completes the select statement that defines the view. The select statement can use more than one table and other views.

with check option
indicates that all data modification statements are validated against the view selection criteria. All rows inserted or updated through the view must remain visible through the view.

Examples

Example 1 Creates a view derived from the title, type, price, and pubdate columns of the base table titles:

```
create view titles_view
as select title, type, price, pubdate
from titles
```

Example 2 Creates "new view" from "old view." Both columns are renamed in the new view. All view and column names that include embedded blanks are enclosed in double quotation marks. Before creating the view, you must use set quoted_identifier on:

```
create view "new view" ("column 1", "column 2")
as select col1, col2 from "old view"
```

Example 3 Creates a view that contains the titles, advances, and amounts due for books with a price less than $5.00:

```
create view accounts (title, advance, amt_due)
as select title, advance, price * total_sales
from titles
where price > $5
```

Example 4 Creates a view derived from two base tables, authors and publishers. The view contains the names and cities of authors who live in a city in which there is a publisher:

```
create view cities
(authorname, acity, publishername, pcity)
as select au_lname, authors.city, pub_name,
publishers.city
from authors, publishers
where authors.city = publishers.city
```

Example 5 Creates a view with the same definition as in example 3, but with column headings provided in the select statement:

```
create view cities2
```

```
as select authorname = au_lname,
acity = authors.city, publishername = pub_name, pcity =
publishers.city
from authors, publishers
where authors.city = publishers.city
```

Example 6 Creates a view, author_codes, derived from titleauthor that lists the unique author identification codes:

```
create view author_codes
as select distinct au_id
from titleauthor
```

Example 7 Creates a view, price_list, derived from title that lists the unique book prices:

```
create view price_list (price)
as select distinct price
from titles
```

Example 8 Creates a view of the stores table that excludes information about stores outside of California. The with check option clause validates each inserted or updated row against the view's selection criteria. Rows for which state has a value other than "CA" are rejected:

```
create view stores_cal
as select * from stores
where state = "CA"
with check option
```

Example 9 Creates a view, stores_cal30, which is derived from stores_cal. The new view inherits the check option from stores_cal. All rows inserted or updated through stores_cal30 must have a state value of "CA.". Because stores_cal30 has no with check option clause, you can insert or update rows through stores_cal30 for which payterms has a value other than "Net 30":

```
create view stores_cal30
as select * from stores_cal
where payterms = "Net 30"
```

Example 10 Creates a view, stores_cal30_check, derived from stores_cal. The new view inherits the check option from stores_cal. It also has a with check option clause of its own. Each row that is inserted or updated through stores_cal30_check is validated against the selection criteria of both stores_cal and stores_cal30_check. Rows with a state value other than "CA" or a payterms value other than "Net 30" are rejected:

```
create view stores_cal30_check
as select * from stores_cal
```

```
where payterms = "Net 30"
with check option
```

Example 11 Uses a SQL derived table in creating a view.

```
create view psych_titles as
   select *
      from (select * from titles
               where type = "psychology") dt_psych
```

Usage

- You can use views as security mechanisms by granting permission on a view, but not on its underlying tables.
- You can rename a view with sp_rename.
- When you query through a view, Adaptive Server checks to make sure that all the database objects referenced anywhere in the statement exist, that they are valid in the context of the statement, and that data update commands do not violate data integrity rules. If any of these checks fail, you get an error message. If the checks are successful, create view "translates" the view into an action on the underlying table(s).
- For more information about views, see the *Transact-SQL User's Guide.*

Restrictions on views

- You can create a view only in the current database.
- The number of columns referenced by a view cannot exceed 1024.
- You cannot create a view on a temporary table.
- You cannot create a trigger or build an index on a view.
- You cannot use readtext or writetext on text or image columns in views.
- You cannot include order by or compute clauses or the keyword into in the select statements that define views.
- You cannot update or insert into a view whose select statements include the union operator.
- If you create a view using a local or a global variable, Adaptive Server issues error message 7351: "Local or global variables not allowed in view definition." For example:

```
declare @p int
select @p = 2
create view v2
as
select * from t1 where c1 > @p
```

- You cannot delete from a view whose select statements include the union operator.
- create view statements can be combined with other SQL statements in a single batch.

Warning! When a create view command occurs within an if...else block or a while loop, Adaptive Server creates the schema for the view before determining whether the condition is true. This may lead to errors if the view already exists. To avoid this, either make sure a view with the same name does not already exist in the database or use an execute statement, as follows:

```
if not exists
   (select * from sysobjects where name="mytable")
begin
execute "create table mytable(x int)"
end
```

- You cannot use the following variable in create view statements:

```
declare @p int
select @p = 2
create view v2
as
select * from t1 where c1 > @p
```

Doing so results in error message 7351, which says, “Local or global variables not allowed in view definition.”

View resolution

- If you alter the structure of a view’s underlying table(s) by adding or deleting columns, the new columns do not appear in a view defined with a select * clause unless the view is dropped and redefined. The asterisk shorthand is interpreted and expanded when the view is first created.
- If a view depends on a table (or view) that has been dropped, Adaptive Server produces an error message when anyone tries to use the view. If a new table (or view) with the same name and schema is created to replace the one that has been dropped, the view again becomes usable.
- You can redefine a view without redefining other views that depend on it, unless the redefinition makes it impossible for Adaptive Server to translate the dependent view(s).

Modifying data through views

- delete statements are not allowed on multitable views.

- insert statements are not allowed unless all not null columns in the underlying table or view are included in the view through which you are inserting new rows (Adaptive Server cannot supply values for not null columns in the underlying table or view).
- You cannot insert a row through a view that includes a computed column.
- insert statements are not allowed on join views created with distinct or with check option.
- update statements are allowed on join views with check option. The update fails if any of the affected columns appear in the where clause, in an expression that includes columns from more than one table.
- If you insert or update a row through a join view, all affected columns must belong to the same base table.
- You cannot update or insert into a view defined with the distinct clause.
- Data update statements cannot change any column in a view that is a computation, and cannot change a view that includes aggregates.

IDENTITY columns and views

- You cannot add a new IDENTITY column to a view with the *column_name* = identity(*precision*) syntax.
- To insert an explicit value into an IDENTITY column, the table owner, Database Owner, or System Administrator must set identity_insert *table_name* on for the column's base table, not through the view through which it is being inserted.

group by clauses and views

- When creating a view for security reasons, be careful when using aggregate functions and the group by clause. A Transact-SQL extension allows you to name columns that do not appear in the group by clause. If you name a column that is not in the group by clause, Adaptive Server returns detailed data rows for the column. For example, this query returns a row for every (18 rows)—more data than you might intend:

```
select title_id, type, sum(total_sales)
from titles
group by type
```

While this query returns one row for each type (6 rows):

```
select type, sum(total_sales)
from titles
group by type
```

For more information about group by, see "group by and having clauses on page 301."

distinct clauses and views

- The distinct clause defines a view as a database object that contains no duplicate rows. A row is defined to be a duplicate of another row if all of its column values match the same column values in another row. Null values are considered to be duplicates of other null values.

  Querying a subset of a view's columns can result in what appear to be duplicate rows. If you select a subset of columns, some of which contain the same values, the results appear to contain duplicate rows. However, the underlying rows in the view are still unique. Adaptive Server applies the distinct requirement to the view's definition when it accesses the view for the first time (before it does any projection and selection) so that all the view's rows are distinct from each other.

  You can specify distinct more than once in the view definition's select statement to eliminate duplicate rows, as part of an aggregate function or a group by clause. For example:

  ```
  select distinct count(distinct title_id), price
  from titles
  ```

- The scope of the distinct applies only for that view; it does not cover any new views derived from the distinct view.

with check option clauses and views

- If a view is created with check option, each row that is inserted or updated through the view must meet the selection criteria of the view.
- If a view is created with check option, all views derived from the "base" view must satisfy its check option. Each row inserted or updated through the derived view must remain visible through the base view.

Getting information about views

- To get a report of the tables or views on which a view depends, and of objects that depend on a view, execute sp_depends.
- To display the text of a view, which is stored in syscomments, execute sp_helptext with the view name as the parameter.

Creating views from SQL derived tables

- To create a view using a SQL derived table, add the derived table expression in the from clause of the select part of the create view statement (see Example 11).

- A view created using a SQL derived table can be updated if the derived table expression can be updated. The update rules for the derived table expression follow the update rules for the select part of the create view statement.
- Data can be inserted through a view that contains a SQL derived table if the insert rules and permission settings for the derived table expression follow the insert rules and permission settings for the select part of the create view statement.
- Temporary tables and local variables are not permitted in a derived table expression that is part of a create view statement.
- For more information about derived table expressions, see select.

Standards

ANSI SQL – Compliance level: Entry-level compliant.

The use of more than one distinct keyword and the use of "*column_heading* = *column_name*" in the select list are Transact-SQL extensions.

Permissions

create view permission defaults to the Database Owner, who can transfer it to other users.

Permissions on objects at view reation When you create a view, Adaptive Server makes no permission checks on objects, such as tables and views, that are referenced by the view. Therefore, you can create a view successfully even if you do not have access to its objects. All permission checks occur when a user invokes the view.

Permissions on objects at view execution When a view is invoked, permission checks on its objects depend on whether the view and all referenced objects are owned by the same user.

- If the view and its objects are not owned by the same user, the invoker must have been granted direct access to the objects. For example, if the view performs a select from a table the invoker cannot access, the select statement fails.
- If the view and its objects are owned by the same user, special rules apply. The invoker automatically has implicit permission to access the view's objects even though the invoker could not access them directly. Without having to grant users direct access to your tables, you can give them restricted access with a view. In this way, a view can be a security mechanism. For example, invokers of the view might be able to access only certain rows and columns of your table. A detailed description of the rules for implicit permissions is discussed in the *System Administration Guide*.

See also

Commands create schema, drop view, select, update

System procedures sp_depends, sp_help, sp_helptext, sp_rename

dbcc

Description

Database Consistency Checker (dbcc) checks the logical and physical consistency of a database and provides statistics, planning, and repair functionality.

Syntax

dbcc addtempdb(*dbid* | *databbase_name*)

dbcc checkalloc [(*database_name* [, fix | nofix])]

dbcc checkcatalog [(*database_name*)]

dbcc checkdb [(*database_name* [, skip_ncindex])]

dbcc checkstorage [(*database_name*)]

dbcc checktable({*table_name* | *table_id*}[, skip_ncindex])

dbcc checkverify [(*database_name*)]

dbcc complete_xact (*xid*, {"commit" | "rollback"})

dbcc forget_xact (*xid*)

dbcc dbrepair (*database_name*, dropdb)

dbcc engine({offline , [*enginenum*] | "online" })

dbcc fix_text ({*table_name* | *table_id*})

dbcc indexalloc ({*table_name* | *table_id*}, *index_id*
[, {full | optimized | fast | null}
[, fix | nofix]])

dbcc pravailabletempdbs

dbcc rebuild_text (*table* [, *column*
[, *text_page_number*]])

dbcc reindex ({*table_name* | *table_id*})

dbcc tablealloc ({*table_name* | *table_id*}
[, {full | optimized | fast | null}
[, fix | nofix]])|

dbcc { traceon | traceoff } (*flag* [, flag ...])

dbcc tune ({ ascinserts, {0 | 1 } , *tablename* |
cleanup, {0 | 1 } |
cpuaffinity, *start_cpu* {, on| off } |
des_greedyalloc, *dbid*, *object_name*,
" { on | off }" |
deviochar vdevno, "*batch_size*" |
doneinproc { 0 | 1 }})

Parameters

addtempdb
adds a temporary database to the global list of available temporary databases. If the database does not exist or is not a temporary database, an error is generated. If the database is already a member of the list, an informational message prints.

dbid
is the database ID.

database_name
is the name of the database to check. If no database name is given, dbcc uses the current database.

checkalloc
checks the specified database to see that all pages are correctly allocated and that no page that is allocated is not used.
If no database name is given, checkalloc checks the current database. It always uses the optimized report option (see tablealloc).

checkalloc reports on the amount of space allocated and used.

fix | nofix
determines whether dbcc fixes the allocation errors found. The default mode for checkalloc is nofix. You must put the database into single-user mode to use the fix option.

For a discussion of page allocation in Adaptive Server, see the *System Administration Guide*.

checkcatalog
checks for consistency in and between system tables. For example, checkcatalog makes sure that every type in syscolumns has a matching entry in systypes, that every table and view in sysobjects has at least one column in syscolumns, and that the last checkpoint in syslogs is valid. checkcatalog also reports on any segments that have been defined. If no database name is given, checkcatalog checks the current database.

checkdb
runs the same checks as checktable, but on each table, including syslogs, in the specified database. If no database name is given, checkdb checks the current database.

skip_ncindex
causes dbcc checktable or dbcc checkdb to skip checking the nonclustered indexes on user tables. The default is to check all indexes.

checkstorage
checks the specified database for allocation, OAM page entries, page consistency, text valued columns, allocation of text valued columns, and text column chains. The results of each dbcc checkstorage operation are stored in the dbccdb database. For details on using dbcc checkstorage, and on creating, maintaining, and generating reports from dbccdb, see the *System Administration Guide*.

checktable
checks the specified table to see that index and data pages are correctly linked, that indexes are in properly sorted order, that all pointers are consistent, that the data information on each page is reasonable, and that page offsets are reasonable. If the log segment is on its own device, running dbcc checktable on the syslogs table reports the log(s) used and free space. For example:

```
Checking syslogs
The total number of data pages in this table is 1.
*** NOTICE: Space used on the log segment is 0.20 Mbytes, 0.13%.
*** NOTICE: Space free on the log segment is 153.4 Mbytes, 99.87%.

DBCC execution completed.  If dbcc printed error messages, see your System
Administrator.
```

If the log segment is not on its own device, the following message appears:

```
*** NOTICE:  Notification of log space used/free cannot be reported because the
log segment is not on its own device.
```

table_name | *table_id*
is the name or object ID of the table to check.

checkverify
verifies the results of the most recent run of dbcc checkstorage for the specified database. For details on using dbcc checkverify, see the *System Administration Guide*.

complete_xact
heuristically completes a transaction by either committing or rolling back its work. Adaptive Server retains information about all heuristically completed transactions in the master.dbo.systransactions table, so that the external transaction coordinator may have some knowledge of how the transaction was completed.

Warning! Heuristically completing a transaction in the prepared state can cause inconsistent results for an entire distributed transaction. The System Administrator's decision to heuristically commit or roll back a transaction may contradict the decision made by the coordinating Adaptive Server or protocol.

---

forget_xact
removes the commit status of a heuristically completed transaction from master.dbo.systransactions. forget_xact can be used when the System Administrator does not want the coordinating service to have knowledge that a transaction was heuristically completed, or when an external coordinator will not be available to clear commit status in systransactions.

Warning! Never use dbcc forget_xact in a normal DTP environment, since the external transaction coordinator should be permitted to detect heuristically-completed transactions. X/Open XA-compliant transaction managers and Adaptive Server transaction coordination services automatically clear the commit status in systransactions.

---

xid
is a transaction name from the systransactions.xactname column. You can also determine valid xid values using sp_transactions.

dbrepair (*database_name*, dropdb)
drops a damaged database. drop database does not work on a damaged database.

Users cannot be using the database being dropped when this dbcc statement is issued (including the user issuing the statement).

fengine
takes Adaptive Server engines offline or brings them online. If *enginenum* is not specified, dbcc engine (offline) takes the highest-numbered engine offline. For more information, see Chapter 8, "Managing Multiprocessor Servers," in the *System Administration Guide*.

fix_text
: upgrades text values after an Adaptive Server's character set has been changed from any character set to a new multibyte character set.

  Changing to a multibyte character set makes the internal management of text data more complicated. Since a text value can be large enough to cover several pages, Adaptive Server must be able to handle characters that span page boundaries. To do so, the server requires additional information on each of the text pages. The System Administrator or table owner must run dbcc fix_text on each table that has text data to calculate the new values needed. For more information, see the *System Administration Guide*.

indexalloc
: checks the specified index to see that all pages are correctly allocated and that no page that is allocated is not used. This is a smaller version of checkalloc, providing the same integrity checks on an individual index.

  indexalloc produces the same three types of reports as tablealloc: full, optimized, and fast. If no type is indicated, or if you use null, Adaptive Server uses optimized. The fix | nofix option functions the same with indexalloc as with tablealloc.

Note You can specify fix or nofix only if you include a value for the type of report (full, optimized, fast, or null).

---

table_name | *table_id*, *index_id*
: is the table name or the table's object ID (the id column from sysobjects) plus the index's indid from sysindexes.

full
: reports all types of allocation errors.

optimized
: produces a report based on the allocation pages listed in the object allocation map (OAM) pages for the index. It does not report and cannot fix unreferenced extents on allocation pages that are not listed in the OAM pages. The optimized option is the default.

fast
: does not produce an allocation report, but produces an exception report of pages that are referenced but not allocated in the extent (2521-level errors).

pravailabletempdbs
: prints the global list of available temporary databases.

fix | nofix
: determines whether indexalloc fixes the allocation errors found in the table. The default is fix for all indexes except indexes on system tables, for which the default is nofix. To use the fix option with system tables, you must first put the database in single-user mode.

  You can specify fix or nofix only if you include a value for the type of report (full, optimized, fast, or null).

rebuild_text
: rebuilds or creates an internal Adaptive Server 12.x data structure for text or image data. This data structure enables Adaptive Server to perform random access and asynchronous prefetch during data queries.

reindex
: checks the integrity of indexes on user tables by running a fast version of dbcc checktable. It can be used with the table name or the table's object ID (the id column from sysobjects). reindex prints a message when it discovers the first index-related error, then drops and re-creates the suspect indexes. The System Administrator or table owner must run dbcc reindex after Adaptive Server's sort order has been changed and indexes have been marked "suspect" by Adaptive Server.

  When dbcc finds corrupt indexes, it drops and re-creates the appropriate indexes. If the indexes for a table are already correct, or if the table has no indexes, dbcc reindex does not rebuild the index, but prints an informational message instead.

  dbcc reindex aborts if a table is suspected of containing corrupt data. When that happens, an error message instructs the user to run dbcc checktable. dbcc reindex does not allow reindexing of system tables. System indexes are checked and rebuilt, if necessary, as an automatic part of recovery after Adaptive Server is restarted following a sort order change.

tablealloc
: checks the specified table to see that all pages are correctly allocated and that no page that is allocated is not used. This is a smaller version of checkalloc, providing the same integrity checks on an individual table. It can be used with the table name or the table's object ID (the id column from sysobjects). For an example of tablealloc output, see the *System Administration Guide*.

  Three types of reports can be generated with tablealloc: full, optimized, and fast. If no type is indicated, or if you use null, Adaptive Server uses optimized.

full
: is equivalent to checkalloc at a table level; it reports all types of allocation errors.

optimized
: produces a report based on the allocation pages listed in the object allocation map (OAM) pages for the table. It does not report and cannot fix unreferenced extents on allocation pages that are not listed in the OAM pages. The optimized option is the default.

fast
: does not produce an allocation report, but produces an exception report of pages that are referenced but not allocated in the extent (2521-level errors).

fix | nofix
: determines whether or not tablealloc fixes the allocation errors found in the table. The default is fix for all tables except system tables, for which the default is nofix. To use the fix option with system tables, you must first put the database in single user mode.

  You can specify fix or nofix only if you include a value for the type of report (full, optimized, fast, or null).

traceon | traceoff
: toggles the printing of diagnostics during query optimization (*flag* values 302, 310, and 317). Values 3604 and 3605 toggle sending trace output to the user session and to the error log, respectively. For more information, see Chapter 37, "Tuning with dbcc traceon" in the *Performance and Tuning Guide*.

tune
: enables or disables tuning flags for special performance situations. For more information on the individual options, see the *Performance and Tuning Guide*.

Examples

Example 1 Checks pubs2 for page allocation errors:

```
dbcc checkalloc(pubs2)
```

Example 2 Checks database consistency for pubs2 and places the information in the dbccdb database:

```
dbcc checkstorage(pubs2)
```

Example 3 checks the salesdetail table:.

```
dbcc checktable(salesdetail)

Checking salesdetail
```

```
The total number of pages in partition 1 is 3.
The total number of pages in partition 2 is 1.
The total number of pages in partition 3 is 1.
The total number of pages in partition 4 is 1.
The total number of data pages in this table is 10.
Table has 116 data rows.
DBCC execution completed. If DBCC printed error
messages, contact a user with System Administrator (SA)
role.
```

Example 4 Heuristically aborts the transaction, “distributedxact1”:

```
dbcc complete_xact (distributedxact1, "rollback")
```

Example 5 Upgrades text values for blurbs after a character set change:

```
dbcc fix_text(blurbs)
```

Example 6 Removes information for the transaction, “distributedxact1” from master.dbo.systransactions:

```
dbcc forget_xact (distributedxact1)
```

Example 7 Adaptive Server returns a full report of allocation for the index with an indid of 2 on the titleauthor table and fixes any allocation errors:

```
dbcc indexalloc ("pubs..titleauthor", 2, full)
```

Example 8 Prints the global list of available temporary databases:

```
dbcc pravailabletempdbs
```

```
Available temporary databases are:
Dbid: 2
Dbid: 4
Dbid: 5
Dbid: 6
Dbid: 7
DBCC execution completed. If DBCC printed error
messages, contact a user with System Administrator (SA)
role.
```

Example 9 Rebuilds or creates an internal Adaptive Server 12.x data structure for all text and image columns in the blurbs table:

```
dbcc rebuild_text (blurbs)
```

Example 10 dbcc reindex has discovered one or more corrupt indexes in the titles table:

```
dbcc reindex(titles)
```

```
One or more indexes are corrupt. They will be rebuilt.
```

Example 11 Adaptive Server returns an optimized report of allocation for this table, but does not fix any allocation errors:

```
dbcc tablealloc(publishers, null, nofix)
```

Usage

- dbcc, the Database Consistency Checker, can be run while the database is active, except for the dbrepair(*database_name*, dropdb) option and dbcc checkalloc with the fix option.
- dbcc locks database objects as it checks them. For information on minimizing performance problems while using dbcc, see the dbcc discussion in the *System Administration Guide*.
- To qualify a table or an index name with a user name or database name, enclose the qualified name in single or double quotation marks. For example:

  ```
  dbcc tablealloc("pubs2.pogo.testtable")
  ```

- dbcc reindex cannot be run within a user-defined transaction.
- dbcc fix_text can generate a large number of log records, which may fill up the transaction log. dbcc fix_text is designed so that updates are done in a series of small transactions: in case of a log space failure, only a small amount of work is lost. If you run out of log space, clear your log and restart dbcc fix_text using the same table that was being upgraded when the original dbcc fix_text failed.
- If you attempt to use select, readtext, or writetext on text values after changing to a multibyte character set, and you have not run dbcc fix_text, the command fails, and an error message instructs you to run dbcc fix_text on the table. However, you can delete text rows after changing character sets without running dbcc fix_text.
- dbcc output is sent as messages or errors, rather than as result rows. Client programs and scripts should check the appropriate error handlers.
- If a table is partitioned, dbcc checktable returns information about each partition.
- text and image data that has been upgraded to Adaptive Server version 12.x *is not* automatically upgraded to the new storage format. To improve query performance and enable prefetch for this data, use the rebuild_text keyword against the upgraded text and image columns.

Standards

ANSI SQL – Compliance level: Transact-SQL extension.

Permissions

Only the table owner can execute dbcc with the checktable, fix_text, rebuild_text, or reindex keywords.

Only the Database Owner can use the checkstorage, checkdb, checkcatalog, checkalloc, indexalloc, and tablealloc keywords.

Only a System Administrator can use the dbrepair, complete_xact, and forget_xact keywords.

Only a System Administrator can use dbcc traceon and dbcc traceoff commands.

Only a System Administrator can use dbcc engine.

See also

Commands drop database

System procedures sp_configure, sp_helpdb

deallocate cursor

Description

Makes a cursor inaccessible and releases all memory resources committed to that cursor.

Syntax

deallocate cursor *cursor_name*

Parameters

cursor_name
is the name of the cursor to deallocate.

Examples

Deallocates the cursor named "authors_crsr":

```
deallocate cursor authors_crsr
```

Usage

- Adaptive Server returns an error message if the cursor does not exist.
- You must deallocate a cursor before you can use its cursor name as part of another declare cursor statement.
- deallocate cursor has no effect on memory resource usage when specified in a stored procedure or trigger.
- You can deallocate a cursor whether it is open or closed.

Standards

ANSI SQL – Compliance level: Transact-SQL extension.

Permissions

deallocate cursor permission defaults to all users. No permission is required to use it.

See also

Commands close, declare cursor

declare

Description

Declares the name and type of local variables for a batch or procedure.

Syntax

Variable declaration:

declare *@variable_name datatype*
[, *@variable_name datatype*]...

Variable assignment:

select *@variable* = {*expression* | *select_statement*}
[, *@variable* = {*expression* | *select_statement*} ...]
[from *table_list*]
[where *search_conditions*]
[group by *group_by_list*]
[having *search_conditions*]
[order by *order_by_list*]
[compute *function_list* [by *by_list*]]

Parameters

@variable_name
must begin with @ and must conform to the rules for identifiers.

datatype
can be either a system datatype or a user-defined datatype.

Examples

Example 1 Declares two variables and prints strings according to the values in the variables:

```
declare @one varchar(18), @two varchar(18)
select @one = "this is one", @two = "this is two"
if @one = "this is one"
    print "you got one"
if @two = "this is two"
    print "you got two"
else print "nope"
```

```
you got one
you got two
```

Example 2 Prints "Ouch!" if the maximum book price in the titles table is more than $20.00:

```
declare @veryhigh money
select @veryhigh = max(price)
    from titles
if @veryhigh > $20
    print "Ouch!"
```

Usage

- Assign values to local variables with a select statement.

- The maximum number of parameters in a procedure is 2048. The number of local or global variables is limited only by available memory. The @ sign denotes a variable name.
- Local variables are often used as counters for while loops or if...else blocks. In stored procedures, they are declared for automatic, noninteractive use by the procedure when it executes. Local variables must be used in the batch or procedure in which they are declared.
- The select statement that assigns a value to the local variable usually returns a single value. If there is more than one value to return, the variable is assigned the last one. The select statement that assigns values to variables cannot be used to retrieve data in the same statement.
- The print and raiserror commands can take local variables as arguments.
- Users cannot create global variables and cannot update the value of global variables directly in a select statement.

Standards — ANSI SQL – Compliance level: Transact-SQL extension.

Permissions — declare permission defaults to all users. No permission is required to use it.

See also — **Commands** print, raiserror, select, while

declare cursor

Description

Defines a cursor.

Syntax

declare *cursor_name* cursor
for *select_statement*
[for {read only | update [of *column_name_list*]}]

Parameters

cursor_name
is the name of the cursor being defined.

select_statement
is the query that defines the cursor result set. See select for more information.

for read only
specifies that the cursor result set cannot be updated.

for update
specifies that the cursor result set is updatable.

of *column_name_list*
is the list of columns from the cursor result set (specified by the *select_statement*) defined as updatable. Adaptive Server also allows you to include columns that are not specified in the list of columns of the cursor's *select_statement* (and excluded from the result set), but that are part of the tables specified in the *select_statement*.

Examples

Example 1 Defines a result set for the authors_crsr cursor that contains all authors from the authors table who do not reside in California:

```
declare authors_crsr cursor
for select au_id, au_lname, au_fname
from authors
where state != 'CA'
```

Example 2 Defines a read-only result set for the titles_crsr cursor that contains the business-type books from the titles table:

```
declare titles_crsr cursor
for select title, title_id from titles
where title_id like "BU%"
for read only
```

Example 3 Defines an updatable result set for the pubs_crsr cursor that contains all of the rows from the publishers table. It defines the address of each publisher (cityand state columns) for update:

```
declare pubs_crsr cursor
for select pub_name, city, state
```

```
from publishers
for update of city, state
```

Usage

Restrictions on cursors

- A declare cursor statement must precede any open statement for that cursor.
- You cannot include other statements with declare cursor in the same Transact-SQL batch.
- You can include up to 1024 columns in an update clause of a client's declare cursor statement.
- *cursor_name* must be a valid Adaptive Server identifier.

Cursor *select* statements

- *select_statement* can use the full syntax and semantics of a Transact-SQL select statement, with these restrictions:
  - Must contain a from clause.
  - Cannot contain a compute, for browse, or into clause.
  - Can contain the holdlock keyword.
- The *select_statement* can contain references to Transact-SQL parameter names or Transact-SQL local variables (for all cursor types except language). The names must reference the Transact-SQL parameters and local variables defined in the procedure, trigger, or statement batch that contains the declare cursor statement.

  The parameters and local variables referenced in the declare cursor statement do not have to contain valid values until the cursor is opened.
- The *select_statement* can contain references to the inserted and deleted temporary tables that are used in triggers.

Cursor scope

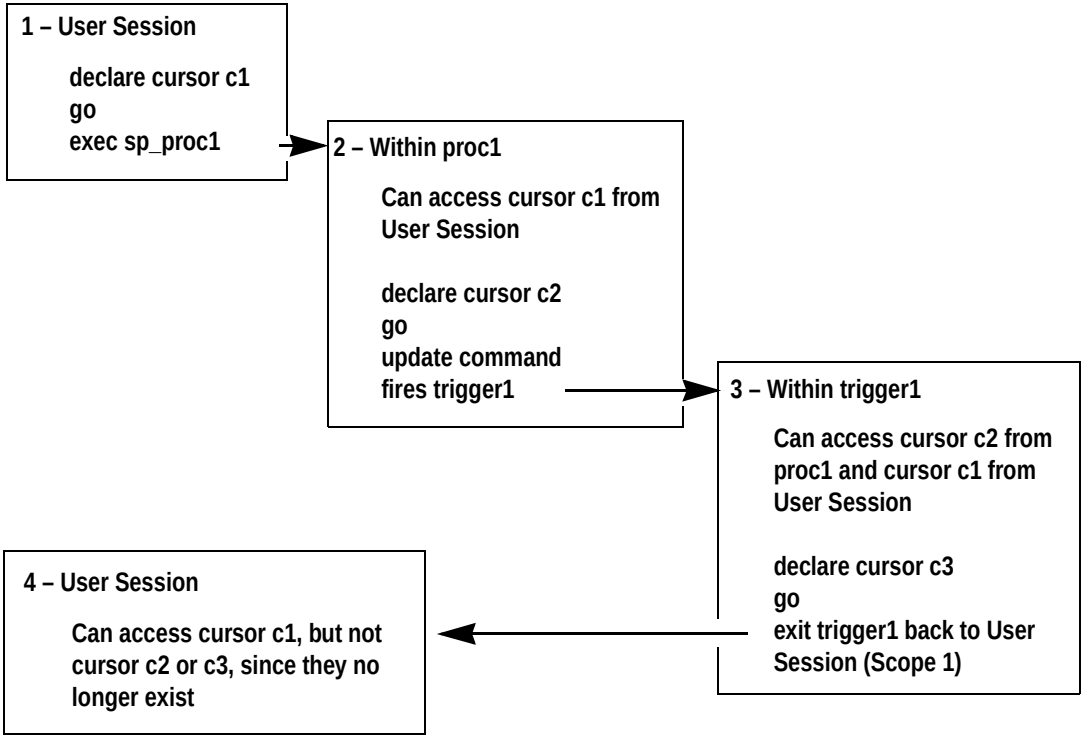
- A cursor's existence depends on its *scope*. The scope refers to the context in which the cursor is used, that is, within a user session, within a stored procedure, or within a trigger.

  Within a user session, the cursor exists only until the user ends the session. The cursor does not exist for any additional sessions started by other users. After the user logs off, Adaptive Server deallocates the cursors created in that session.

If a declare cursor statement is part of a stored procedure or trigger, the cursor created within it applies to stored procedure or trigger scope and to the scope that launched the stored procedure or trigger. Cursors declared inside a trigger on an inserted or a deleted table are not accessible to any nested stored procedures or triggers. However, cursors declared inside a trigger on an inserted or a deleted table *are* accessible within the scope of the trigger. Once the stored procedure or trigger completes, Adaptive Server deallocates the cursors created within it.

Figure 1-1 illustrates how cursors operate between scopes.

Figure 1-1: How cursors operate within scopes



- A cursor name must be unique within a given scope. Adaptive Server detects name conflicts within a particular scope only during runtime. A stored procedure or trigger can define two cursors with the same name if only one is executed. For example, the following stored procedure works because only one names_crsr cursor is defined in its scope:

```
create procedure proc2 @flag int
```

```
as
if @flag > 0
    declare names_crsr cursor
    for select au_fname from authors
else
    declare names_crsr cursor
    for select au_lname from authors
return
```

Result set

- Cursor result set rows may not reflect the values in the actual base table rows. For example, a cursor declared with an order by clause usually requires the creation of an internal table to order the rows for the cursor result set. Adaptive Server does not lock the rows in the base table that correspond to the rows in the internal table, which permits other clients to update these base table rows. In that case, the rows returned to the client from the cursor result set would not be in sync with the base table rows.
- A cursor result set is generated as the rows are returned through a fetch of that cursor. This means that a cursor select query is processed like a normal select query. This process, known as a *cursor scan*, provides a faster turnaround time and eliminates the need to read rows that are not required by the application.

  A restriction of cursor scans is that they can only use the unique indexes of a table. However, if none of the base tables referenced by the cursor result set are updated by another process in the same lock space as the cursor, the restriction is unnecessary. Adaptive Server allows the declaration of cursors on tables without unique indexes, but any attempt to update those tables in the same lock space closes all cursors on the tables.

Updatable cursors

- After defining a cursor using declare cursor, Adaptive Server determines whether the cursor is *updatable* or *read-only*. If a cursor is updatable, you can update or delete rows within the cursor result set. If a cursor is read-only, you cannot change the result set.
- Use the for update or for read only clause to explicitly define a cursor as updatable or read-only. You cannot define an updatable cursor if its *select_statement* contains one of the following constructs:
  - distinct option
  - group by clause
  - Aggregate function

- Subquery
- union operator
- at isolation read uncommitted clause

If you omit either the for update or the read only clause, Adaptive Server checks to see whether the cursor is updatable.

Adaptive Server also defines a cursor as read-only if you declare a language- or server-type cursor that includes an order by clause as part of its *select_statement*. Adaptive Server handles updates differently for client- and execute-type cursors, thereby eliminating this restriction.

- If you do not specify a *column_name_list* with the for update clause, all the specified columns in the query are updatable. Adaptive Server attempts to use unique indexes for updatable cursors when scanning the base table. For cursors, Adaptive Server considers an index containing an IDENTITY column to be unique, even if it is not so declared.

  If you do not specify the for update clause, Adaptive Server chooses any unique index, although it can also use other indexes or table scans if no unique index exists for the specified table columns. However, when you specify the for update clause, Adaptive Server must use a unique index defined for one or more of the columns to scan the base table. If none exists, it returns an error.

- In most cases, include only columns to be updated in the *column_name_list* of the for update clause. If the table has only one unique index, you do not need to include its column in the for update *column_name_list*; Adaptive Server will find it when it performs the cursor scan. If the table has more than one unique index, include its column in the for update *column_name_list*, so that Adaptive Server can find it quickly for the cursor scan.

  This allows Adaptive Server to use that unique index for its cursor scan, which helps prevent an update anomaly called the **Halloween problem**. Another way to prevent the Halloween problem is to create tables with the unique auto_identity index database option. For more information, see the *System Administration Guide*.

The Halloween problem occurs when a client updates a column of a cursor result set row that defines the order in which the rows are returned from the base tables. For example, if Adaptive Server accesses a base table using an index, and the index key is updated by the client, the updated index row can move within the index and be read again by the cursor. This is a result of an updatable cursor only logically creating a cursor result set. The cursor result set is actually the base tables that derive the cursor.

- If you specify the read only option, the cursor result set cannot be updated using the delete or update statement.

Standards

ANSI SQL – Compliance level: Entry-level compliant.

The for update and for read only options are Transact-SQL extensions.

Permissions

declare cursor permission defaults to all users. No permission is required to use it.

See also

Commands open

delete

Description

Removes rows from a table.

Syntax

```
delete [from]
        [[database.]owner.]{view_name|table_name}
        [where search_conditions]
        [plan "abstract plan"]

delete [[database.]owner.]{table_name | view_name}
        [from [[database.]owner.]{view_name [readpast]|
            table_name [readpast]
                [(index {index_name | table_name }
                [ prefetch size ][lru|mru])]}
        [, [[database.]owner.]{view_name [readpast]|
            table_name [readpast]
                [(index {index_name | table_name }
                [ prefetch size ][lru|mru])]} ...]
        [where search_conditions] ]
        [plan "abstract plan"]

delete [from] [[database.]owner.]{table_name|view_name}
        where current of cursor_name
```

Parameters

from (after delete)
is an optional keyword used for compatibility with other versions of SQL.

view_name | *table_name*
is the name of the view or table from which to remove rows. Specify the database name if the view or table is in another database, and specify the owner's name if more than one view or table of that name exists in the database. The default value for *owner* is the current user, and the default value for *database* is the current database.

where
is a standard where clause. See where clause for more information.

from (after *table_name* or *view_name*)
lets you name more than one table or view to use with a where clause when specifying which rows to delete. This from clause allows you to delete rows from one table based on data stored in other tables, giving you much of the power of an embedded select statement.

readpast
specifies that the delete command skip all pages or rows on which incompatible locks are held, without waiting for locks or timing out. For datapages-locked tables, the command skips all rows on pages on which incompatible locks are held; for datarows-locked tables, it skips all rows on which incompatible locks are held.

index *index_name*
specifies an index to use for accessing *table_name*. You cannot use this option when you delete from a view.

prefetch *size*
specifies the I/O size, in kilobytes, for tables that are bound to caches with large I/Os configured. You cannot use this option when you delete from a view. sp_helpcache shows the valid sizes for the cache an object is bound to or for the default cache.

When using prefetch and designating the prefetch size (*size*), the minimum is 2K and any power of two on the logical page size up to 16K. prefetch size options in kilobytes are:

Logical page size	Prefetch size options
2	2, 4, 8 16
4	4, 8, 16, 32
8	8, 16, 32, 64
16	16, 32, 64, 128

The prefetch size specified in the query is only a suggestion. To allow the size specification, configure the data cache at that size. If you do not configure the data cache to a specific size, the default prefetch size is used.

To configure the data cache size, use sp_cacheconfigure.

Note If Component Integration Services is enabled, you cannot use the prefetch keyword for remote servers.

---

lru | mru
specifies the buffer replacement strategy to use for the table. Use lru to force the optimizer to read the table into the cache on the MRU/LRU (most recently used/least recently used) chain. Use mru to discard the buffer from cache, and replace it with the next buffer for the table. You cannot use this option when you delete from a view.

plan "*abstract plan*"
specifies the abstract plan to use to optimize the query. It can be a full or partial plan, specified in the abstract plan language. See Chapter 22, "Creating and Using Abstract Plans," in the *Performance and Tuning Guide* for more information.

where current of *cursor_name*
causes Adaptive Server to delete the row of the table or view indicated by the current cursor position for *cursor_name*.

Examples

Example 1 Deletes all rows from the authors table:

```
delete authors
```

Example 2 Deletes a row or rows from the authors table:

```
delete from authors
where au_lname = "McBadden"
```

Example 3 Deletes rows for books written by Bennet from the titles table.

```
delete titles
from titles, authors, titleauthor
where authors.au_lname = 'Bennet'
  and authors.au_id = titleauthor.au_id
  and titleauthor.title_id = titles.title_id
```

The pubs2 database includes a trigger (deltitle) that prevents the deletion of the titles recorded in the sales table; drop this trigger for this example to work.

Example 4 Deletes a row from the titles table currently indicated by the cursor title_crsr:

```
delete titles where current of title_crsr
```

Example 5 Determines which row has a value of 4 for the IDENTITY column and deletes it from the authors table. Note the use of the syb_identity keyword instead of the actual name of the IDENTITY column:

```
delete authors
where syb_identity = 4
```

Example 6 Deletes rows from authors, skipping any locked rows:

```
delete from authors from authors readpast
where state = "CA"
```

Example 7 Deletes rows from stores, skipping any locked rows. If any rows in authors are locked, the query blocks on these rows, waiting for the locks to be released:

```
delete stores from stores readpast, authors
where stores.city = authors.city
```

Usage

- delete removes rows from the specified table.
- You can refer to as many as 15 tables in a delete statement.

Restrictions

- You cannot use delete with a multitable view (one whose from clause names more than one table), even though you may be able to use update or insert on that same view. Deleting a row through a multitable view changes multiple tables, which is not permitted. insert and update statements that affect only one base table of the view are permitted.
- Adaptive Server treats two different designations for the same table in a delete as two tables. For example, the following delete issued in pubs2 specifies discounts as two tables (discounts and pubs2..discounts):

  ```
  delete discounts
  from pubs2..discounts, pubs2..stores
  where pubs2..discounts.stor_id =
     pubs2..stores.stor_id
  ```

  In this case, the join does not include discounts, so the where condition remains true for every row; Adaptive Server deletes all rows in discounts (which is not the desired result). To avoid this problem, use the same designation for a table throughout the statement.
- If you are deleting a row from a table that is referenced from other tables via referential constraints, Adaptive Server checks all the referencing tables before permitting the delete. If the row you are attempting to delete contains a primary key that is being used as a foreign key by one of the referencing tables, the delete is not allowed.

Deleting all rows from a table

- If you do not use a where clause, *all* rows in the table named after delete [from] are removed. The table, though empty of data, continues to exist until you issue a drop table command.
- truncate table and delete without a row specification are functionally equivalent, but truncate table is faster. delete removes rows one at a time and logs these transactions. truncate table removes whole data pages, and the rows are not logged.

  Both delete and truncate table reclaim the space occupied by the data and its associated indexes.
- You cannot use the truncate table command on a partitioned table. To remove all rows from a partitioned table, either use the delete command without a where clause, or unpartition the table before issuing the truncate table command.

delete and transactions

- In chained transaction mode, each delete statement implicitly begins a new transaction if no transaction is currently active. Use commit to complete any deletes, or use rollback to undo the changes. For example:

```
delete from sales where date < '01/01/89'
if exists (select stor_id
   from stores
   where stor_id not in
   (select stor_id from sales))
      rollback transaction
else
      commit transaction
```

  This batch begins a transaction (using the chained transaction mode) and deletes rows with dates earlier than Jan. 1, 1989 from the sales table. If it deletes all sales entries associated with a store, it rolls back all the changes to sales and ends the transaction. Otherwise, it commits the deletions and ends the transaction. For more information about the chained mode, see the *Transact-SQL User's Guide*.

delete triggers

- You can define a trigger to take a specified action when a delete command is issued on a specified table.

Using *delete where current of*

- Use the clause where current of with cursors. Before deleting rows using the clause where current of, you must first define the cursor with declare cursor and open it using the open statement. Position the cursor on the row you want to delete using one or more fetch statements. The cursor name cannot be a Transact-SQL parameter or local variable. The cursor must be an updatable cursor or Adaptive Server returns an error. Any deletion to the cursor result set also affects the base table row from which the cursor row is derived. You can delete only one row at a time using the cursor.
- You cannot delete rows in a cursor result set if the cursor's select statement contains a join clause, even though the cursor is considered updatable. The *table_name* or *view_name* specified with a delete...where current of must be the table or view specified in the first from clause of the select statement that defines the cursor.

- After the deletion of a row from the cursor's result set, the cursor is positioned before the next row in the cursor's result set. You must issue a fetch to access the next row. If the deleted row is the last row of the cursor result set, the cursor is positioned after the last row of the result set. The following describes the position and behavior of open cursors affected by a delete:
  - If a client deletes a row (using another cursor or a regular delete) and that row represents the current cursor position of other opened cursors owned by the same client, the position of each affected cursor is implicitly set to precede the next available row. However, one client cannot delete a row representing the current cursor position of another client's cursor.
  - If a client deletes a row that represents the current cursor position of another cursor defined by a join operation and owned by the same client, Adaptive Server accepts the delete statement. However, it implicitly closes the cursor defined by the join.

Using *readpast*

- The readpast option allows delete commands on data-only-locked tables to proceed without being blocked by incompatible locks held by other tasks.
  - On datarows-locked tables, readpast skips all rows on which shared, update, or exclusive locks are held by another task.
  - On datapages-locked tables, readpast skips all pages on which shared, update, or exclusive locks are held by another task.
- Commands specifying readpast block if there is an exclusive table lock.
- If the readpast option is specified for an allpages-locked table, the readpast option is ignored. The command blocks as soon as it finds an incompatible lock.
- If the session-wide isolation level is 3, the readpast option is silently ignored. The command executes at level 3. The command blocks on any rows or pages with incompatible locks.
- If the transaction isolation level for a session is 0, a delete command using readpast does not issue warning messages. For datapages-locked tables, delete with readpast modifies all rows on all pages that are not locked with incompatible locks. For datarows-locked tables, it affects all rows that are not locked with incompatible locks.

- If the delete command applies to a row with two or more text columns, and any text column has an incompatible lock on it, readpast locking skips the row.

Using *index*, *prefetch*, or *lru* | *mru*

- The index, prefetch, and lru | mru options override the choices made by the Adaptive Server optimizer. Use these options with caution, and always check the performance impact with set statistics io on. For more information about using these options, see the *Performance and Tuning Guide*.

Standards

ANSI SQL – Compliance level: Entry-level compliant.

The use of more than one table in the from clause and qualification of table name with database name are Transact-SQL extensions.

readpast is a Transact-SQL extension.

Permissions

delete permission defaults to the table or view owner, who can transfer it to other users.

If set ansi_permissions is on, you must have select permission on all columns appearing in the where clause, in addition to the regular permissions required for delete statements. By default, ansi_permissions is off.

See also

Commands create trigger, drop table, drop trigger, truncate table, where clause

delete statistics

Description

Removes statistics from the sysstatistics system table.

Syntax

delete [shared] statistics *table_name* [(*column_name* [, *column_name*]...)]

Parameters

shared
removes simulated statistics information from sysstatistics in the master database.

table_name
removes statistics for all columns in the table.

column_name
removes statistics for the specified column.

Examples

Example 1 Delete the densities, selectivities, and histograms for all columns in the titles table:

```
delete statistics titles
```

Example 2 Deletes densities, selectivities, and histograms for the pub_id column in the titles table:

```
delete statistics titles(pub_id)
```

Example 3 Deletes densities, selectivities, and histograms for pub_id, pubdate, without affecting statistics on the single-column pub_id or the single-column pubdate:

```
delete statistics titles(pub_id, pubdate)
```

Usage

- delete statistics removes statistics for the specified columns or table from the sysstatistics table. It does not affect statistics in the systabstats table.
- When you issue the drop table command, the corresponding rows in sysstatistics are dropped. When you use the drop index command, the rows in sysstatistics are not deleted. This allows the query optimizer to continue to use index statistics without incurring the overhead of maintaining the index on the table.

Warning! Densities, selectivities, and histograms are essential to good query optimization. The delete statistics command is provided as a tool to remove statistics not used by the optimizer. If you inadvertently delete statistics needed for query optimization, run update statistics on the table, index, or column.

- Loading simulated statistics with the optdiag utility command adds a small number of rows to master..sysstatistics table. If the simulated statistics are no longer in use, the information in master..sysstatistics can be dropped with the delete shared statistics command.

Standards

ANSI SQL – Compliance level: Transact-SQL extension.

Permissions

Only the table owner or a System Administrator can use delete statistics.

See also

Commands create index, update

Utilities optdiag

disk init

Description

Makes a physical device or file usable by Adaptive Server.

Syntax

```
disk init
        name = "device_name" ,
        physname = "physicalname" ,
        [vdevno = virtual_device_number ,]
        size = number_of_blocks
        [, vstart = virtual_address
              , cntrltype = controller_number ]
        [, contiguous]
        [, dsync = { true | false } ]
```

Parameters

name

is the name of the database device or file. The name must conform to the rules for identifiers and must be enclosed in single or double quotes. This name is used in the create database and alter database commands.

physname

is the full specification of the database device. This name must be enclosed in single or double quotes.

vdevno

is the virtual device number, which must be unique among the database devices associated with Adaptive Server. The device number 0 is reserved for the master device. Valid device numbers are between 1 and 255, but the highest number must be one less than the number of database devices for which your Adaptive Server is configured. For example, for an Adaptive Server with the default configuration of 10 devices, the available device numbers are 1 – 9. To see the maximum number of devices available on Adaptive Server, run sp_configure, and check the number of devices value.

To determine the virtual device number, look at the device_number column of the sp_helpdevice report, and use the next unused integer.

size

is the amount of space to allocate to the database extension. size can be in the following unit specifiers: ‘k’ or ‘K’ (kilobytes), ‘m’ or ‘M’ (megabytes), and ‘g’ or ‘G’ (gigabytes). Sybase recommends that you always include a unit specifier. Quotes are optional if you do not include a unit specifier. However, you must use quotes if you include a unit specifier.

vstart
: is the starting virtual address, or the offset, for Adaptive Server to begin using the database device. vstart accepts the following optional unit specifiers: ‘k’ or ‘K’ (kilobytes), ‘m’ or ‘M’ (megabytes), and ‘g’ or ‘G’ (gigabytes). The size of the offset depends on how you enter the value for vstart.

  - If you do not specify a unit size, vstart uses 2K pages for its starting address. For example, if you specify `vstart = 13`, Adaptive Server uses 13 * 2K pages as the offset for the starting address.
  - If you specify a unit value, vstart uses this as the starting address. For example, if you specify `vstart = "13M"`, Adaptive Server sets the starting address offset at 13 megabytes.

  The default value (and usually the preferred value) of vstart is 0. If the specified device does not have the sum of vstart + size blocks available, the disk init command fails. If you are running the Logical Volume Manager on an AIX operating system. vstart should be 2. Specify vstart only if instructed to do so by Sybase Technical Support.

cntrltype
: specifies the disk controller. Its default value is 0. Reset cntrltype only if instructed to do so by Sybase Technical Support.

dsync
: *UNIX platforms only* – specifies whether writes to the database device take place directly to the storage media, or are buffered when using UNIX operating system files. This option is meaningful only when you are initializing a UNIX operating system file; it has no effect when initializing devices on a raw partition. By default, all UNIX operating system files are initialized with dsync set to true.

Examples

Example 1 Initializes 5MB of a disk on a UNIX system:

```
disk init
name = "user_disk",
physname = "/dev/rxy1a",
vdevno = 2, size = 5120
```

Example 2 Initializes 10MB of a disk on a UNIX operating system file. Adaptive Server opens the device file with the dsync setting, and writes to the file are guaranteed to take place directly on the storage media:

```
disk init
name = "user_file",
physname = "/usr/u/sybase/data/userfile1.dat",
vdevno = 2, size = 5120, dsync = true
```

Usage

- The master device is initialized by the installation program; you need not initialize this device with disk init.
- To successfully complete disk initialization, the "sybase" user must have the appropriate operating system permissions on the device that is being initialized.
- You can specify the size as a float, but the size is rounded down to the nearest multiple of 2K.
- If you do not use a unit specifier for *size*:
  - disk init uses the virtual page size of 2K.
  - The *size* argument for create database and alter database is in terms of megabytes of disk space. This value is converted to the number of logical pages the master device was built with

  .
- The minimum size of a disk piece that you can initialize using disk init is the larger of:
  - One megabyte
  - One allocation unit of the server's logical page size
- Use disk init for each new database device. Each time disk init is issued, a row is added to master..sysdevices. A new database device does not automatically become part of the pool of default database storage. Assign default status to a database device with sp_diskdefault.
- Back up the master database with the dump database or dump transaction command after each use of disk init. This makes recovery easier and safer in case master is damaged. If you add a device with disk init and fail to back up master, you may be able to recover the changes by using disk reinit, then stopping and restarting Adaptive Server.
- Assign user databases to database devices with the name clause of the create database or alter database command.

- The preferred method for placing a database's transaction log (the system table syslogs) on a different device than the one on which the rest of the database is stored, is to use the log on extension to create database. Alternatively, you can name at least two devices when you create the database, then execute sp_logdevice. You can also use alter database to extend the database onto a second device, then run sp_logdevice. The log on extension immediately moves the entire log to a separate device. The sp_logdevice method retains part of the system log on the original database device until transaction activity causes the migration to become complete.
- For a report on all Adaptive Server devices on your system (both database and dump devices), execute sp_helpdevice.
- Remove a database device with sp_dropdevice. You must first drop all existing databases on that device.
- If disk unit failed because the size value is too large for the database device, use a different virtual device number or restart Adaptive Server before executing disk unit again.

Using *dsync*

Note Do not set dsync to false for any device that stores critical data. The only exception is tempdb, which can safely be stored on devices for which dsync is set to false.

- When dsync is on, writes to the database device are guaranteed to take place on the physical storage media, and Adaptive Server can recover data on the device in the event of a system failure.
- When dsync is off, writes to the database device may be buffered by the UNIX file system. The UNIX file system may mark an update as being completed, even though the physical media has not yet been modified. In the event of a system failure, there is no guarantee that data updates have ever taken place on the physical media, and Adaptive Server may be unable to recover the database.
- dsync is always on for the master device file.
- The dsync value should be turned off only when databases on the device need not be recovered after a system failure. For example, you may consider turning dsync off for a device that stores only the tempdb database.

- Adaptive Server ignores the dsync setting for devices stored on raw partitions—writes to those device are guaranteed to take place on the physical storage media, regardless of the dsync setting.
- The dsync setting is not used on the Windows NT platform.
- disk reinit ensures that master..sysdevices is correct if the master database has been damaged or if devices have been added since the last dump of master.

Standards

ANSI SQL – Compliance level: Transact-SQL extension.

Permissions

disk init permission defaults to System Administrators and is not transferable. You must be using the master database to use disk init.

See also

Commands alter database, create database, disk refit, disk reinit, dump database, dump transaction, load database, load transaction

System procedures sp_diskdefault, sp_dropdevice, sp_helpdevice, sp_logdevice

disk mirror

Description

Creates a software mirror that immediately takes over when the primary device fails.

Syntax

```
disk mirror
        name = "device_name" ,
        mirror = "physicalname"
        [, writes = { serial | noserial }]
```

Parameters

name

is the name of the database device that you want to mirror. This is recorded in the name column of the sysdevices table. The name must be enclosed in single or double quotes.

mirror

is the full path name of the database mirror device that is to be your secondary device. It must be enclosed in single or double quotes. If the secondary device is a file, physicalname should be a path specification that clearly identifies the file, which Adaptive Server creates. The value of physicalname cannot be an existing file.

writes

allows you to choose whether to enforce serial writes to the devices. In the default case (serial), the write to the primary database device is guaranteed to finish before the write to the secondary device begins. If the primary and secondary devices are on different physical devices, serial writes can ensure that at least one of the disks will be unaffected in the event of a power failure.

Examples

```
disk mirror
    name = "user_disk",
    mirror = "/server/data/mirror.dat"
```

Creates a software mirror for the database device user_disk on the file *mirror.dat*.

Usage

- Disk mirroring creates a software mirror of a user database device, the master database device, or a database device used for user database transaction logs. If a database device fails, its mirror immediately takes over.

  Disk mirroring does not interfere with ongoing activities in the database. You can mirror or unmirror database devices without shutting down Adaptive Server.

- Back up the master database with the dump database command after each use of disk mirror. This makes recovery easier and safer in case master is damaged.
- When a read or write to a mirrored device is unsuccessful, Adaptive Server unmirrors the bad device and prints error messages. Adaptive Server continues to run, unmirrored. The System Administrator must use the disk remirror command to restart mirroring.
- You can mirror the master device, devices that store data, and devices that store transaction logs. However, you cannot mirror dump devices.
- Devices are mirrored; databases are not.
- A device and its mirror constitute one logical device. Adaptive Server stores the physical name of the mirror device in the mirrorname column of the sysdevices table. It does not require a separate entry in sysdevices and should not be initialized with disk init.
- To retain use of asynchronous I/O, always mirror devices that are capable of asynchronous I/O to other devices capable of asynchronous I/O. In most cases, this means mirroring raw devices to raw devices and operating system files to operating system files.

  If the operating system cannot perform asynchronous I/O on files, mirroring a raw device to a regular file produces an error message. Mirroring a regular file to a raw device works, but does not use asynchronous I/O.
- Mirror all default database devices so that you are still protected if a create database or alter database command affects a database device in the default list.
- For greater protection, mirror the database device used for transaction logs.
- Always put user database transaction logs on a separate database device. To put a database's transaction log (that is, the system table syslogs) on a device other than the one on which the rest of the database is stored, name the database device and the log device when you create the database. Alternatively, use alter database to extend the database onto a second device, then run sp_logdevice.

- If you mirror the database device for the master database, you can use the -r option and the name of the mirror for UNIX, when you restart Adaptive Server with the dataserver utility program. Add this to the *RUN_servername* file for that server so that the startserver utility program knows about it. For example, to start a master device named master.dat and its mirror, mirror.dat enter:

  ```
  dataserver -dmaster.dat -rmirror.dat
  ```

  For more information, see dataserver and startserver in the *Utility Guide*.

- If you mirror a database device that has unallocated space (room for additional create database and alter database statements to allocate part of the device), disk mirror begins mirroring these allocations when they are made, not when the disk mirror command is issued.

- For a report on all Adaptive Server devices on your system (user database devices and their mirrors, as well as dump devices), execute sp_helpdevice.

Standards

ANSI SQL – Compliance level: Transact-SQL extension.

Permissions

disk mirror permission defaults to the System Administrator and is not transferable. You must be using the master database to use disk mirror.

See also

Commands alter database, create database, disk init, disk refit, disk reinit, disk remirror, disk unmirror, dump database, dump transaction, load database, load transaction

System procedures sp_diskdefault, sp_helpdevice, sp_logdevice

Utilities dataserver, startserver

disk refit

Description

Rebuilds the master database's sysusages and sysdatabases system tables from information contained in sysdevices.

Syntax

disk refit

Examples

```
disk refit
```

Usage

- Adaptive Server automatically shuts down after disk refit rebuilds the system tables.
- Use disk refit after disk reinit as part of the procedure to restore the master database.

Note You must start Adaptive Server with trace flag 3608 before you run disk refit. However, make sure you read the information in the *Troubleshooting and Error Messages Guide* before you start Adaptive Server with any trace flag.

Standards

ANSI SQL – Compliance level: Transact-SQL extension.

Permissions

disk refit permission defaults to System Administrators and is not transferable. You must be in the master database to use disk refit.

See also

Documents For more information, see the *System Administration Guide*.

Commands disk init, disk reinit

System procedures sp_addumpdevice, sp_helpdevice

disk reinit

Description

Rebuilds the master database's sysdevices system table. Use disk reinit as part of the procedure to restore the master database.

Syntax

```
disk reinit
        name = "device_name",
        physname = "physicalname" ,
        [vdevno = virtual_device_number ,]
        size = number_of_blocks
        [, vstart = virtual_address
            , cntrltype = controller_number]
        [, dsync = { true | false } ]
```

Parameters

name

is the name of the database device. It must conform to the rules for identifiers, and it must be enclosed in single or double quotes. This name is used in the create database and alter database commands.

physname

is the name of the database device. The physical name must be enclosed in single or double quotes.

vdevno

is the virtual device number. It must be unique among devices used by Adaptive Server. The device number 0 is reserved for the master database device. Legal numbers are between 1 and 255, but cannot be greater than the number of database devices for which your system is configured. The default is 50 devices.

size

is the amount of space to allocate to the database extension. size can be in the following unit specifiers: 'k' or 'K' (kilobytes), 'm' or 'M' (megabytes), and 'g' or 'G' (gigabytes). Sybase recommends that you always include a unit specifier. Quotes are optional if you do not include a unit specifier. However, you must use quotes if you include a unit specifier.

vstart
is the starting virtual address, or the offset, for Adaptive Server to begin using the database device. vstart accepts the following optional unit specifiers: 'k' or 'K' (kilobytes), 'm' or 'M' (megabytes), and 'g' or 'G' (gigabytes). The size of the offset depends on how you enter the value for vstart.

- If you do not specify a unit size, vstart uses 2K pages for its starting address. For example, if you specify `vstart = 13`, Adaptive Server uses 13 * 2K pages as the offset for the starting address.
- If you specify a unit value, vstart uses this as the starting address. For example, if you specify `vstart = "13M"`, Adaptive Server sets the starting address offset at 13 megabytes.

The default value (and usually the preferred value) of vstart is 0. If the specified device does not have the sum of vstart + size blocks available, the disk reinit command fails.

Note If you are running the Logical Volume Manager on an AIX operating system, vstart should be 2.

Specify vstart only if instructed to do so by Sybase Technical Support.

cntrltype
specifies the disk controller. Its default value is 0. Reset it only if instructed to do so by Sybase Technical Support.

dsync
UNIX platforms only – specifies whether writes to the database device take place directly to the storage media, or are buffered when using UNIX operating system files. This option is meaningful only when you are initializing a UNIX operating system file; it has no effect when initializing devices on a raw partition. By default, all UNIX operating system files are initialized with dsync set to true.

Examples

Initializes 10MB of a disk on a UNIX operating system file. Adaptive Server opens the device file with the dsync setting, and writes to the file are guaranteed to take place directly on the storage media:

```
disk reinit
name = "user_file",
physname = "/usr/u/sybase/data/userfile1.dat",
vdevno = 2, size = 5120, dsync = true
```

Usage

- disk reinit ensures that master..sysdevices is correct if the master database has been damaged or if devices have been added since the last dump of master.
- disk reinit is similar to disk init, but does not initialize the database device.
- You can specify the *size* as a float, but the size is rounded down to the nearest multiple of 2K.
- If you do not use a unit specifier for *size*, disk reinit uses the virtual page size of 2K.
- For complete information on restoring the master database, see the *System Administration Guide*.

Using *dsync*

Note Do not set dsync to false for any device that stores critical data. The only exception is tempdb, which can safely be stored on devices for which dsync is set to false.

- When dsync is on, writes to the database device are guaranteed to take place on the physical storage media, and Adaptive Server can recover data on the device in the event of a system failure.
- When dsync is off, writes to the database device may be buffered by the UNIX file system. The UNIX file system may mark an update as being completed, even though the physical media has not yet been modified. In the event of a system failure, there is no guarantee that data updates have ever taken place on the physical media, and Adaptive Server may be unable to recover the database.
- dsync is always on for the master device file.
- The dsync value should be turned off only when databases on the device need not be recovered after a system failure. For example, you may consider turning dsync off for a device that stores only the tempdb database.
- Adaptive Server ignores the dsync setting for devices stored on raw partitions—writes to those device are guaranteed to take place on the physical storage media, regardless of the dsync setting.
- The dsync setting is not used on the Windows NT platform.
- disk reinit ensures that master..sysdevices is correct if the master database has been damaged or if devices have been added since the last dump of master.

Standards	ANSI SQL – Compliance level: Transact-SQL extension.
Permissions	disk reinit permission defaults to System Administrators and is not transferable. You must be in the master database to use disk reinit.
See also	**Commands** alter database, create database, dbcc, disk init, disk refit
	System procedures sp_addumpdevice, sp_helpdevice

disk remirror

Description

Restarts disk mirroring after it is stopped by failure of a mirrored device or temporarily disabled by the disk unmirror command.

Syntax

```
disk remirror
        name = "device_name"
```

Parameters

name

is the name of the database device that you want to remirror. The name is recorded in the name column of the sysdevices table, and must be enclosed in single or double quotes.

Examples

Resumes software mirroring on the database device user_disk:

```
disk remirror
  name = "user_disk"
```

Usage

- Disk mirroring creates a software mirror of a user database device, the master database device, or a database device used for user database transaction logs. If a database device fails, its mirror immediately takes over.

  Use the disk remirror command to reestablish mirroring after it has been temporarily stopped by failure of a mirrored device or temporarily disabled with the mode = retain option of the disk unmirror command. The disk remirror command copies data on the retained disk to the mirror.

- It is important to back up the master database with the dump database command after each use of disk remirror. This makes recovery easier and safer in case master is damaged.

- If mirroring was permanently disabled with the mode = remove option, you must remove the operating system file that contains the mirror before using disk remirror.

- Database devices, not databases, are mirrored.

- You can mirror, remirror, or unmirror database devices without shutting down Adaptive Server. Disk mirroring does not interfere with ongoing activities in the database.

- When a read or write to a mirrored device is unsuccessful, Adaptive Server unmirrors the bad device and prints error messages. Adaptive Server continues to run, unmirrored. The System Administrator must use disk remirror to restart mirroring.

- In addition to mirroring user database devices, always put user database transaction logs on a separate database device. The database device used for transaction logs can also be mirrored for even greater protection. To put a database's transaction log (that is, the system table syslogs) on a different device than the one on which the rest of the database is stored, name the database device and the log device when you create the database. Alternatively, alter database to a second device, then run sp_logdevice.
- If you mirror the database device for the master database, you can use the -r option and the name of the mirror for UNIX, when you restart Adaptive Server with the dataserver utility program. Add this option to the *RUN_servername* file for that server so that the startserver utility program knows about it. For example, the following command starts a master device named master.dat and its mirror, mirror.dat:

  ```
  dataserver -dmaster.dat -rmirror.dat
  ```

  For more information, see dataserver and startserver in the *Utility Guide*.
- For a report on all Adaptive Server devices on your system (user database devices and their mirrors, as well as dump devices), execute sp_helpdevice.

Standards

ANSI SQL – Compliance level: Transact-SQL extension.

Permissions

disk remirror permission defaults to the System Administrator and is not transferable. You must be using the master database to use disk remirror.

See also

Commands alter database, create database, disk init, disk mirror, disk refit, disk reinit, disk unmirror, dump database, dump transaction, load database, load transaction

System procedures sp_diskdefault, sp_helpdevice, sp_logdevice

Utilities dataserver, startserver

disk resize

Description

Dynamically increases the size of the device used by Adaptive Server.

Syntax

```
disk resize
        name = "device_name",
        size = additional_space
```

Parameters

name

The name of the device whose size you are increasing.

additional_space

The additional space you are adding to the device.

Examples

To increase the size of testdev by 4MB, enter:

```
disk resize
name = "test_dev",
size = "4M"
```

Usage

- The disk resize command allows you to dynamically increase the size of your disks.
- After you resize a device, dump the master device, which maintains the size of the device in the sysdevices table. If you attempt a recovery from an old dump of the master device, the information stored in sysdevices will not be current.
- Any properties that are set on the device continue to be set after you increase its size.
- During the physical initialization of the disk, if any error occurs due to insufficient disk space, disk resize extends the database device to the point before the error occurs.

  For example, on a server that uses 4K logical pages, if you try to increase the size of the device by 40MB, but only 39.5MB is available, then the device is extended only by 39.5MB. From the extended size (39.5MB), only 39MB is used by Adaptive Server. The last 0.5MB is allocated but not used, as 4K servers configure devices in one MB minimums.

  To utilize the last 0.5MB, make sure that at least another 1.5MB is available for the device, then re-run disk resize, specifying 1.5MB as the incremental size.
- You cannot decrease the size of a device with disk resize.
- *device_name* must have a valid identifier. The device is initialized using the disk init command and, it must refer to a valid Adaptive Server device, not a dump or load device.

- Use the following unit specifiers to indicate the size of the device: “k” or “K” to indicate kilobytes, “m” or “M” to indicate megabytes and “g”or “G” to indicate gigabytes. Although it is optional, Sybase recommends that you always include the unit specifier with the disk resize command to avoid confusion in the actual number of pages allocated.

  You must enclose the unit specifier in single or double quotes. If you do not use a unit specifier, the size defaults to the number of disk pages.

- Permanently disable mirroring while the resize operation is in progress. You can reestablish mirroring when the resize operation is completed.

Standards

ANSI SQL – compliance level: Transact-SQL extension

Permissions

Only a user with the sa role can execute the disk resize command.

See also

Commands create database, disk init, drop database, load database

System procedures sp_addsegment, sp_dropsegment, sp_helpdb, sp_helpsegment, sp_logdevice, sp_renamedb, sp_spaceused

disk unmirror

Description

Suspends disk mirroring initiated with the disk mirror command to allow hardware maintenance or the changing of a hardware device.

Syntax

```
disk unmirror
        name = "device_name"
        [ ,side = { "primary" | secondary }]
        [ ,mode = { retain | remove }]
```

Parameters

name

is the name of the database device that you want to unmirror. The name must be enclosed in single or double quotes.

side

specifies whether to disable the primary device or the secondary device (the mirror). By default, the secondary device is unmirrored.

mode

determines whether the unmirroring is temporary (retain) or permanent (remove). By default, unmirroring is temporary.

Specify retain when you plan to remirror the database device later in the same configuration. This option mimics what happens when the primary device fails:

- I/O is directed only at the device *not* being unmirrored.
- The status column of sysdevices indicates that mirroring is deactivated. remove eliminates all sysdevices references to a mirror device.
- The status column indicates that the mirroring feature is ignored.
- The phyname column is replaced by the name of the secondary device in the mirrorname column if the primary device is the one being deactivated.
- The mirrorname column is set to NULL.

Examples

Example 1 Suspends software mirroring for the database device user_disk:

```
disk unmirror
name = "user_disk"
```

Example 2 Suspends software mirroring for the database device user_disk on the secondary side:

```
disk unmirror name = "user_disk", side = secondary
```

Example 3 Suspends software mirroring for the database device user_disk and removes all device references to the mirror device:

```
disk unmirror name = "user_disk", mode = remove
```

Usage

- Disk mirroring creates a software mirror of a user database device, the master database device, or a database device used for user database transaction logs. If a database device fails, its mirror immediately takes over.

  disk unmirror disables either the original database device or the mirror, either permanently or temporarily, so that the device is no longer available to Adaptive Server for reads or writes. It does not remove the associated file from the operating system.

- Disk unmirroring alters the sysdevices table in the master database. It is important to back up the master database with the dump database command after each use of disk unmirror. This makes recovery easier and safer in case master is damaged.
- You can unmirror a database device while it is in use.
- You cannot unmirror any of a database's devices while a dump database, load database, or load transaction is in progress. Adaptive Server displays a message asking whether to abort the dump or load or to defer the disk unmirror until after the dump or load completes.
- You cannot unmirror a database's log device while a dump transaction is in progress. Adaptive Server displays a message asking whether to abort the dump or defer the disk unmirror until after the dump completes.

  Note dump transaction with truncate_only and dump transaction with no_log are not affected when a log device is unmirrored.

- You should mirror all the default database devices so that you are still protected if a create or alter database command affects a database device in the default list.
- When a read or write to a mirrored device is unsuccessful, Adaptive Server automatically unmirrors the bad device and prints error messages. Adaptive Server continues to run, unmirrored. A System Administrator must restart mirroring with the disk remirror command.
- For a report on all Adaptive Server devices on your system (user database devices and their mirrors, as well as dump devices), execute sp_helpdevice.

- Use disk remirror to reestablish mirroring after it is temporarily stopped with the mode = retain option of the disk unmirror command. If mirroring is permanently disabled with the mode = remove option, you must remove the operating system file that contains the mirror before using disk remirror.

Standards

ANSI SQL – Compliance level: Transact-SQL extension.

Permissions

disk unmirror permission defaults to the System Administrator, and is not transferable. You must be using the master database to use disk unmirror.

See also

Commands alter database, create database, disk init, disk mirror, disk refit, disk reinit, disk remirror, dump database, dump transaction, load database, load transaction

System procedures sp_diskdefault, sp_helpdevice, sp_logdevice

Utilities dataserver, startserver

drop database

Description

Removes one or more databases from Adaptive Server.

Syntax

drop database *database_name* [, *database_name*] ...

Parameters

database_name
is the name of a database to remove. Use sp_helpdb to get a list of databases.

Examples

Removes the publishing database and all its contents:

```
drop database publishing
```

Usage

- Removing a database deletes the database and all its objects, frees its storage allocation, and erases its entries from the sysdatabases and sysusages system tables in the master database.
- drop database clears the suspect page entries pertaining to the dropped database from master..sysattributes.

Restrictions

- You must be using the master database to drop a database.
- You cannot drop a database that is in use (open for reading or writing by any user).
- You cannot use drop database to remove a database that is referenced by a table in another database. Execute the following query to determine which tables and external databases have foreign key constraints on primary key tables in the current database:

  ```
  select object_name(tableid), frgndbname
      from sysreferences
      where frgndbname is not null
  ```

  Use alter table to drop these cross-database constraints, then reissue the drop database command.
- You cannot use drop database to remove a damaged database. Use the dbcc dbrepair command:

  ```
  dbcc dbrepair (database_name, dropdb)
  ```
- You cannot drop the sybsecurity database if auditing is enabled. When auditing is disabled, only the System Security Officer can drop sybsecurity.

Standards

ANSI SQL – Compliance level: Transact-SQL extension.

Permissions

Only the Database Owner can execute drop database, except for the sybsecurity database, which can be dropped only by the System Security Officer.

See also

Commands alter database, create database, dbcc, use

Procedures sp_changedbowner, sp_helpdb, sp_renamedb, sp_spaceused

drop default

Description

Removes a user-defined default.

Syntax

drop default [*owner*.]*default_name*
[, [*owner*.]*default_name*] ...

Parameters

default_name
is the name of an existing default. Execute sp_help to get a list of existing defaults. Specify the owner's name to drop a default of the same name owned by a different user in the current database. The default value for *owner* is the current user.

Examples

Removes the user-defined default datedefault from the database:

```
drop default datedefault
```

Usage

- You cannot drop a default that is currently bound to a column or to a user-defined datatype. Use sp_unbindefault to unbind the default before you drop it.
- You can bind a new default to a column or user-defined datatype without unbinding its current default. The new default overrides the old one.
- When you drop a default for a NULL column, NULL becomes the column's default value. When you drop a default for a NOT NULL column, an error message appears if users do not explicitly enter a value for that column when inserting data.

Standards

ANSI SQL – Compliance level: Transact-SQL extension.

Permissions

drop default permission defaults to the owner of the default and is not transferable.

See also

Commands create default

System procedures sp_help, sp_helptext, sp_unbindefault

drop function (SQLJ)

Description

Removes a SQLJ function.

Syntax

drop func[tion] [*owner*.]*function_name*
[, [*owner*.]*function_name*] ...

Parameters

[*owner*.]*function_name*
is the SQL name of a SQLJ function.

Examples

Removes the SQLJ function square_root:

```
drop function square_root
```

Usage

drop function removes only user-created functions from the current database. It does not remove system functions.

Permissions

Only the Database Owner or user with the sa role can execute drop function.

See also

Documents See *Java in Adaptive Server Enterprise* for more information about SQLJ functions.

Commands create function (SQLJ)

drop index

Description

Removes an index from a table in the current database.

Syntax

drop index *table_name.index_name*
[, *table_name.index_name*] ...

Parameters

table_name
is the table in which the indexed column is located. The table must be in the current database.

index_name
is the index to drop. In Transact-SQL, index names need not be unique in a database, though they must be unique within a table.

Examples

Removes au_id_ind from the authors table:

```
drop index authors.au_id_ind
```

Usage

- Once the drop index command is issued, you regain all the space that was previously occupied by the index. This space can be used for any database objects.
- You cannot use drop index on system tables.
- drop index cannot remove indexes that support unique constraints. To drop such indexes, drop the constraints through alter table or drop the table. See create table for more information about unique constraint indexes.
- You cannot drop indexes that are currently used by any open cursor. For information about which cursors are open and what indexes they use, use sp_cursorinfo.
- To get information about what indexes exist on a table, use the following, where objname is the name of the table:

```
sp_helpindex objname
```

Standards

ANSI SQL – Compliance level: Transact-SQL extension.

Permissions

drop index permission defaults to the index owner and is not transferable.

See also

Commands create index

System procedures sp_cursorinfo, sp_helpindex, sp_spaceused

drop procedure

Description

Removes a procedure.

Syntax

drop proc[edure] [*owner*.]*procedure_name*
[, [*owner*.]*procedure_name*] ...

Parameters

procedure_name
is the name of the Transact-SQL or SQLJ procedure to drop. Specify the owner's name to drop a procedure of the same name owned by a different user in the current database. The default value for *owner* is the current user.

Examples

Example 1 Deletes the stored procedure showind:

```
drop procedure showind
```

Example 2 Unregisters the extended stored procedure xp_echo:

```
drop procedure xp_echo
```

Usage

- drop procedure drops user-defined stored procedures, system procedures, and extended stored procedures (ESPs).
- Adaptive Server checks the existence of a procedure each time a user or a program executes that procedure.
- A procedure group (more than one procedure with the same name but with different number suffixes) can be dropped with a single drop procedure statement. For example, if the procedures used with the application named orders were named orderproc;1, orderproc;2, and so on, the following statement drops the entire group:

  ```
  drop proc orderproc
  ```

  Once procedures have been grouped, individual procedures within the group cannot be dropped. For example, the following statement is not allowed:

  ```
  drop procedure orderproc;2
  ```

  You cannot drop extended stored procedures as a procedure group.
- sp_helptext displays the procedure's text, which is stored in syscomments.
- sp_helpextendedproc displays ESPs and their corresponding DLLs.
- Dropping an ESP unregisters the procedure by removing it from the system tables. It has no effect on the underlying DLL.
- drop procedure drops only user-created procedures from your current database.

Standards	ANSI SQL – Compliance level: Transact-SQL extension.
Permissions	drop procedure permission defaults to the procedure owner and is not transferable.
See also	**Commands** create procedure, create procedure (SQLJ)
	System procedures sp_depends, sp_dropextendedproc, sp_helpextendedproc, sp_helptext, sp_rename

drop role

Description

Drops a user-defined role.

Syntax

drop role *role_name* [with override]

Parameters

role_name
is the name of the role you want to drop.

with override
overrides any restrictions on dropping a role. When you use the with override option, you can drop any role without having to check whether the role permissions have been dropped in each database.

Examples

Example 1 Drops the named role only if all permissions in all databases have been revoked. The System Administrator or object owner must revoke permissions granted in each database before dropping a role, or the command fails:

```
drop role doctor_role
```

Example 2 Drops the named role and removes permission information and any other reference to the role from all databases:

```
drop role doctor_role with override
```

Usage

- You need not drop memberships before dropping a role. Dropping a role automatically removes any user's membership in that role, regardless of whether you use the with override option.
- Use drop role from the master database.

Restrictions

- You cannot use drop role to drop system roles.

Standards

ANSI SQL – Compliance level: Transact-SQL extension.

Permissions

You must be a System Security Officer to use drop role.

drop role permission is not included in the grant all command.

See also

Commands alter role, create role, grant, revoke, set

System procedures sp_activeroles, sp_displaylogin, sp_displayroles, sp_helprotect, sp_modifylogin

drop rule

Description

Removes a user-defined rule.

Syntax

drop rule [*owner*.]*rule_name* [, [*owner*.]*rule_name*] ...

Parameters

rule_name
is the name of the rule to drop. Specify the owner's name to drop a rule of the same name owned by a different user in the current database. The default value for *owner* is the current user.

Examples

Removes the rule pubid_rule from the current database:

```
drop rule pubid_rule
```

Usage

- Before dropping a rule, you must unbind it using the system procedure sp_unbindrule. If the rule has not been unbound, an error message appears, and the drop rule command fails.
- You can bind a new rule to a column or user-defined datatype without unbinding its current rule. The new rule overrides the old one.
- After you drop a rule, Adaptive Server enters new data into the columns that were previously governed by the rule without constraints. Existing data is not affected in any way.

Standards

ANSI SQL – Compliance level: Transact-SQL extension.

Permissions

drop rule permission defaults to the rule owner and is not transferable.

See also

Commands create rule

System procedures sp_bindrule, sp_help, sp_helptext, sp_unbindrule

drop table

Description

Removes a table definition and all of its data, indexes, triggers, and permissions from the database.

Syntax

drop table [[*database*.]*owner*.]*table_name*
[, [[*database*.]*owner*.]*table_name*] ...

Parameters

table_name
is the name of the table to drop. Specify the database name if the table is in another database, and specify the owner's name if more than one table of that name exists in the database. The default value for *owner* is the current user, and the default value for *database* is the current database.

Examples

Removes the table roysched and its data and indexes from the current database:

```
drop table roysched
```

Usage

- When you use drop table, any rules or defaults on the table lose their binding, and any triggers associated with it are automatically dropped. If you re-create a table, you must rebind the appropriate rules and defaults and re-create any triggers.
- The system tables affected when a table is dropped are sysobjects, syscolumns, sysindexes, sysprotects, and syscomments.
- If Component Integration Services is enabled, and if the table being dropped was created with create existing table, the table is not dropped from the remote server. Instead, Adaptive Server removes references to the table from the system tables.

Restrictions

- You cannot use the drop table command on system tables.
- You can drop a table in any database, as long as you are the table owner. For example, use either of the following to drop a table called newtable in the database otherdb:

```
drop table otherdb..newtable
drop table otherdb.yourname.newtable
```

- If you delete all the rows in a table or use the truncate table command, the table still exists until you drop it.

Dropping tables with cross-database referential integrity constraints

- When you create a cross-database constraint, Adaptive Server stores the following information in the sysreferences system table of each database:

Table 1-22: Information stored about referential integrity constraints

Information stored in sysreferences	Columns with information about referenced table	Columns with information about referencing table
Key column IDs	refkey1 through refkey16	fokey1 through fokey16
Table ID	reftabid	tableid
Database name	pmrydbname	frgndbname

- Because the referencing table depends on information from the referenced table, Adaptive Server does not allow you to:
  - Drop the referenced table,
  - Drop the external database that contains it, or
  - Rename either database with sp_renamedb.

  Use sp_helpconstraint to determine which tables reference the table you want to drop. Use alter table to drop the constraints before reissuing the drop table command.
- You can drop a referencing table or its database without problems. Adaptive Server automatically removes the foreign key information from the referenced database.
- Each time you add or remove a cross-database constraint or drop a table that contains a cross-database constraint, dump *both* of the affected databases.

Warning! Loading earlier dumps of these databases can cause database corruption. For more information about loading databases with cross-database referential integrity constraints, see the *System Administration Guide*.

Standards — ANSI SQL – Compliance level: Transact-SQL extension.

Permissions — drop table permission defaults to the table owner and is not transferable.

See also — **Commands** alter table, create table, delete, truncate table

System procedures sp_depends, sp_help, sp_spaceused

drop trigger

Description

Removes a trigger.

Syntax

drop trigger [*owner*.]*trigger_name*
[, [*owner*.]*trigger_name*] ...

Parameters

trigger_name
is the name of the trigger to drop. Specify the owner's name to drop a trigger of the same name owned by a different user in the current database. The default value for *owner* is the current user.

Examples

Removes the trigger trigger1 from the current database:

```
drop trigger trigger1
```

Usage

- drop trigger drops a trigger in the current database.
- You do not need to explicitly drop a trigger from a table to create a new trigger for the same operation (insert, update, or delete). In a table or column each new trigger for the same operation overwrites the previous one.
- When a table is dropped, Adaptive Server automatically drops any triggers associated with it.

Standards

ANSI SQL – Compliance level: Transact-SQL extension.

Permissions

drop trigger permission defaults to the trigger owner and is not transferable.

See also

Commands create trigger

System procedures sp_depends, sp_help, sp_helptext

drop view

Description — Removes one or more views from the current database.

Syntax — drop view [*owner*.]*view_name* [, [*owner*.]*view_name*] ...

Parameters

view_name
is the name of the view to drop. Specify the owner's name to drop a view of the same name owned by a different user in the current database. The default value for *owner* is the current user.

Examples — Removes the view new_price from the current database:

```
drop view new_price
```

Usage

- When you use drop view, the definition of the view and other information about it, including privileges, is deleted from the system tables sysobjects, syscolumns, syscomments, sysdepends, sysprocedures, and sysprotects.
- Existence of a view is checked each time the view is referenced, for example, by another view or by a stored procedure.

Standards — ANSI SQL – Compliance level: Transact-SQL extension.

Permissions — drop view permission defaults to the view owner and is not transferable.

See also — **Commands** create view

System procedures sp_depends, sp_help, sp_helptext

dump database

Description

Makes a backup copy of the entire database, including the transaction log, in a form that can be read in with load database. Dumps and loads are performed through Backup Server.

Syntax

```
dump database database_name
        to [compress::[compression_level::]]stripe_device
            [at backup_server_name]
            [density = density_value,
            blocksize = number_bytes,
            capacity = number_kilobytes,
            dumpvolume = volume_name,
            file = file_name]
        [stripe on [compress::[compression_level::]]stripe_device
            [at backup_server_name]
            [density = density_value,
            blocksize = number_bytes,
            capacity = number_kilobytes,
            dumpvolume = volume_name,
            file = file_name]]
        [[stripe on [compress::[compression_level::]]stripe_device
            [at backup_server_name]
            [density = density_value,
            blocksize = number_bytes,
            capacity = number_kilobytes,
            dumpvolume = volume_name,
            file = file_name]]...]
        [with {
            density = density_value,
            blocksize = number_bytes,
            capacity = number_kilobytes,
            dumpvolume = volume_name,
            file = file_name,
            [dismount | nodismount],
            [nounload | unload],
            retaindays = number_days,
            [noinit | init],
            notify = {client | operator_console}
            } ]
```

Parameters

database_name

is the name of the database from which you are copying data. The database name can be specified as a literal, a local variable, or a stored procedure parameter.

compress::*compression_level*
is a number between 0 and 9, with 0 indicating no compression, and 9 providing the highest level of compression. If you do not specify *compression_level*, the default is 1. See Chapter 27, "Backing Up and Restoring User Databases" in the *System Administration Guide* for more information about the compress option.

Note The compress option works only with local archives; you cannot use the *backup_server_name* option.

---

to *stripe_device*
is the device to which to copy the data. See "Specifying dump devices" in this section for information about what form to use when specifying a dump device.

at *backup_server_name*
is the name of the Backup Server. Do not specify this parameter when dumping to the default Backup Server. Specify this parameter only when dumping over the network to a remote Backup Server. You can specify as many as 32 remote Backup Servers with this option. When dumping across the network, specify the *network name* of a remote Backup Server running on the machine to which the dump device is attached. For platforms that use interfaces files, the *backup_server_name* must appear in the interfaces file.

density = *density_value*
overrides the default density for a tape device. Valid densities are 800, 1600, 6250, 6666, 10000, and 38000. Not all values are valid for every tape drive; use the correct density for your tape drive.

blocksize = *number_bytes*
overrides the default block size for a dump device. The block size must be at least one database page (2048 bytes for most systems) and must be an exact multiple of the database page size. For optimal performance, specify the blocksize as a power of 2, for example, 65536, 131072, or 262144.

capacity = *number_kilobytes*
: is the maximum amount of data that the device can write to a single tape volume. The capacity must be at least five database pages and should be less than the recommended capacity for your device.

  A general rule for calculating capacity is to use 70 percent of the manufacturer's maximum capacity for the device, allowing 30 percent for overhead such as inter-record gaps and tape marks. The maximum capacity is the capacity of the device on the drive, not the drive itself. This rule works in most cases, but may not work in all cases due to differences in overhead across vendors and across devices.

  On UNIX platforms that cannot reliably detect the end-of-tape marker, indicate how many kilobytes can be dumped to the tape. You *must* supply a capacity for dump devices specified as a physical path name. If a dump device is specified as a logical device name, the Backup Server uses the *size* parameter stored in the sysdevices system table unless you specify a capacity.

dumpvolume = *volume_name*
: establishes the name that is assigned to the volume. The maximum length of *volume_name* is 6 characters. Backup Server writes the *volume_name* in the ANSI tape label when overwriting an existing dump, dumping to a brand new tape, or dumping to a tape whose contents are not recognizable. The load database command checks the label and generates an error message if the wrong volume is loaded.

Warning! Label each tape volume as you create it so that the operator can load the correct tape.

---

stripe on *stripe_device*
: is an additional dump device. You can use as many as 32 devices, including the device named in the to *stripe_device* clause. The Backup Server splits the database into approximately equal portions, and sends each portion to a different device. Dumps are made concurrently on all devices, reducing the time required to make a dump and requiring fewer volume changes during the dump. See "Specifying dump devices" on page 247 for information about how to specify a dump device.

dismount | nodismount
: on platforms that support logical dismount, determines whether tapes remain mounted. By default, all tapes used for a dump are dismounted when the dump completes. Use nodismount to keep tapes available for additional dumps or loads.

nounload | unload
determines whether tapes rewind after the dump completes. By default, tapes do not rewind, allowing you to make additional dumps to the same tape volume. Specify unload for the last dump file to be added to a multidump volume. This rewinds and unloads the tape when the dump completes.

retaindays= *number_days*
on UNIX systems – when dumping to disk, specifies the number of days that Backup Server protects you from overwriting the dump. If you try to overwrite the dump before it expires, Backup Server requests confirmation before overwriting the unexpired volume.

Note This option is meaningful only when dumping to a disk. It is not meaningful for tape dumps.

The *number_days* must be a positive integer or 0, for dumps that you can overwrite immediately. If you do not specify a retaindays value, Backup Server uses the tape retention in days value set by sp_configure.

noinit | init
determines whether to append the dump to existing dump files or reinitialize (overwrite) the tape volume. By default, Adaptive Server appends dumps following the last end-of-tape mark, allowing you to dump additional databases to the same volume. New dumps can be appended only to the last volume of a multivolume dump. Use init for the first database you dump to a tape to overwrite its contents.

Use init when you want Backup Server to store or update tape device characteristics in the tape configuration file. For more information, see the *System Administration Guide*.

file = *file_name*
is the name of the dump file. The name cannot exceed 17 characters and must conform to operating system conventions for file names. For more information, see “Dump files” on page 248.

notify = {client | operator_console}
overrides the default message destination.

On operating systems that offer an operator terminal feature, volume change messages are always sent to the operator terminal on the machine on which Backup Server is running. Use client to route other Backup Server messages to the terminal session that initiated the dump database.

On operating systems that do not offer an operator terminal feature, such as UNIX, messages are sent to the client that initiated the dump database. Use operator_console to route messages to the terminal on which Backup Server is running.

Examples

Example 1 Dumps the database pubs2 to a tape device. If the tape has an ANSI tape label, this command appends this dump to the files already on the tape, since the init option is not specified:

```
dump database pubs2
    to "/dev/nrmt0"
```

Example 2 *For UNIX* – dumps the pubs2 database, using the REMOTE_BKP_SERVER Backup Server. The command names three dump devices, so the Backup Server dumps approximately one-third of the database to each device. This command appends the dump to existing files on the tapes. On UNIX systems, the retaindays option specifies that the tapes cannot be overwritten for 14 days:

```
dump database pubs2
    to "/dev/rmt4" at REMOTE_BKP_SERVER
    stripe on "/dev/nrmt5" at REMOTE_BKP_SERVER
    stripe on "/dev/nrmt0" at REMOTE_BKP_SERVER
with retaindays = 14
```

Example 3 The init option initializes the tape volume, overwriting any existing files:

```
dump database pubs2
    to "/dev/nrmt0"
    with init
```

Example 4 Rewinds the dump volumes upon completion of the dump:

```
dump database pubs2
    to "/dev/nrmt0"
    with unload
```

Example 5 *For UNIX* – the notify clause sends Backup Server messages requesting volume changes to the client which initiated the dump request, rather than sending them to the default location, the console of the Backup Server machine:

```
dump database pubs2
    to "/dev/nrmt0"
    with notify = client
```

Example 6 Creates a compressed dump of the pubs2 database into a file called *dmp090100.dmp* using a compression level of 4:

```
dump database pubs2 to
    "compress::4::/opt/bin/Sybase/dumps/dmp090100.dmp"
```

Usage

- Table 1-23 describes the commands and system procedures used to back up databases:

Table 1-23: Commands used to back up databases and logs

To do this	Use this command
Make routine dumps of the entire database, including the transaction log.	dump database
Make routine dumps of the transaction log, then truncate the inactive portion.	dump transaction
Dump the transaction log after failure of a database device.	dump transaction with no_truncate
Truncate the log without making a backup, then copy the entire database.	dump transaction with truncate_only dump database
Truncate the log after your usual method fails due to insufficient log space, then copy the entire database.	dump transaction with no_log dump database
Respond to the Backup Server's volume change messages.	sp_volchanged

Restrictions

- If proxy tables are in the database they are be part of the database saveset. The content data of proxy tables is not included in the save; only the pointer is saved and restored.
- You cannot dump from an 11.x Adaptive Server to a 10.x Backup Server.
- You cannot have Sybase dumps and non-Sybase data (for example, UNIX archives) on the same tape.

- If a database has cross-database referential integrity constraints, the sysreferences system table stores the *name*—not the ID number—of the external database. Adaptive Server cannot guarantee referential integrity if you use load database to change the database name or to load it onto a different server.

  Warning! Before dumping a database to load it with a different name or move it to another Adaptive Server, use alter table to drop all external referential integrity constraints.

- You cannot use dump database in a user-defined transaction.
- If you issue dump database on a database where a dump transaction is already in progress, dump database sleeps until the transaction dump completes.
- When using 1/4-inch cartridge tape, you can dump only one database or transaction log per tape.
- You cannot dump a database if it has offline pages. To force offline pages online, use sp_forceonline_db or sp_forceonline_page.

Scheduling dumps

- Adaptive Server database dumps are *dynamic*—they can take place while the database is active. However, they may slow the system down slightly, so you may want to run dump database when the database is not being heavily updated.
- *Back up the* master *database regularly and frequently*. In addition to your regular backups, dump master after each create database, alter database, and disk init command is issued.
- Back up the model database each time you make a change to the database.
- Use dump database immediately after creating a database, to make a copy of the entire database. You cannot run dump transaction on a new database until you have run dump database.
- Each time you add or remove a cross-database constraint or drop a table that contains a cross-database constraint, dump *both* of the affected databases.

  Warning! Loading earlier dumps of these databases can cause database corruption.

- Develop a regular schedule for backing up user databases and their transaction logs.
- Use thresholds to automate backup procedures. To take advantage of Adaptive Server's last-chance threshold, create user databases with log segments on a device that is separate from data segments. For more information about thresholds, see the *System Administration Guide*.

Dumping the system databases

- The master, model, and sybsystemprocs databases do not have separate segments for their transaction logs. Use dump transaction with truncate_only to purge the log, then use dump database to back up the database.
- Backups of the master database are needed for recovery procedures in case of a failure that affects the master database. See the *System Administration Guide* for step-by-step instructions for backing up and restoring the master database.
- If you are using removable media for backups, the entire master database must fit on a single volume unless you have another Adaptive Server that can respond to volume change messages.

Specifying dump devices

- You can specify the dump device as a literal, a local variable, or a parameter to a stored procedure.
- You cannot dump to the null device (on UNIX, */dev/null*).
- Dumping to multiple stripes is supported for tape and disk devices. Placing multiple dumps on a device is supported only for tape devices.
- You can specify a local dump device as:
  - A logical device name from the sysdevices system table
  - An absolute path name
  - A relative path name

  Backup Server resolves relative path names using Adaptive Server's current working directory.
- When dumping across the network, you must specify the absolute path name of the dump device. The path name must be valid on the machine on which Backup Server is running. If the name includes any characters except letters, numbers, or the underscore (_), you must enclose it in quotes.

- Ownership and permissions problems on the dump device may interfere with the use of dump commands. sp_addumpdevice adds the device to the system tables, but does not guarantee that you can dump to that device or create a file as a dump device.
- You can run more than one dump (or load) at the same time, as long as each uses different dump devices.
- If the device file already exists, Backup Server overwrites it; it does not truncate it. For example, suppose you dump a database to a device file and the device file becomes 10MB. If the next dump of the database to that device is smaller, the device file is still 10MB.

Determining tape device characteristics

- If you issue a dump command without the init qualifier and Backup Server cannot determine the device type, the dump command fails. For more information, see the *System Administration Guide*.

Backup servers

- You must have a Backup Server running on the same machine as Adaptive Server. The Backup Server must be listed in the master..sysservers table. This entry is created during installation or upgrade, and should not be deleted.
- If your backup devices are located on another machine so that you dump across a network, you must also have a Backup Server installed on the remote machine.

Dump files

- Dumping a database with the init option overwrites any existing files on the tape or disk.
- If you perform two or more dumps to a tape device and use the same file name for both dumps (specified with the FILENAME parameter), Adaptive Server appends the second dump to the archive device. You will not be able to restore the second dump because Adaptive Server locates the first instance of the dump image with the specified file name and restores this image instead. Adaptive Server does not search for subsequent dump images with the same file name.
- Backup Server sends the dump file name to the location specified by the with notify clause. Before storing a backup tape, the operator should label it with the database name, file name, date, and other pertinent information. When loading a tape without an identifying label, use the with headeronly and with listonly options to determine the contents.

File names and archive names

- The name of a dump file identifies the database that was dumped and when the dump was made. However, in the syntax, *file_name* has different meanings depending on whether you are dumping to disk or to a UNIX tape:

  ```
  file = file_name
  ```

  In a dump to disk, the path name of a disk file is also its file name.

  In a dump to a UNIX tape, the path name is not the file name. The ANSI Standard Format for File Interchange contains a file name field in the HDR1 label. For tapes conforming to the ANSI specification, this field in the label identifies the file name. The ANSI specification only applies these labels to tape; it does not apply to disk files.

  This creates two problems:

  - UNIX does not follow the ANSI convention for tape file names. UNIX considers the tape's data to be unlabeled. Although it can be divided into files, those files have no name.
  - In Backup Server, the ANSI tape labels are used to store information about the archive, negating the ANSI meanings. Therefore, disk files also have ANSI labels, because the archive name is stored there.

  The meaning of filename changes depending on the kind of dump you are performing. For example, in the following syntax:

```
dump database database_name to 'filename' with file='filename'
```

  - The first *filename* refers to the path name you enter to display the file.
  - The second *filename* is actually the archive name, the name stored in the HDR1 label in the archive, which the user can specify with the file=*filename* parameter of the dump or load command.

  When the archive name is specified, the server uses that name during a database load to locate the selected archive.

  If the archive name is not specified, the server loads the first archive it encounters.

  In both cases, file='*archivename*' establishes the name that is stored in the HDR1 label, and which the subsequent load uses to validate that it is looking at the correct data.

  If the archive name is not specified, a dump creates one; a load uses the first name it encounters.

The meaning of *filename* in the to '*filename*' clause changes according to whether this is a disk or tape dump:

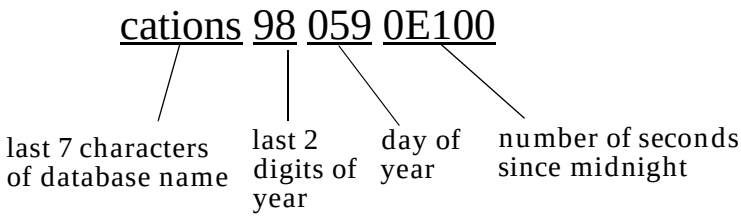
- If the dump is to tape, '*filename*' is the name of the tape device,
- If the dump is to disk, it is the name of a disk file.

If this is a disk dump and the '*filename*' is not a complete path, it is modified by prepending the server's current working directory.

- If you are dumping to tape and you do not specify a file name, Backup Server creates a default file name by concatenating the following:
  - Last seven characters of the database name
  - Two-digit year number
  - Three-digit day of the year (1–366)
  - Hexadecimal-encoded time at which the dump file was created

  For example, the file *cations980590E100* contains a copy of the publications database made on the 59th day of 1998:

Figure 1-2: File naming convention for database dumps to tape



Volume names

- Dump volumes are labeled according to the ANSI tape-labeling standard. The label includes the logical volume number and the position of the device within the stripe set.

- During loads, Backup Server uses the tape label to verify that volumes are mounted in the correct order. This allows you to load from a smaller number of devices than you used at dump time.

Note When dumping and loading across the network, you must specify the same number of stripe devices for each operation.

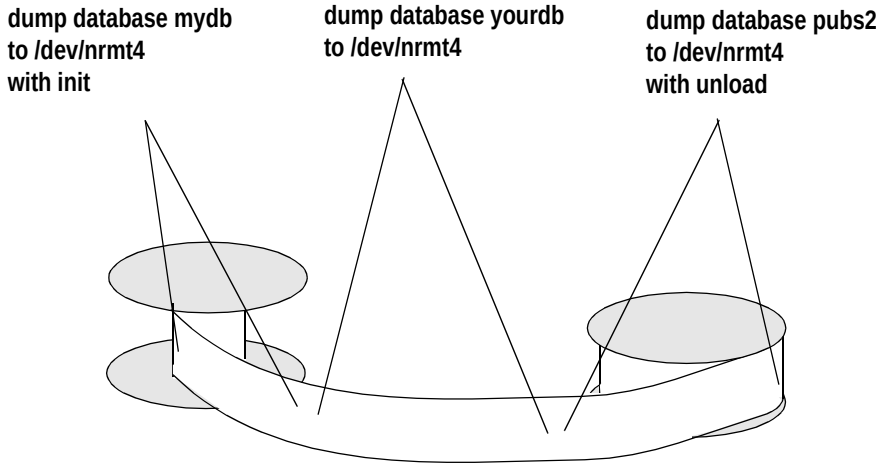
Changing dump volumes

- *On UNIX systems* – Backup Server requests a volume change when the tape capacity has been reached. After mounting another volume, the operator notifies Backup Server by executing sp_volchanged on any Adaptive Server that can communicate with Backup Server.
- If Backup Server detects a problem with the currently mounted volume, it requests a volume change by sending messages to either the client or its operator console. The operator responds to these messages with the sp_volchanged system procedure.

Appending to or overwriting a volume

- By default (noinit), Backup Server writes successive dumps to the same tape volume, making efficient use of high-capacity tape media. Data is added following the last end-of-tape mark. New dumps can be appended only to the last volume of a multivolume dump. Before writing to the tape, Backup Server verifies that the first file has not yet expired. If the tape contains non-Sybase data, Backup Server rejects it to avoid destroying potentially valuable information.
- Use the init option to reinitialize a volume. If you specify init, Backup Server overwrites any existing contents, even if the tape contains non-Sybase data, the first file has not yet expired, or the tape has ANSI access restrictions.
- Figure 1-3 illustrates how to dump three databases to a single volume using:
  - init to initialize the tape for the first dump
  - noinit (the default) to append subsequent dumps
  - unload to rewind and unload the tape after the last dump

Figure 1-3: Dumping several databases to the same volume



Dumping from a 32-bit OS to a 64-bit OS

Database dumps from a 32-bit version of Adaptive Server are fully compatible with a 64-bit version of Adaptive Server of the same platform, and vice-versa.

Dumping databases whose devices are mirrored

- At the beginning of a dump database, Adaptive Server passes Backup Server the primary device name of all database and log devices. If the primary device has been unmirrored, Adaptive Server passes the name of the secondary device instead. If any named device fails before the Backup Server completes its data transfer, Adaptive Server aborts the dump.
- If a user attempts to unmirror any of the named database devices while a dump database is in progress, Adaptive Server displays a message. The user executing the disk unmirror command can abort the dump or defer the disk unmirror until after the dump is complete.

Standards

ANSI SQL – Compliance level: Transact-SQL extension.

Permissions

Only the System Administrator, the Database Owner, and users with the Operator role can execute dump database.

See also

Commands dump transaction, load database, load transaction

System procedures sp_addthreshold, sp_addumpdevice, sp_dropdevice, sp_dropthreshold, sp_helpdb, sp_helpdevice, sp_helpthreshold, sp_logdevice, sp_spaceused, sp_volchanged

dump transaction

Description

Makes a copy of a transaction log and removes the inactive portion.

Syntax

To make a routine log dump:

```
dump tran[saction] database_name
    to [compress::[compression_level::]]stripe_device
        [at backup_server_name]
        [density = density_value,
        blocksize = number_bytes,
        capacity = number_kilobytes,
        dumpvolume = volume_name,
        file = file_name]
    [stripe on [compress::[compression_level::]]stripe_device
        [at backup_server_name]
        [density = density_value,
        blocksize = number_bytes,
        capacity = number_kilobytes,
        dumpvolume = volume_name,
        file = file_name]]
    [[stripe on [compress::[compression_level::]]stripe_device
        [at backup_server_name]
        [density = density_value,
        blocksize = number_bytes,
        capacity = number_kilobytes,
        dumpvolume = volume_name,
        file = file_name] ]...]
    [with {
        density = density_value,
        blocksize = number_bytes,
        capacity = number_kilobytes,
        dumpvolume = volume_name,
        file = file_name,
        [dismount | nodismount],
        [nounload | unload],
        retaindays = number_days,
        [noinit | init],
        notify = {client | operator_console},
        standby_access }]
```

To truncate the log without making a backup copy:

```
dump tran[saction] database_name
    with truncate_only
```

To truncate a log that is filled to capacity. *Use only as a last resort*:

```
dump tran[saction] database_name
    with no_log
```

To back up the log after a database device fails:

```
dump tran[saction] database_name
    to [compress::[compression_level::]]stripe_device
        [at backup_server_name]
        [density = density_value,
        blocksize = number_bytes,
        capacity = number_kilobytes,
        dumpvolume = volume_name,
        file = file_name]
    [stripe on [compress::[compression_level::]]stripe_device
        [at backup_server_name]
        [density = density_value,
        blocksize = number_bytes,
        capacity = number_kilobytes,
        dumpvolume = volume_name,
        file = file_name]]
    [[stripe on [compress::[compression_level::]]stripe_device
        [at backup_server_name]
        [density = density_value,
        blocksize = number_bytes,
        capacity = number_kilobytes,
        dumpvolume = volume_name,
        file = file_name] ]...]
    [with {
        density = density_value,
        blocksize = number_bytes,
        capacity = number_kilobytes,
        dumpvolume = volume_name,
        file = file_name,
        [dismount | nodismount],
        [nounload | unload],
        retaindays = number_days,
        [noinit | init],
        no_truncate,
        notify = {client | operator_console}}]
```

Parameters

database_name

is the name of the database from which you are copying data. The name can be given as a literal, a local variable, or a parameter to a stored procedure.

compress::*compression_level*

is a number between 0 and 9, with 0 indicating no compression, and 9 providing the highest level of compression. If you do not specify *compression_level*, the default is 1. For more information about the compress option, see Chapter 27, "Backing Up and Restoring User Databases" in the *System Administration Guide*.

Note The compress option works only with local archives; you cannot use the *backup_server_name* option.

---

truncate_only
: removes the inactive part of the log *without making a backup copy*. Use on databases without log segments on a separate device from data segments, Do not specify a dump device or Backup Server name.

no_log
: removes the inactive part of the log *without making a backup copy and without recording the procedure in the transaction log*. Use no_log only when you are completely out of log space and cannot run the usual dump transaction command. Use no_log as a last resort and use it only once after dump transaction with truncate_only fails. For additional information, see the *System Administration Guide*.

to *stripe_device*
: is the device to which data is being dumped. See "Specifying dump devices" on page 247 for information about what form to use when specifying a dump device.

at *backup_server_name*
: is the name of the Backup Server. Do not specify this parameter if you are dumping to the default Backup Server. Specify this parameter only if you are dumping over the network to a remote Backup Server. You can specify up to 32 different remote Backup Servers using this option. When dumping across the network, specify the *network name* of a remote Backup Server running on the machine to which the dump device is attached. For platforms that use interfaces files, the *backup_server_name* must appear in the interfaces file.

density = *density_value*
: overrides the default density for a tape device. Valid densities are 800, 1600, 6250, 6666, 10000, and 38000. Not all values are valid for every tape drive; use the correct density for your tape drive.

blocksize = *number_bytes*
: overrides the default block size for a dump device. The block size must be at least one database page (2048 bytes for most systems) and must be an exact multiple of the database page size.

Note Whenever possible, use the default block size; it is the best block size for your system.

---

capacity = *number_kilobytes*

is the maximum amount of data that the device can write to a single tape volume. The capacity must be at least five database pages, and should be slightly less than the recommended capacity for your device.

A general rule for calculating capacity is to use 70 percent of the manufacturer's maximum capacity for the device, leaving 30 percent for overhead such as inter-record gaps and tape marks. This rule works in most cases, but may not work in all cases because of differences in overhead across vendors and devices.

On UNIX platforms that cannot reliably detect the end-of-tape marker, you must indicate how many kilobytes can be dumped to the tape. You *must* supply a capacity for dump devices specified as a physical path name. If a dump device is specified as a logical device name, the Backup Server uses the *size* parameter stored in the sysdevices system table, unless you specify a capacity.

dumpvolume = *volume_name*

establishes the name that is assigned to the volume. The maximum length of *volume_name* is 6 characters. The Backup Server writes the *volume_name* in the ANSI tape label when overwriting an existing dump, dumping to a brand new tape, or dumping to a tape whose contents are not recognizable. The load transaction command checks the label and generates an error message if the wrong volume is loaded.

stripe on *stripe_device*

is an additional dump device. You can use up to 32 devices, including the device named in the to *stripe_device* clause. The Backup Server splits the log into approximately equal portions and sends each portion to a different device. Dumps are made concurrently on all devices, reducing the time and the number of volume changes required. See "Specifying dump devices" on page 247 for information about how to specify a dump device.

dismount | nodismount

on platforms that support logical dismount – determines whether tapes remain mounted. By default, all tapes used for a dump are dismounted when the dump completes. Use nodismount to keep tapes available for additional dumps or loads.

nounload | unload
determines whether tapes rewind after the dump completes. By default, tapes do not rewind, allowing you to make additional dumps to the same tape volume. Specify unload for the last dump file to be added to a multidump volume. This rewinds and unloads the tape when the dump completes.

retaindays = *number_days*
on UNIX platforms – specifies the number of days that Backup Server protects you from overwriting a dump. If you try to overwrite a dump before it expires, Backup Server requests confirmation before overwriting the unexpired volume.

Note This option is meaningful for disk, 1/4-inch cartridge, and single-file media. On multifile media, this option is meaningful for all volumes except the first.

The *number_days* must be a positive integer or 0, for dumps you can overwrite immediately. If you do not specify a retaindays value, Backup Server uses the server-wide tape retention in days value, set by sp_configure.

noinit | init
determines whether to append the dump to existing dump files or reinitialize (overwrite) the tape volume. By default, Adaptive Server appends dumps following the last end-of-tape mark, allowing you to dump additional databases to the same volume. New dumps can be appended only to the last volume of a multivolume dump. Use init for the first database you dump to a tape, to overwrite its contents.

Use init when you want Backup Server to store or update tape device characteristics in the tape configuration file. For more information, see the *System Administration Guide*.

file = *file_name*
is the name of the dump file. The name cannot exceed 17 characters and must conform to operating system conventions for file names. If you do not specify a file name, Backup Server creates a default file name. For more information, see “Dump files” on page 248.

no_truncate
: dumps a transaction log, *even if the disk containing the data segments for a database is inaccessible*, using a pointer to the transaction log in the master database. The with no_truncate option provides up-to-the-minute log recovery when the transaction log resides on an undamaged device, and the master database and user databases reside on different physical devices.

  If you use dump tran with *no_truncate* you must follow it with dump database, not with another dump tran. Adaptive Server will not force you to follow dump tran with *no_truncate* with dump database, but if you load a dump generated using the *no_truncate* option, Adaptive Server prevents you from loading any subsequent dump.

notify = {client | operator_console}
: overrides the default message destination.

  - On operating systems that offer an operator terminal feature, volume change messages are always sent to the operator terminal on the machine on which the Backup Server is running. Use client to route other Backup Server messages to the terminal session that initiated the dump database.
  - On operating systems (such as UNIX) that do not offer an operator terminal feature, messages are sent to the client that initiated the dump database. Use operator_console to route messages to the terminal on which the Backup Server is running.

with standby_access
: specifies that only completed transactions are to be dumped. The dump continues to the furthest point it can find at which a transaction has just completed and there are no other active transactions.

Examples

Example 1 Dumps the transaction log to a tape, appending it to the files on the tape, since the init option is not specified:

```
dump transaction pubs2
    to "/dev/nrmt0"
```

Example 2 Dumps the transaction log for the mydb database, using the Backup Server REMOTE_BKP_SERVER. The Backup Server dumps approximately half the log to each of the two devices. The init option overwrites any existing files on the tape. The retaindays option specifies that the tapes cannot be overwritten for 14 days:

```
dump transaction mydb
    to "/dev/nrmt4" at REMOTE_BKP_SERVER
    stripe on "/dev/nrmt5" at REMOTE_BKP_SERVER
with init, retaindays = 14
```

Example 3 Dumps completed transactions from the inventory_db transaction log file to device dev1:

```
dump tran inventory_db to dev1 with standby_access
```

Usage

- Table 1-24 describes the commands and system procedures used to back up databases and logs.

Table 1-24: Commands used to back up databases and logs

To do this	Use this command
Make routine dumps of the entire database, including the transaction log.	dump database
Make routine dumps of the transaction log, then truncate the inactive portion.	dump transaction
Dump the transaction log after failure of a database device.	dump transaction with no_truncate
Truncate the log without making a backup.	dump transaction with truncate_only
Then copy the entire database.	dump database
Truncate the log after your usual method fails due to insufficient log space.	dump transaction with no_log
Then copy the entire database.	dump database
Respond to the Backup Server's volume change messages.	sp_volchanged

Restrictions

- You cannot dump to the null device (on UNIX, */dev/null*).
- You cannot use the dump transaction command in a transaction.
- When using 1/4-inch cartridge tape, you can dump only one database or transaction log per tape.
- You cannot issue dump the transaction log while the trunc log on chkpt database option is enabled or after enabling select into/bulk copy/pllsort and making minimally logged changes to the database with select into, fast bulk copy operations, default unlogged writetext operations, or a parallel sort. Use dump database instead.

  Warning! Never modify the log table syslogs with a delete, update, or insert command.

- If a database does not have a log segment on a separate device from data segments, you cannot use dump transaction to copy the log and truncate it.
- If a user or threshold procedure issues a dump transaction command on a database where a dump database or another dump transaction is in progress, the second command sleeps until the first completes.

- To restore a database, use load database to load the most recent database dump; then use load transaction to load each subsequent transaction log dump *in the order in which it was made*.
- Each time you add or remove a cross-database constraint, or drop a table that contains a cross-database constraint, dump *both* of the affected databases.

Warning! Loading earlier dumps of these databases can cause database corruption.

- You cannot dump from an 11.x Adaptive Server to a 10.x Backup Server.
- You cannot have Sybase dumps and non-Sybase data (for example, UNIX archives) on the same tape.
- You cannot dump a transaction with no_log or with truncate_only if the database has offline pages.

Copying the log after device failure

- After device failure, use dump transaction with no_truncate to copy the log without truncating it. You can use this option only if your log is on a separate segment and your master database is accessible.
- The backup created by dump transaction with no_truncate is the most recent dump for your log. When restoring the database, load this dump last.

Dumping databases without separate log segments

- When a database does not have a log segment on a separate device from data segments, use dump transaction with truncate_only to remove committed transactions from the log without making a backup copy.

Warning! dump transaction with truncate_only provides no means to recover your databases. Run dump database at the earliest opportunity to ensure recoverability.

- Use with truncate_only on the master, model, and sybsystemprocs databases, which do not have log segments on a separate device from data segments.
- You can also use this option on very small databases that store the transaction log and data on the same device.

- Mission-critical user databases should have log segments on a separate device from data segments. Use the log on clause of create database to create a database with a separate log segment, or alter database and sp_logdevice to transfer the log to a separate device.

Dumping only complete transactions

- Use the with standby_access option to dump transaction logs for loading into a server that acts as a warm standby server for the database.
- When you use with standby_access to dump the transaction log, the dump proceeds to the furthest point in the log at which all earlier transactions have completed and there are no records belonging to open transactions.
- You must use dump tran[saction]...with standby_access in all situations where you will be loading two or more transaction logs in sequence and you want the database to be online between loads.
- After loading a dump made with the with standby_access option, use the online database command with the for standby_access option to make the database accessible.

Warning! If a transaction log contains open transactions and you dump it without the with standby_access option, version 11.9.2 does not allow you to load the log, bring the database online, then load a subsequent transaction dump. If you are going to load a series of transaction dumps, you can bring the database online only after a load that was originally dumped with standby_access or after loading the entire series.

Dumping without the log

Warning! Use dump transaction with no_log only as a last resort, after your usual method of dumping the transaction log (dump transaction or dump transaction with truncate_only) fails because of insufficient log space. dump transaction with no_log provides no means to recover your databases. Run dump database at the earliest opportunity to ensure recoverability.

- dump transaction...with no_log truncates the log without logging the dump transaction event. Because it copies no data, it requires only the name of the database.
- Every use of dump transaction...with no_log is considered an error and is recorded in Adaptive Server's error log.

- If you have created your databases with log segments on a separate device from data segments, written a last-chance threshold procedure that dumps your transaction log often enough, and allocated enough space to your log and database, you should not have to use this option. If you must use with no_log, increase the frequency of your dumps and the amount of log space.

Scheduling dumps

- Transaction log dumps are *dynamic*—they can take place while the database is active. They may slow the system slightly, so run dumps when the database is not being heavily updated.
- Use dump database immediately after creating a database to make a copy of the entire database. You cannot run dump transaction on a new database until you have run dump database.
- Develop a regular schedule for backing up user databases and their transaction logs.
- dump transaction uses less storage space and takes less time than dump database. Typically, transaction log dumps are made more frequently than database dumps.

Using thresholds to automate *dump transaction*

- Use thresholds to automate backup procedures. To take advantage of Adaptive Server's last-chance threshold, create user databases with log segments on a separate device from data segments.
- When space on the log segment falls below the last-chance threshold, Adaptive Server executes the last-chance threshold procedure. Including a dump transaction command in your last-chance threshold procedure helps protect you from running out of log space. For more information, see sp_thresholdaction.
- You can use sp_addthreshold to add a second threshold to monitor log space. For more information about thresholds, see the *System Administration Guide*.

Specifying dump devices

- You can specify the dump device as a literal, a local variable, or a parameter to a stored procedure.
- You can specify a local dump device as:
  - A logical device name from the sysdevices system table
  - An absolute path name
  - A relative path name

The Backup Server resolves relative path names using Adaptive Server's current working directory.

- Dumping to multiple stripes is supported for tape and disk devices. Placing multiple dumps on a device is supported only for tape devices.
- When dumping across the network, specify the absolute path name of the dump device. The path name must be valid on the machine on which the Backup Server is running. If the name includes any characters except letters, numbers, or the underscore (_), enclose it in quotes.
- Ownership and permissions problems on the dump device may interfere with use of dump commands. sp_addumpdevice adds the device to the system tables, but does not guarantee that you can dump to that device or create a file as a dump device.
- You can run more than one dump (or load) at the same time, as long as they use different dump devices.

Determining tape device characteristics

- If you issue a dump transaction command without the init qualifier and Backup Server cannot determine the device type, the dump transaction command fails. For more information, see the *System Administration Guide*.

Backup servers

- You must have a Backup Server running on the same machine as your Adaptive Server. The Backup Server must be listed in the master..sysservers table. This entry is created during installation or upgrade and should not be deleted.
- If your backup devices are located on another machine so that you dump across a network, you must also have a Backup Server installed on the remote machine.

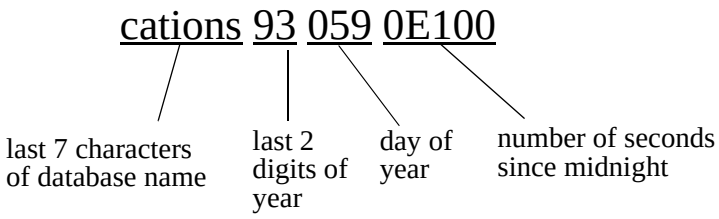
Dump files

- Dumping a log with the init option overwrites any existing files on the tape or disk.
- Dump file names identify which database was dumped and when the dump was made. If you do not specify a file name, Backup Server creates a default file name by concatenating the following:
  - Last seven characters of the database name
  - Two-digit year number
  - Three-digit day of the year (1– 366)

- Hexadecimal-encoded time at which the dump file was created

For example, the file *cations930590E100* contains a copy of the publications database made on the 59th day of 1993:

Figure 1-4: File naming convention for transaction log dumps



- The Backup Server sends the dump file name to the location specified by the with notify clause. Before storing a backup tape, the operator should label it with the database name, file name, date, and other pertinent information. When loading a tape without an identifying label, use the with headeronly and with listonly options to determine the contents.

Volume names

- Dump volumes are labeled according to the ANSI tape-labeling standard. The label includes the logical volume number and the position of the device within the stripe set.
- During loads, Backup Server uses the tape label to verify that volumes are mounted in the correct order. This allows you to load from a smaller number of devices than you used at dump time.

Note When dumping and loading across the network, you must specify the same number of stripe devices for each operation.

Changing dump volumes

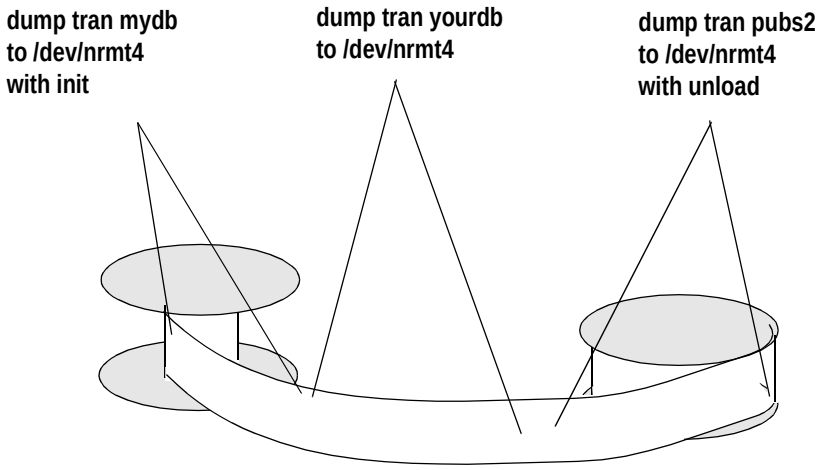
- *On UNIX systems* – the Backup Server requests a volume change when the tape capacity has been reached. After mounting another volume, the operator notifies the Backup Server by executing the sp_volchanged system procedure on any Adaptive Server that can communicate with the Backup Server.

- If the Backup Server detects a problem with the currently mounted volume (for example, if the wrong volume is mounted), it requests a volume change by sending messages to either the client or its operator console. The operator responds to these messages with the sp_volchanged system procedure.

Appending to or overwriting a volume

- By default (noinit), Backup Server writes successive dumps to the same tape volume, making efficient use of high-capacity tape media. Data is added following the last end-of-tape mark. New dumps can be appended only to the last volume of a multivolume dump. Before writing to the tape, Backup Server verifies that the first file has not yet expired. If the tape contains non-Sybase data, Backup Server rejects it to avoid destroying potentially valuable information.
- Use the init option to reinitialize a volume. If you specify init, Backup Server overwrites any existing contents, even if the tape contains non-Sybase data, the first file has not yet expired, or the tape has ANSI access restrictions.
- Figure 1-5 illustrates how to dump three transaction logs to a single volume. Use:
  - init to initialize the tape for the first dump
  - noinit (the default) to append subsequent dumps
  - unload to rewind and unload the tape after the last dump

Figure 1-5: Dumping three transaction logs to a single volume



Dumping logs stored on mirrored devices

- At the beginning of a dump transaction, Adaptive Server passes the primary device name of each logical log device to the Backup Server. If the primary device has been unmirrored, Adaptive Server passes the name of the secondary device instead. If the named device fails before Backup Server completes its data transfer, Adaptive Server aborts the dump.
- If you attempt to unmirror a named log device while a dump transaction is in progress, Adaptive Server displays a message. The user executing the disk unmirror command can abort the dump or defer the disk unmirror until after the dump completes.
- dump transaction with truncate_only and dump transaction with no_log do not use the Backup Server. These commands are not affected when a log device is unmirrored, either by a device failure or by a disk unmirror command.
- dump transaction copies only the log segment. It is not affected when a data-only device is unmirrored, either by a device failure or by a disk unmirror command.

Standards — ANSI SQL – Compliance level: Transact-SQL extension.

Permissions — Only System Administrators, users who have been granted the Operator role, and the Database Owner can execute dump transaction.

See also — **Commands** dump database, load database, load transaction, online database

System procedures sp_addumpdevice, sp_dboption, sp_dropdevice, sp_helpdevice, sp_logdevice, sp_volchanged

execute

Description

Runs a procedure or dynamically executes Transact-SQL commands.

Syntax

```
[exec[ute]] [@return_status  = ]
        [[[server .]database.]owner.]procedure_name[;number]
            [[@parameter_name =] value  |
                [@parameter_name =] @variable [output]
            [,[@parameter_name =] value  |
                [@parameter_name =] @variable [output]...]]
        [with recompile]
```

or

```
    exec[ute] ("string" | char_variable
        [+ "string" | char_variable]...)
```

Parameters

execute | exec

is used to execute a stored procedure or an extended stored procedure (ESP). This parameter is necessary only if the stored procedure call is *not* the first statement in a batch.

@return_status

is an optional integer variable that stores the return status of a stored procedure. *@return_status* must be declared in the batch or stored procedure before it is used in an execute statement.

server

is the name of a remote server. You can execute a procedure on another Adaptive Server as long as you have permission to use that server and to execute the procedure in that database. If you specify a server name, but do not specify a database name, Adaptive Server looks for the procedure in your default database.

database

is the database name. Specify the database name if the procedure is in another database. The default value for *database* is the current database. You can execute a procedure in another database as long as you are its owner or have permission to execute it in that database.

owner

is the procedure owner's name. Specify the owner's name if more than one procedure of that name exists in the database. The default value for *owner* is the current user. The owner name is optional only if the Database Owner owns the procedure or if you own it.

procedure_name

is the name of a procedure defined with create procedure.

;*number*
is an optional integer used to group procedures of the same name so that they can be dropped together with a single drop procedure statement. Procedures used in the same application are often grouped this way. For example, if the procedures used with an application named orders are named *orderproc;1*, *orderproc;2*, and so on, the following statement drops the entire group:

```
drop proc orderproc
```

After procedures have been grouped, individual procedures within the group cannot be dropped. For example, you cannot execute the statement:

```
drop procedure orderproc;2
```

parameter_name
is the name of an argument to the procedure, as defined in create procedure. Parameter names must be preceded by the @ sign.

If the "*@parameter_name = value*" form is used, parameter names and constants need not be supplied in the order defined in create procedure. However, if this form is used for any parameter, it must be used for all subsequent parameters.

value
is the value of the parameter or argument to the procedure. If you do not use the "*@parameter_name = value*" form, you must supply parameter values in the order defined in create procedure.

@variable
is the name of a variable used to store a return parameter.

output
indicates that the stored procedure is to return a return parameter. The matching parameter in the stored procedure must also have been created with the keyword output.

The output keyword can be abbreviated to out.

with recompile
: forces compilation of a new plan. Use this option if the parameter you are supplying is atypical or if the data has significantly changed. The changed plan is used on subsequent executions. Adaptive Server ignores this option when executing an extended system procedure (ESP).

Note Using execute procedure *with recompile* many times can adversely affect the procedure cache performance. Since a new plan is generated every time you use *with recompile*, a useful performance plan may age out of the cache if there is insufficient space for new plans.

---

string
: is a literal string containing part of a Transact-SQL command to execute. There are no restrictions to the number of characters supplied with the literal string.

char_variable
: is the name of a variable that supplies the text of a Transact-SQL command.

Examples

Example 1 All three examples execute showind with a parameter value titles:

```
execute showind titles
exec showind @tabname = titles
```

If this is the only statement in a batch or file:

```
showind titles
```

Example 2 Executes checkcontract on the remote server GATEWAY. Stores the return status indicating success or failure in *@retstat*:

```
declare @retstat int
execute @retstat = GATEWAY.pubs.dbo.checkcontract
"409-56-4008"
```

Example 3 Executes roy_check, passing three parameters. The third parameter, *@pc*, is an output parameter. After execution of the procedure, the return value is available in the variable *@percent*:

```
declare @percent int
select @percent = 10
execute roy_check "BU1032", 1050, @pc = @percent output
select Percent = @percent
```

Example 4 This procedure displays information about the system tables if you do not supply a parameter:

```
create procedure
```

```
showsysind @table varchar(30) = "sys%"
as
  select sysobjects.name, sysindexes.name, indid
  from sysindexes, sysobjects
  where sysobjects.name like @table
  and sysobjects.id = sysindexes.id
```

Example 5 Executes xp_echo, passing in a value of "Hello World!". The returned value of the extended stored procedure is stored in a variable named *result*:

```
declare @input varchar(12), @in varchar(12),
    @out varchar(255), @result varchar(255)
select @input="Hello World!"
execute xp_echo @in = @input, @out= @result output
```

Example 6 The final execute command concatenates string values and character variables to issue the Transact-SQL command:

```
select name from sysobjects where id=3

declare @tablename char(20)
declare @columname char(20)
select @tablename="sysobjects"
select @columname="name"
execute ('select ' + @columname + ' from ' + @tablename
+ ' where id=3')
```

Example 7 Executes sp_who:

```
declare @sproc varchar(255)
select @sproc = "sp_who"
execute @sproc
```

Usage

- Procedure results may vary, depending on the database in which they are executed. For example, the user-defined system procedure *sp_foo*, which executes the db_name() system function, returns the name of the database from which it is executed. When executed from the pubs2 database, it returns the value "pubs2":

  ```
  exec pubs2..sp_foo
  ------------------------------
  pubs2
  (1 row affected, return status = 0)
  ```

  When executed from sybsystemprocs, it returns the value "sybsystemprocs":

  ```
  exec sybsystemprocs..sp_foo
  ------------------------------
  ```

```
sybsystemprocs
(1 row affected, return status = 0)
```

- There are two ways to supply parameters—by position, or by using:

  ```
  @parameter_name = value
  ```

  If you use the second form, you do not have to supply the parameters in the order defined in create procedure.

  If you are using the output keyword and intend to use the return parameters in additional statements in your batch or procedure, the value of the parameter must be passed as a variable. For example:

  ```
  parameter_name = @variable_name
  ```

  When executing an extended stored procedure, pass all parameters by either name or value. You cannot mix parameters by value and parameters by name in a single invocation of the execute command for an ESP.

- The Dynamic SQL syntax of exec (@*parameter_name*) is also valid; however, it may take more keystrokes. For example, the dynamic SQL command exec (@sproc ="7") passes the integer value 7 to the procedure, but this can be accomplished with fewer keystrokes as exec @sproc 7.

- You cannot use text and image columns as parameters to stored procedures or as values passed to parameters.

- Executing a procedure specifying output for a parameter that is not defined as a return parameter in create procedure causes an error.

- You cannot pass constants to stored procedures using output; the return parameter requires a variable name. You must declare the variable's datatype and assign it a value before executing the procedure. Return parameters cannot have a datatype of text or image.

- It is not necessary to use the keyword execute if the statement is the first one in a batch. A batch is a segment of an input file terminated by the word "go" on a line by itself.

- Since the execution plan for a procedure is stored the first time it is run, subsequent run time is much shorter than for the equivalent set of standalone statements.

- Nesting occurs when one stored procedure calls another. The nesting level is incremented when the called procedure begins execution and it is decremented when the called procedure completes execution. Exceeding the maximum of 16 levels of nesting causes the transaction to fail. The current nesting level is stored in the @@*nestlevel* global variable.

- Return values 0 and -1 through -14 are currently used by Adaptive Server to indicate the execution status of stored procedures. Values from -15 through -99 are reserved for future use. See return for a list of values.
- Parameters are not part of transactions, so if a parameter is changed in a transaction that is later rolled back, its value does not revert to its previous value. The value that is returned to the caller is always the value at the time the procedure returns.
- If you use select * in create procedure, the procedure does not pick up any new columns you may have added to the table (even if you use the with recompile option to execute). You must drop the procedure and re-create it.
- Commands executed via remote procedure calls cannot be rolled back.
- The with recompile option is ignored when Adaptive Server executes an extended stored procedure.

Dynamically executing Transact-SQL

- When used with the *string* or *char_variable* options, execute concatenates the supplied strings and variables to execute the resulting Transact-SQL command. This form of the execute command may be used in SQL batches, procedures, and triggers.
- You cannot supply *string* and *char_variable* options to execute the following commands: begin transaction, commit, connect to, declare cursor, rollback, dump transaction, dbcc, set, use, or nested execute commands.
- The create view command can be specified using execute(), but only in SQL batches. create view cannot be used in procedures, either as a static command or as a string parameter to execute().
- The contents of the *string* or *char_variable* options cannot reference local variables declared in the SQL batch or procedure.
- *string* and *char_variable* options can be concatenated to create new tables. Within the same SQL batch or procedure, however, the table created with execute() is visible only to other execute() commands. After the SQL batch or procedure has completed, the dynamically-created table is persistent and visible to other commands.

Standards

ANSI SQL – Compliance level: Transact-SQL extension.

Permissions

execute permission defaults to the owner of the procedure, who can transfer it to other users.

The permission to execute Transact-SQL commands defined with the *string* or *char_variable* options is checked against the user executing the command. This is true even when execute() is defined within a procedure or trigger that belongs to another user.

See also

Commands create procedure, drop procedure, return

System procedures sp_addextendedproc, sp_depends, sp_dropextendedproc, sp_helptext

fetch

Description

Returns a row or a set of rows from a cursor result set.

Syntax

fetch *cursor_name* [into *fetch_target_list*]

Parameters

cursor_name
the name of the cursor

into *fetch_target_list*
is a comma-separated list of parameters or local variables into which cursor results are placed. The parameters and variables must be declared prior to the fetch.

Examples

Example 1 Returns a row of information from the cursor result set defined by the authors_crsr cursor:

```
fetch authors_crsr
```

Example 2 Returns a row of information from the cursor result set defined by the pubs_crsr cursor into the variables *@name*, *@city*, and *@state*:

```
fetch pubs_crsr into @name, @city, @state
```

Usage

Restrictions

- Before you can use fetch, you must declare the cursor and open it.
- The *cursor_name* cannot be a Transact-SQL parameter or local variable.
- You cannot fetch a row that has already been fetched. There is no way to backtrack through the result set, but you can close and reopen the cursor to create the cursor result set again and start from the beginning.
- Adaptive Server expects a one-to-one correspondence between the variables in the *fetch_target_list* and the target list expressions specified by the *select_statement* that defines the cursor. The datatypes of the variables or parameters must be compatible with the datatypes of the columns in the cursor result set.
- When you set chained transaction mode, Adaptive Server implicitly begins a transaction with the fetch statement if no transaction is currently active. However, this situation occurs only when you set the close on endtran option and the cursor remains open after the end of the transaction that initially opened it, since the open statement also automatically begins a transaction.

Cursor position

- After you fetch all the rows, the cursor points to the last row of the result set. If you fetch again, Adaptive Server returns a warning through the *@@sqlstatus* variable indicating there is no more data, and the cursor position moves beyond the end of the result set. You can no longer update or delete from that current cursor position.
- With fetch into, Adaptive Server does not advance the cursor position when an error occurs because the number of variables in the *fetch_target_list* does not equal the number of target list expressions specified by the query that defines the cursor. However, it does advance the cursor position, even if a compatibility error occurs between the datatypes of the variables and the datatypes of the columns in the cursor result set.

Determining the number of rows fetched

- You can fetch one or more rows at a time. Use the cursor rows option of the set command to specify the number of rows to fetch.

Getting information about fetches

- The *@@sqlstatus* global variable holds status information (warning exceptions) resulting from the execution of a fetch statement. The value of *@@sqlstatus* is 0, 1, or 2, as shown in Table 1-25.

Table 1-25: @@sqlstatus values

0	Indicates successful completion of the fetch statement.
1	Indicates that the fetch statement resulted in an error.
2	Indicates that there is no more data in the result set. This warning can occur if the current cursor position is on the last row in the result set and the client submits a fetch statement for that cursor.

Only a fetch statement can set *@@sqlstatus*. Other statements have no effect on *@@sqlstatus*.

- The *@@rowcount* global variable holds the number of rows returned from the cursor result set to the client up to the last fetch. In other words, it represents the total number of rows seen by the client at any one time.

  Once all the rows have been read from the cursor result set, *@@rowcount* represents the total number of rows in the cursor results set. Each open cursor is associated with a specific *@@rowcount* variable, which is dropped when you close the cursor. Check *@@rowcount* after a fetch to get the number of rows read for the cursor specified in that fetch.

Standards

ANSI SQL – Compliance level: Entry-level compliant.

The use of variables in a target list and fetch of multiple rows are Transact-SQL extensions.

Permissions	fetch permission defaults to all users.
See also	**Commands** declare cursor, open, set

goto label

Description

Branches to a user-defined label.

Syntax

label:
goto *label*

Examples

Shows the use of a label called restart:

```
declare @count smallint
select @count = 1
restart:
  print "yes"
select @count = @count + 1
while @count <=4
  goto restart
```

Usage

- The label name must conform to the rules for identifiers and must be followed by a colon (:) when it is declared. It is not followed by a colon when it is used with goto.
- Make the goto dependent on an if or while test, or some other condition, to avoid an endless loop between goto and the label.

Standards

ANSI SQL – Compliance level: Transact-SQL extension.

Permissions

goto permission defaults to all users. No permission is required to use it.

See also

Commands if...else, while

grant

Description

Assigns permissions to users or to user-defined roles. Assigns roles to users or system or user-defined roles.

Syntax

To grant permission to access database objects:

```
grant {all [privileges]| permission_list}
    on { table_name [(column_list)]
        | view_name[(column_list)]
        | stored_procedure_name}
    to {public | name_list | role_name}
    [with grant option]
```

To grant permission to select built-in functions:

```
grant select
    on [builtin] built-in
    to { name_list | role_name }
```

To grant permission to execute certain commands:

```
grant {all [privileges] | command_list}
    to {public | name_list | role_name}
```

To grant a role to a user or a role:

```
grant {role role_granted [, role_granted ...]}
    to grantee [, grantee...]
```

To grant and revoke access on certain dbcc commands:

```
grant dbcc {dbcc_command [on {all | database }]
        [, dbcc_command [on {all | database }], ...]}
    to { user_list | role_list }
```

Parameters

all

when used to assign permission to access database objects (the first syntax format), all specifies that all permissions applicable to the specified object are granted. All object owners can use grant all with an object name to grant permissions on their own objects.

Only a System Administrator or the Database Owner can assign permission to create database objects (the second syntax format). When used by a System Administrator, grant all assigns all create permissions (create database, create default, create procedure, create rule, create table, and create view). When the Database Owner uses grant all, Adaptive Server grants all create permissions except create database, and prints an informational message.

Specifying all does not include permission to execute set proxy or set session authorization.

permission_list

is a list of object access permissions granted. If more than one permission is listed, separate them with commas. The following table illustrates the access permissions that can be granted on each type of object:

Object	permission_list can include
Table	select, insert, delete, update, references
View	select, insert, delete, update
Column	select, update, references Column names can be specified in either *permission_list* or *column_list* (see Example 2).
Stored procedure	execute

function_list

is a built-in function. Specifying built-in functions allows you to differentiate between a table and a grantable built-in function with the same name. The functions are set_appcontext, get_appcontext, list_appcontext, and rm_appcontext.

command_list

is a list of commands that the user can execute. If more than one command is listed, separate them with commas. The command list can include create database, create default, create procedure, create rule, create table, create view, set proxy, and set session authorization.

create database permission can be granted only by a System Administrator, and only from within the master database.

Only a System Security Officer can grant users permission to execute set proxy or set session authorization. Granting permission to execute set proxy or set session authorization allows the grantee to impersonate another login in the server. set proxy and set session authorization are identical, except that set session authorization follows the ANSI92 standard, and set proxy is a Transact-SQL extension.

table_name

is the name of the table on which you are granting permissions. The table must be in your current database. Only one object can be listed for each grant statement.

column_list

is a list of columns, separated by commas, to which the permissions apply. If columns are specified, only select, references, and update permissions can be granted.

view_name
is the name of the view on which you are granting permissions. The view must be in your current database. Only one object can be listed for each grant statement.

stored_procedure_name
is the name of the stored procedure on which you are granting permissions. The stored procedure must be in your current database. Only one object can be listed for each grant statement.

public
is all users. For object access permissions, public excludes the object owner. For object creation permissions or set proxy authorizations, public excludes the Database Owner. You cannot grant permissions with grant option to "public" or to other groups or roles.

name_list
is a list of users' database names and/or group names, separated by commas.

with grant option
allows the users specified in *name_list* to grant object access permissions to other users. You can grant permissions with grant option only to individual users, not to "public" or to a group or role.

role
grants a role to a user or to a system or user-defined role.

role_granted
is the name of a system or user-defined role that the System Security Officer is granting to a user or a role.

grantee
is the name of a system role, user-defined role, or a user, to whom you are granting a role.

role_name
is the name of a system or user-defined role to which you are granting the permission.

dbcc_command
is the name of the dbcc command you are granting. It cannot be a variable. Table 1-27 on page 298 lists the valid grant dbcc commands.

database
is the name of the database on which you are granting permissions. It is used with database-specific dbcc commands to grant permission only on the target database. The grantee must be a valid user in the target database. *database* conforms to the rules for identifiers and cannot be a variable.

If there are multiple granted actions in the same command, *database* must be unique.

See "on all | database parameter and server-level commands" on page 299 for more information.

user_list
is a list of users to whom you are granting the permission, and cannot be a variable.

role_list
is a list of the name of system or user-defined roles to whom you are granting the permission, and cannot be a variable.

Note You cannot grant or revoke dbcc commands to public or groups.

Examples

Example 1 Grants Mary and the "sales" group permission to use the insert and delete commands on the titles table:

```
grant insert, delete
on titles
to mary, sales
```

Example 2 Grants select permission on the get_appcontext function to "public" (which includes all users):

```
grant select on builtin get_appcontext to public
```

Compare this to the following, which grants select permission on a table called get_appcontext, if a table with that name exists:

```
grant select on get_appcontext to public
```

Example 3 Two ways to grant update permission on the price and advance columns of the titles table to "public" (which includes all users):

```
grant update
on titles (price, advance)
to public
```

or:

```
grant update (price, advance)
```

```
on titles
to public
```

Example 4 Grants Harry and Billy permission to execute either set proxy or set session authorization to impersonate another user in the server:

```
grant set proxy to harry, billy
```

Example 5 Grants users with sso_role permission to execute either set proxy or set session authorization to impersonate another user in the server:

```
grant set session authorization to sso_role
```

Example 6 Grants users with vip_role the ability to impersonate another user in the server. vip_role must be a role defined by a System Security Officer with the create role command:

```
grant set proxy to vip_role
```

Example 7 Grants Mary and John permission to use the create database and create table commands. Because create database permission is being granted, this command can be executed only by a System Administrator within the master database. Mary and John's create table permission applies only to the master database:

```
grant create database, create table
to mary, john
```

Example 8 Grants complete access permissions on the titles table to all users:

```
grant all on titles
to public
```

Example 9 Grants all object creation permissions in the current database to all users. If this command is executed by a System Administrator from the master database, it includes create database permission:

```
grant all
to public
```

Example 10 Gives Mary permission to use the update command on the authors table and to grant that permission to others:

```
grant update on authors
to mary
with grant option
```

Example 11 Gives Bob permission to use the select and update commands on the price column of the titles table and to grant that permission to others:

```
grant select, update on titles(price)
to bob
```

```
with grant option
```

Example 12 Grants permission to execute the new_sproc stored procedure to all System Security Officers:

```
grant execute on new_sproc
to sso_role
```

Example 13 Grants James permission to create a referential integrity constraint on another table that refers to the price column of the titles table:

```
grant references on titles(price)
to james
```

Example 14 Grants the role "specialist", with all its permissions and privileges, to the role "doctor":

```
grant role specialist_role to doctor_role
```

Example 15 Grants the role "doctor" to Mary:

```
grant role doctor_role to mary
```

On a user database called pubs2 owned by Jane, only Jane or the System Administrator can execute the dbcc checkdb command. Others encounter the following error:

```
1> dbcc checkdb(pubs2)
2> go

Msg 10302, Level 14, State 1:
Line 1:
Only the DBO of database 'test' or a user with System
Administrator (SA) role can run this command. DBCC
execution completed. If DBCC printed error messages,
contact a user with System Administrator (SA) role.
```

If Walter needs to be a maintenance user for pubs2 but the System Administrator does not want to grant him administrator-level privileges elsewhere, the System Administrator executes the following:

```
1> use pubs2
2> go
1> grant dbcc checkdb on pubs2 to walter
2> go
```

Note The System Administrator must be in the target database—in this case pubs2—and Walter must be a valid user in this target database.

Walter can now execute the dbcc checkdb command on the customers database without encountering an error:

```
%isql -Uwalter -Pwalterpassword -SSERVER
1> use pubs2
2> go
1> dbcc checkdb(pubs2)
2> go

Checking sysobjects: Logical pagesize is 2048 bytes
The total number of data pages in this table is 2.
Table has 27 data rows.
...
Table has 1 data rows.
DBCC execution completed. If DBCC printed error
messages, contact a user with System Administrator (SA)
role.
```

Example 16 Grants the use of dbcc to a role instead of a user. This lets System Administrators assign the ability to execute dbcc to individual users based on their role:

```
1> use master
2> go
1> create role checkdb_role
2> go
1> use pubs2
2> go
1> grant dbcc checkdb on pubs2 to checkdb_role
2> go
```

Next, the System Administrator grants the role to Joe:

```
1> sp_addlogin joe, joepassword
2> go

Password correctly set.
Account unlocked.
New login created.
(return status = 0)

1> use pubs2
2> sp_adduser joe
3> go

1> grant role checkdb_role to joe
2> go
```

Joe can now execute the dbcc checkdb command on the pubs2 database when activating checkdb_role. Joe must be a valid user in pubs2:

```
% isql -Ujoe -Pjoepassword -SSERVER
1> use pubs2
2> go
1> dbcc checkdb(pubs2)
2> go

Msg 10302, Level 14, State 1:
Line 1:
Only the DBO of database 'pubs2' or a user with System
Administrator (SA) role can run this command. DBCC
execution completed. If DBCC printed error messages,
contact a user with System Administrator (SA) role.

1> set role checkdb_role on
2> go
1> dbcc checkdb(pubs2)
2> go

Checking sysobjects: Logical pagesize is 2048 bytes
The total number of data pages in this table is 2.
...
The total number of data pages in this table is 1.
Table has 1 data rows. DBCC execution completed. If DBCC
printed error messages, contact a user with System
Administrator (SA) role.
```

Example 17 Through the use of a role, the System Administrator allows Carlos to run dbcc checkalloc on any database where he is a valid user, or where a database allows a "guest" user.

Note You do not need to add Carlos as an actual user in the master database if the user "guest" already exists in master.

```
1> use master
2> go
1> create role checkalloc_role
2> go
1> grant dbcc checkalloc on all to checkalloc_role
2> go
1> sp_addlogin carlos, carlospassword
2> go
1> grant role checkalloc_role to carlos
2> go
```

Example 18 Gives Frank, a valid user in the master database, the ability to execute dbcc for all databases in the server:

```
1> use master
2> go
1> sp_addlogin frank, frankpassword
2> go

Password correctly set.
Account unlocked.
New login created.
(return status = 0)

1> sp_adduser frank
2> go

New user added.
(return status = 0)

1> grant dbcc checkdb on all to frank
2> go
```

Now Frank can execute the dbcc checkdb command on each database in the server where he is a valid user:

```
% isql -Ufrank -Pfrankpassword -SSERVER
1> dbcc checkdb(tempdb)
2> go

Checking tempdb: Logical pagesize is 2048 bytes
Checking sysobjects: Logical pagesize is 2048 bytes
...
The total number of data pages in this table is 1. DBCC
execution completed. If DBCC printed error messages,
contact a user with System Administrator (SA) role.
```

Note You cannot grant or revoke dbcc commands to public or groups.

Example 19 Grants Alex permission to use the dbcc tune command on pubs2. This example returns an error because server-level dbcc commands cannot be granted at the database level:

```
grant dbcc tune on pubs2 to alex

Msg 4626, Level 16, State 1:
Line 1:
DBCC command 'tune' cannot be assigned at
database-level.
```

Example 20 Grants dbcc tune on the master database to Alex. This returns an error because even if the current database is master, a server-level command cannot be granted at the database level. The on *database* parameter shows the intention to restrict the access to the current database scope, and this is not possible for server-level commands:

```
grant dbcc tune on master to alex

Msg 4626, Level 16, State 1:
Line 1:
DBCC command 'tune' cannot be assigned at the
database-level.
```

Example 21 Grants dbcc tune to Alex. This returns an error because server-level commands require that master be the current database:

```
grant dbcc tune to alex

Msg 4627, Level 16, State 1:
Line 1:
The user must be in the master database to GRANT/REVOKE
this command.
```

Example 22 Grants dbcc checkalloc on the pubs2 database to "nonuser." This returns an error because a user must be a valid user in the database to be granted database-level access:

```
grant dbcc checkalloc on pubs2 to nonuser

Msg 11105, Level 11, State 1:
Line 1:
No such user/role 'nonuser' exists.
```

Example 23 Grants dbcc tune on all to Alex. The on all parameter is ignored because any access granted in the master database is granted for any database by default. The command however, does not display any error:

```
grant dbcc tune on all to alex
```

Example 24 Grants dbcc checkalloc on all and dbcc checkdb on pubs2 to Alex. Although several commands can be granted under the same statement, they must all affect the same database, so you must be in master if one of them is on all:

```
grant dbcc checkalloc on all,
dbcc checkdb on pubs2 to alex

Msg 4627, Level 16, State 1:
Line 1:
The user must be in the master database in order to
grant/revoke server-wide DBCC access.
```

Example 25 You cannot apply grant and revoke to groups or public:

```
1> grant dbcc tablealloc on pubs2 to public

Msg 4629, Level 16, State 1:
Line 1:
GRANT/REVOKE DBCC does not apply to groups or PUBLIC.

1> sp_addgroup gr

New group added.
(return status = 0)

1> grant dbcc tablealloc on pubs2 to gr

Msg 4629, Level 16, State 1:
Line 1:
GRANT/REVOKE DBCC does not apply to groups or PUBLIC.
```

Example 26 You cannot grant a database-level command at the database level if a server-wide permission exists.

```
1> grant dbcc checkalloc on all to alex
1> use pubs2
1> grant dbcc checkalloc on pubs2, dbcc tablealloc on pubs2 to alex
1> exec sp_helprotect

grantor   grantee   type   action   object    column            grantable
-------   -------   ----   ------   -------   -------           ---------
dbo       alex     Grant   DBCC     DBCC      dbcc tablealloc   FALSE
(return status = 0)
```

Example 27 Only the System Administrator can grant the privilege:

```
set role sa_role off
grant dbcc tablealloc on all to alex

Msg 10353, Level 14, State 1:
Line 1:
You must have the following role(s) to execute this command/procedure:
'sa_role'. Please contact a user with the appropriate role for help.
```

Example 28 Granting a dbcc traceon results in an error message because dbcc traceon is not a grantable command:

```
grant dbcc traceon to joe
go

Msg 4607, Level 16, State 2:
Line 12:
Privilege DBCC traceon may not be GRANTed or REVOKEd.
```

See Table 1-27 on page 298 for a list of commands you can grant.

Example 29 The col_name function displays only the dbcc commands that can be granted, and returns the string `dbcc internal` for all the dbcc commands that cannot be granted.

```
1> declare @a int
2> select @a=1
3> while (@a<200)
4> begin
5> insert #t values(@a, col_name(-317, @a))
6> select @a=@a+1
7> end
8> select dbcc_id=a, dbcc_command=b from #t where b!="dbcc internal"

 dbcc_id  dbcc_command
-------- ------------------------------

        1 dbcc catalogcheck
        2 dbcc checktable
        3 dbcc checkalloc
        4 dbcc checkdb
        6 dbcc reindex
        9 dbcc fix_text
       11 dbcc tablealloc
       12 dbcc indexalloc
       13 dbcc textalloc
       18 dbcc tune
       37 dbcc checkstorage
       40 dbcc checkverify
```

Example 30 You cannot use the grant dbcc command using the grant option:

```
grant dbcc tune to alex with grant option

Msg 156, Level 15, State 1:
Line 1:
Incorrect syntax near the keyword 'with'.
```

Usage

- You can substitute the word from for to in the grant syntax.
- Table 1-26 summarizes default permissions on Transact-SQL commands in Adaptive Server. The user listed under the “Defaults to” heading is the lowest level of user that is automatically granted permission to execute a command. This user can grant or revoke the permission if it is transferable. Users at higher levels than the default are either automatically assigned permission or (in the case of Database Owners) can get permission by using the setuser command.

For example, the owner of a database does not automatically receive permission on objects owned by other users. A Database Owner can gain such permission by assuming the identity of the object owner with the setuser command, and then issuing the appropriate grant or revoke statement. System Administrators have permission to access all commands and objects at any time.

The Adaptive Server installation script assigns a set of permissions to the default group "public." grant and revoke statements need not be written for these permissions.

Table 1-26 does not include the System Security Officer, who does not have any special permissions on commands and objects, but only on certain system procedures.

Table 1-26: Command and object permissions

Statement	Defaults to					Can be granted/revoked		
	System Admin	Operator	Database Owner	Object owner	Public	Yes	No	N/A
alter database			X			(1)		
alter role								X
alter table				X			X	
begin transaction					X			X
checkpoint			X				X	
commit					X			X
connect to						X		
create database	X					X		
create default			X			X		
create index				X			X	
create procedure			X			X		
create role								X
create rule			X			X		
create table			X		(2)	X (2)		
create trigger					X	X		
create view			X			X		
dbcc	Varies depending upon options. See dbcc in this manual.						X	
delete				X (3)		X		
disk init	X						X	
disk mirror	X							
disk refit	X							

Statement	Defaults to					Can be granted/revoked		
	System Admin	Operator	Database Owner	Object owner	Public	Yes	No	N/A
disk reinit	X							
disk remirror	X							
disk unmirror	X						X	
drop any object				X			X	
dump database		X	X				X	
dump transaction		X	X				X	
execute				X (4)		X		
grant on object				X		X		
grant command			X			X		
insert				X (3)		X		
kill	X						X	
load database		X	X				X	
load transaction		X	X				X	
print					X			X
raiserror					X			X
readtext				X		(5)		
revoke on object				X			X	
revoke command			X				X	
rollback					X			X
save transaction					X			X
select				X (3)		X		
set					X			X
setuser			X				X	
shutdown	X						X	
truncate table				X			X	
update				X (3)		X		
update all statistics				X			X	
update partition statistics				X			X	
update statistics				X			X	
writetext				X		(6)		

Statement	Defaults to					Can be granted/revoked		
	System Admin	Operator	Database Owner	Object owner	Public	Yes	No	N/A

(1) Transferred with database ownership
(2) Public can create temporary tables, no permission required
(3) If a view, permission defaults to view owner
(4) Defaults to stored procedure owner
(5) Transferred with select permission
(6) Transferred with update permission
"No" means use of the command is never restricted
"N/A" means use of the command is always restricted

- You can grant permissions only on objects in your current database.
- Before you create a table that includes a referential integrity constraint to reference another user's table, you must be granted references permission on that referenced table (see example 10). The table must also include a unique constraint or unique index on the referenced columns. See create table for more information about referential integrity constraints.
- grant and revoke commands are order-sensitive. The command that takes effect when there is a conflict is the one issued most recently.
- A user can be granted permission on a view or stored procedure even if he or she has no permissions on objects referenced by the procedure or view. For more information, see the *System Administration Guide*.
- Adaptive Server grants all users permission to declare cursors, regardless of the permissions defined for the base tables or views referenced in the declare cursor statement. Cursors are not defined as Adaptive Server objects (such as tables), so no permissions can be applied against a cursor. When a user opens a cursor, Adaptive Server determines whether the user has select permissions on the objects that define that cursor's result set. It checks permissions each time a cursor is opened.

  If the user has permission to access the objects defined by the cursor, Adaptive Server opens the cursor and allows the user to fetch row data through the cursor. Adaptive Server does not apply permission checking for each fetch. However, if the user performs a delete or an update through that cursor, the regular permission checking applies for deleting and updating the data of objects referenced in the cursor result set.

- A grant statement adds one row to the sysprotects system table for each user, group, or role that receives the permission. If you subsequently revoke the permission from the user or group, Adaptive Server removes the row from *sysprotects*. If you revoke the permission from selected group members only, but not from the entire group to which it was granted, Adaptive Server retains the original row and adds a new row for the revoke.
- If a user inherits a particular permission by virtue of being a member of a group, and the same permission is explicitly granted to the user, no row is added to sysprotects. For example, if "public" has been granted select permission on the phone column in the authors table, then John, a member of "public," is granted select permission on all columns of authors. The row added to sysprotects as a result of the grant to John contains references to all columns in the authors table except for the phone column, on which he already had permission.
- Permission to issue the create trigger command is granted to users by default. When you revoke permission for a user to create triggers, a revoke row is added in the sysprotects table for that user. To grant permission to that user to issue create trigger, you must issue two grant commands. The first command removes the revoke row from sysprotects; the second inserts a grant row. If you revoke permission to create triggers, the user cannot create triggers even on tables that the user owns. Revoking permission to create triggers from a user affects only the database where the revoke command was issued.
- You can get information about permissions with these system procedures:
  - sp_helprotect reports permissions information for a database object or a user.
  - sp_column_privileges reports permissions information for one or more columns in a table or view.
  - sp_table_privileges reports permissions information for all columns in a table or view.
  - sp_activeroles displays all active roles for the current login session of Adaptive Server.
  - sp_displayroles displays all roles granted to another role, or displays the entire hierarchy tree of roles in table format.
- You can view permissions using sp_helprotect:

```
1> use pubs2
2> go
```

```
                    1> sp_helprotect
                    2> go
grantor  grantee  type   action   object         column      grantable
-------  -------  ----   ------   -------        -------     ---------
dbo      public   Grant  Select   sysalternates  All          FALSE
...
dbo      Walter   Grant  DBCC     DBCC           dbcc checkdb FALSE

(1 row affected)
(return status = 0)
```

- You cannot use the grant with grant parameter with grant dbcc.

grant all object creation permissions

- When used with only user or group names (no object names), grant all assigns these permissions: create database, create default, create procedure, create rule, create table, and create view. create database permission can be granted only by a System Administrator and only from within the master database.
- Only the Database Owner and a System Administrator can use the grant all syntax without an object name to grant create command permissions to users or groups. When the grant all command is used by the Database Owner, an informational message is printed, stating that only a System Administrator can grant create database permission. All other permissions noted above are granted.
- All object owners can use grant all with an object name to grant permissions on their own objects. When used with a table or view name plus user or group names, grant all enables delete, insert, select, and update permissions on the table.

grant with grant option rules

- You cannot grant permissions with grant option to "public" or to a group or role.
- In granting permissions, a System Administrator is treated as the object owner. If a System Administrator grants permission on another user's object, the owner's name appears as the grantor in sysprotects and in sp_helprotect output.
- Information for each grant is kept in the system table sysprotects with the following exceptions:

- Adaptive Server displays an informational message if a specific permission is granted to a user more than once by the same grantor. Only the first grant is kept.
- If two grants are exactly same except that one of them is granted with grant option, the grant with grant option is kept.
- If two grant statements grant the same permissions on a particular table to a specific user, but the columns specified in the grants are different, Adaptive Server treats the grants as if they were one statement. For example, the following grant statements are equivalent:

```
grant select on titles(price, contract)
    to keiko
grant select on titles(advance) to keiko
grant select on titles(price, contract,
    advance)
to keiko
```

Granting proxies and session authorizations

- Granting permission to execute set proxy or set session authorization allows the grantee to impersonate another login in Adaptive Server. set proxy and set session authorization are identical with one exception: set session authorization follows the SQL standard, and set proxy is a Transact-SQL extension.
- To grant set proxy or set session authorization permission, you must be a System Security Officer, and you must be in the master database.
- The name you specify in the grant set proxy command must be a valid user in the database; that is, the name must be in the sysusers table in the database.
- grant all does *not* include the set proxy or set session authorization permissions.

Granting permission to roles

- You can use the grant command to grant permissions to all users who have been granted a specified role. The role can be either a system role, like sso_role or sa_role, or a user-defined role. For a user-defined role, the System Security Officer must create the role with a create role command.

However, grant execute permission does not prevent users who do not have a specified role from being individually granted permission to execute a stored procedure. If you want to ensure, for example, that only System Security Officers can ever be granted permission to execute a stored procedure, use the proc_role system function within the stored procedure itself. It checks to see whether the invoking user has the correct role to execute the procedure. For more information, see proc_role.

- Permissions that are granted to roles override permissions that are granted to users or groups. For example, say John has been granted the System Security Officer role, and sso_role has been granted permission on the sales table. If John's individual permission on sales is revoked, he can still access sales because his role permissions override his individual permissions.

Users and user groups

- User groups allow you to grant or revoke permissions to more than one user with a single statement. Each user can be a member of only one group and is always a member of "public".
- The Database Owner or System Administrator can add new users with sp_adduser and create groups with sp_addgroup. To allow users with logins on Adaptive Server to use the database with limited privileges, you can add a "guest" user with sp_adduser and assign limited permissions to "guest". All users with logins can access the database as "guest".
- To remove a user, use sp_dropuser. To remove a group, use sp_dropgroup.

  To add a new user to a group other than "public," use sp_adduser. To change an established user's group, use sp_changegroup.

  To display the members of a group, use sp_helpgroup.
- When sp_changegroup is executed to change group membership, it clears the in-memory protection cache by executing:

  ```
  grant all to null
  ```

  so that the cache can be refreshed with updated information from the sysprotects table. To modify sysprotects directly, contact Sybase Technical Support.

grant dbcc command options

Table 1-27 lists the valid grant dbcc commands.

Table 1-27: dbcc command options

Command name	Description
checkalloc	Checks the specified database to make sure all of its pages are correctly allocated, and that there are no unused allocated pages.
checkcatalog	Checks for consistency in and between system tables.
checkdb	Runs the same checks as checktable, but on each table in the specified database, including syslogs.
checkstorage	Checks the specified database for: • Allocation • OAM page entries • Page consistency • Text-valued columns • Allocation of text-valued columns • Text-column chains
checktable	Checks the specified table to make sure that: • Index and data pages are correctly linked. • Indexes are correctly sorted. • All pointers are consistent. • Data information on each page is reasonable. • Page offsets are reasonable.
checkverify	Verifies the results of the most recent run of dbcc checkstorage for the specified database.
fix_text	Upgrades text values after any Adaptive Server character set is converted to a new multibyte character set.
indexalloc	Checks the specified index to make sure all pages are correctly allocated, and that there are no unused allocated pages.
reindex	Checks the integrity of indexes on user tables by running a fast version of dbcc checktable.
tablealloc	Checks the specified table to make sure that all pages are correctly allocated, and that there are no unused allocated pages.
textalloc	Checks for a violation of the format of the root page of a text or image index.
tune	Enables or disables tuning flags for special performance situations.

All of the options in Table 1-27 are database-level commands except for tune, which is a server-level command.

See Chapter 25, “Checking Database Consistency” in the *System Administration Guide* for more information on these dbcc commands.

on all | *database* parameter and server-level commands

The on *database* parameter specifies the database on which to invoke the database-level grant dbcc command. Because on master grants the ability to use dbcc commands on all databases, on master is the same as on all. You must be in the master database to use either the on all and on master parameters.

Neither the on *database* nor on all parameters work when invoking a server-level grant dbcc command such as dbcc tune, because by doing so, you are forcing a server-level command to restrict itself to individual databases. For this reason, using the server-level grant dbcc tune on master command raises an error.

on all and guest

Before you grant dbcc permission for a database to a user, that user must first be a valid user in the database, and cannot be a "guest" user. However, if you grant dbcc through roles, the users can then execute that dbcc command in any database twhere they are a valid user, including the user "guest."

Standards

ANSI SQL – Compliance level: Entry-level compliant.

Granting permissions to groups and granting set proxy are Transact-SQL extensions. Granting set session authorization (identical in function to set proxy) follows the ANSI standard.

Permissions

Database object access grant permission for database objects defaults to object owners. An object owner can grant permission to other users on his or her own database objects.

Command execution Only a System Administrator can grant create database permission, and only from the master database. Only a System Security Officer can grant create trigger permission.

Proxy and session authorization Only a System Security Officer can grant set proxy or set session authorization, and only from the master database.

Roles You can grant roles only from the master database. Only a System Security Officer can grant sso_role, oper_role or a user-defined role to a user or a role. Only System Administrators can grant sa_role to a user or a role. Only a user who has both sa_role and sso_role can grant a role which includes sa_role.

Database consistency checking Only System Administrators can run grant dbcc commands. Database Owners cannot run grant dbcc.

See also

Catalog stored procedures sp_column_privileges

Commands revoke, setuser, set

Functions proc_role

System procedures sp_addgroup, sp_adduser, sp_changedbowner, sp_changegroup, sp_dropgroup, sp_dropuser, sp_helpgroup, sp_helprotect, sp_helpuser, sp_role

group by and having clauses

Description

Used in select statements to divide a table into groups and to return only groups that match conditions in the having clause.

Syntax

Start of select *statement*

[group by [all] *aggregate_free_expression*
[, *aggregate_free_expression*]...]

[having *search_conditions*]

End of select *statement*

Parameters

group by

specifies the groups into which the table will be divided, and if aggregate functions are included in the select list, finds a summary value for each group. These summary values appear as columns in the results, one for each group. You can refer to these summary columns in the having clause.

You can use the avg, count, max, min, and sum aggregate functions in the select list before group by (the expression is usually a column name). For more information, see "Aggregate functions" on page 52 in Chapter 2, "Transact-SQL Functions" of *Reference Manual: Building Blocks*.

A table can be grouped by any combination of columns—that is, groups can be nested within each other, as in Example 2.

all

is a Transact-SQL extension that includes all groups in the results, even those excluded by a where clause. For example:

```
select type, avg(price)
from titles
where advance > 7000
group by all type

type
-----------------  ----------
UNDECIDED                NULL
business                 2.99
mod_cook                 2.99
popular_comp            20.00
psychology               NULL
trad_cook               14.99

(6 rows affected)
```

"NULL" in the aggregate column indicates groups that would be excluded by the where clause. A having clause negates the meaning of all.

aggregate_free_expression
is an expression that includes no aggregates. A Transact-SQL extension allows grouping by an aggregate-free expression as well as by a column name.

You cannot group by column heading or alias. This example is correct:

```
select Price=avg(price), Pay=avg(advance),
Total=price * $1.15
from titles
group by price * $1.15
```

having
sets conditions for the group by clause, similar to the way in which where sets conditions for the select clause.

having search conditions can include aggregate expressions; otherwise, having search conditions are identical to where search conditions. Following is an example of a having clause with aggregates:

```
select pub_id, total = sum(total_sales)
from titles
where total_sales is not null
group by pub_id
having count(*)>5
```

When Adaptive Server optimizes queries, it evaluates the search conditions in where and having clauses, and determines which conditions are search arguments (SARGs) that can be used to choose the best indexes and query plan. All of the search conditions are used to qualify the rows. For more information on search arguments, see the *Performance and Tuning Guide*.

Examples

Example 1 Calculates the average advance and the sum of the sales for each type of book:

```
select type, avg(advance), sum(total_sales)
from titles
group by type
```

Example 2 Groups the results by type, then by pub_id within each type:

```
select type, pub_id, avg(advance), sum(total_sales)
from titles
group by type, pub_id
```

Example 3 Calculates results for all groups, but displays only groups whose type begins with “p”:

```
select type, avg(price)
from titles
```

```
group by type
having type like 'p%'
```

Example 4 Calculates results for all groups, but displays results for groups matching the multiple conditions in the having clause:

```
select pub_id, sum(advance), avg(price)
from titles
group by pub_id
having sum(advance) > $15000
and avg(price) < $10
and pub_id > "0700"
```

Example 5 Calculates the total sales for each group (publisher) after joining the titles and publishers tables:

```
select p.pub_id, sum(t.total_sales)
from publishers p, titles t
where p.pub_id = t.pub_id
group by p.pub_id
```

Example 6 Displays the titles that have an advance of more than $1000 and a price that is more than the average price of all titles:

```
select title_id, advance, price
from titles
where advance > 1000
having price > avg(price)
```

Usage

- You can use a column name or any expression (except a column heading or alias) after group by. You can use group by to calculate results or display a column or an expression that does not appear in the select list (a Transact-SQL extension described in "Transact-SQL extensions to group by and having" on page 305).
- The maximum number of columns or expressions allowed in a group by clause is 31, the same as the maximum number of indexes allowed on a table.
- The group by clause on large columns, and on all columns specified by the group by clause, is limited by the maximum size of the index for a given logical page size. This is because Adaptive Server generates a worktable with a key when grouping data results. For more information on index sizes, see create index.

  An index size limitation may cause errors when you process a group by clause. For instance, a group by clause in a 1024-byte column on a 2K page size server causes an error if the index size limitation is 600 bytes.

- Null values in the group by column are put into a single group.
- You cannot name text or image columns in group by and having clauses.
- You cannot use a group by clause in the select statement of an updatable cursor.
- Aggregate functions can be used only in the select list or in a having clause. They cannot be used in a where or group by clause.

  Aggregate functions are of two types. Aggregates applied to *all the qualifying rows in a table* (producing a single value for the whole table per function) are called *scalar aggregates*. An aggregate function in the select list with no group by clause applies to the whole table; it is one example of a scalar aggregate.

  Aggregates applied to *a group of rows in a specified column or expression* (producing a value for each group per function) are called *vector aggregates*. For either aggregate type, the results of the aggregate operations are shown as new columns that the having clause can refer to.

  You can nest a vector aggregate inside a scalar aggregate. See "Aggregate functions" on page 52 in Chapter 2, "Transact-SQL Functions" of *Reference Manual: Building Blocks* for more information.

How *group by* and *having* queries with aggregates work

- The where clause excludes rows that do not meet its search conditions; its function remains the same for grouped or nongrouped queries.
- The group by clause collects the remaining rows into one group for each unique value in the group by expression. Omitting group by creates a single group for the whole table.
- Aggregate functions specified in the select list calculate summary values for each group. For scalar aggregates, there is only one value for the table. Vector aggregates calculate values for the distinct groups.
- The having clause excludes groups from the results that do not meet its search conditions. Even though the having clause tests only rows, the presence or absence of a group by clause may make it appear to be operating on groups:
  - When the query includes group by, having excludes result group rows. This is why having seems to operate on groups.
  - When the query has no group by, having excludes result rows from the (single-group) table. This is why having seems to operate on rows (the results are similar to where clause results).

Standard *group by* and *having* queries

- All group by and having queries in the Examples section adhere to the SQL standard. It dictates that queries using group by, having, and vector aggregate functions produce one row and one summary value per group, using these guidelines:
  - Columns in a select list must also be in the group by expression, or they must be arguments of aggregate functions.
  - A group by expression can contain only column names that are in the select list. However, columns used only as arguments of aggregate functions in the select list do not qualify.
  - Columns in a having expression must be single-valued —arguments of aggregates, for instance — and they must be in the select list or group by clause. Queries with a select list aggregate and a having clause *must* have a group by clause. If you omit the group by for a query without a select list aggregate, all the rows not excluded by the where clause are considered to be a single group (see Example 6).

  In nongrouped queries, the principle that "where excludes rows" seems straightforward. In grouped queries, the principle expands to "where excludes rows before group by, and having excludes rows from the display of results."
- The SQL standard allows queries that join two or more tables to use group by and having, if they also adhere to the above guidelines. When specifying joins or other complex queries, use the standard syntax of group by and having until you fully comprehend the effect of the Transact-SQL extensions to both clauses, as described in "Transact-SQL extensions to group by and having."

  To help you avoid problems with extensions, Adaptive Server provides the fipsflagger option to the set command that issues a nonfatal warning for each occurrence of a Transact-SQL extension in a query. See set for more information.

Transact-SQL extensions to *group by* and *having*

- Transact-SQL extensions to standard SQL make displaying data more flexible, by allowing references to columns and expressions that are not used for creating groups or summary calculations:
  - A select list that includes aggregates can include *extended* columns that are not arguments of aggregate functions and are not included in the group by clause. An extended column affects the display of final results, since additional rows are displayed.

- The group by clause can include columns or expressions that are not in the select list.
- The group by all clause displays all groups, even those excluded from calculations by a where clause. See the example for the keyword all in the "Parameters" section.
- The having clause can include columns or expressions that are not in the select list and not in the group by clause.

When the Transact-SQL extensions add rows and columns to a display, or if group by is omitted, query results can be hard to interpret. The examples that follow can help you understand how Transact-SQL extensions can affect query results.

- The following examples illustrate the differences between queries that use standard group by and having clauses and queries that use the Transact-SQL extensions:

  a An example of a standard grouping query:

```
select type, avg(price)
from titles
group by type

type
----------------------  ----------
UNDECIDED                 NULL
business                 13.73
mod_cook                 11.49
popular_comp             21.48
psychology               13.50
trad_cook                15.96

(6 rows affected)
```

  b The Transact-SQL extended column, price (in the select list, but not an aggregate and not in the group by clause), causes all qualified rows to display in each qualified group, even though a standard group by clause produces a single row per group. The group by still affects the vector aggregate, which computes the average price per group displayed on each row of each group (they are the same values that were computed for example a):

```
select type, price, avg(price)
from titles
group by type

type           price
```

```
------------ ---------------- --------------
business       19.99             13.73
business       11.95             13.73
business        2.99             13.73
business       19.99             13.73
mod_cook       19.99             11.49
mod_cook        2.99             11.49
UNDECIDED       NULL              NULL
popular_comp   22.95             21.48
popular_comp   20.00             21.48
popular_comp    NULL             21.48
psychology     21.59             13.50
psychology     10.95             13.50
psychology      7.00             13.50
psychology     19.99             13.50
psychology      7.99             13.50
trad_cook      20.95             15.96
trad_cook      11.95             15.96
trad_cook      14.99             15.96

(18 rows affected)
```

c The way Transact-SQL extended columns are handled can make it look as if a query is ignoring a where clause. This query computes the average prices using only those rows that satisfy the where clause, but it also displays rows that do not match the where clause.

Adaptive Server first builds a worktable containing only the type and aggregate values using the where clause. This worktable is joined back to the titles table in the grouping column type to include the price column in the results, but the where clause is *not* used in the join.

The only row in titles that is not in the results is the lone row with type = “UNDECIDED” and a NULL price, that is, a row for which there were no results in the worktable. If you also want to eliminate the rows from the displayed results that have prices of less than $10.00, you must add a having clause that repeats the where clause, as shown in Example 4:

```
select type, price, avg(price)
from titles
where price > 10.00
group by type

type           price
------------ ---------------- --------------
business        19.99            17.31
```

```
business        11.95           17.31
business         2.99           17.31
business        19.99           17.31
mod_cook        19.99           19.99
mod_cook         2.99           19.99
popular_comp    22.95           21.48
popular_comp    20.00           21.48
popular_comp     NULL           21.48
psychology      21.59           17.51
psychology      10.95           17.51
psychology       7.00           17.51
psychology      19.99           17.51
psychology       7.99           17.51
trad_cook       20.95           15.96
trad_cook       11.95           15.96
trad_cook       14.99           15.96

(17 rows affected)
```

d If you are specifying additional conditions, such as aggregates, in the having clause, be sure to also include all conditions specified in the where clause. Adaptive Server will appear to ignore any where clause conditions that are missing from the having clause:

```
select type, price, avg(price)
from titles
where price > 10.00
group by type
having price > 10.00

type           price
---------- ----------------  --------------
business       19.99           17.31
business       11.95           17.31
business       19.99           17.31
mod_cook       19.99           19.99
popular_comp   22.95           21.48
popular_comp   20.00           21.48
psychology     21.59           17.51
psychology     10.95           17.51
psychology     19.99           17.51
trad_cook      20.95           15.96
trad_cook      11.95           15.96
trad_cook      14.99           15.96

(12 rows affected)
```

e This is an example of a standard grouping query using a join between two tables. It groups by pub_id, then by type within each publisher ID, to calculate the vector aggregate for each row:

```
select p.pub_id, t.type, sum(t.total_sales)
from publishers p, titles t
where p.pub_id = t.pub_id
group by p.pub_id, t.type

pub_id  type
------  ------------  --------
0736    business       18722
0736    psychology      9564
0877    UNDECIDED       NULL
0877    mod_cook       24278
0877    psychology       375
0877    trad_cook      19566
1389    business       12066
1389    popular_comp   12875

(8 rows affected)
```

It may seem that it is only necessary to specify group by for the pub_id and type columns to produce the results, and add extended columns as follows:

```
select p.pub_id, p.pub_name, t.type,
    sum(t.total_sales)
from publishers p, titles t
where p.pub_id = t.pub_id
group by p.pub_id, t.type
```

However, the results for the above query are much different from the results for the first query in this example. After joining the two tables to determine the vector aggregate in a worktable, Adaptive Server joins the worktable to the table (publishers) of the extended column for the final results. Each extended column from a different table invokes an additional join.

As you can see, using the extended column extension in queries that join tables can easily produce results that are difficult to comprehend. In most cases, you should use the standard group by to join tables in your queries.

f This example uses the Transact-SQL extension to group by to include columns that are not in the select list. Both the pub_id and type columns are used to group the results for the vector aggregate. However, the final results do not include the type within each publisher. In this case, you may only want to know how many distinct title types are sold for each publisher:

```
select p.pub_id, sum(t.total_sales)
from publishers p, titles t
where p.pub_id = t.pub_id
group by p.pub_id, t.type

pub_id
------  --------
0736       18722
0736        9564
0877        NULL
0877        24278
0877          375
0877        19566
1389        12066
1389        12875

(8 rows affected)
```

g This example combines two Transact-SQL extension effects. First, it omits the group by clause while including an aggregate in the select list. Second, it includes an extended column. By omitting the group by clause:

- The table becomes a single group. The scalar aggregate counts three qualified rows.
- pub_id becomes a Transact-SQL extended column because it does not appear in a group by clause. No having clause is present, so all rows in the group are qualified to be displayed.

```
select pub_id, count(pub_id)
from publishers

pub_id
---------- ---------
0736               3
0877               3
1389               3

(3 rows affected)
```

h The where clause excludes publishers with a pub_id of 1000 or more from the single group, so the scalar aggregate counts two qualified rows. The extended column pub_id displays all qualified rows from the publishers table:

```
select pub_id, count(pub_id)
from publishers
where pub_id < "1000"

pub_id
-------------- -----------
0736                     2
0877                     2
1389                     2

(3 rows affected)
```

i This example illustrates an effect of a having clause used without a group by clause.

- The table is considered a single group. No where clause excludes rows, so all the rows in the group (table) are qualified to be counted.
- The rows in this single-group table are tested by the having clause.
- These combined effects display the two qualified rows.

```
select pub_id, count(pub_id)
from publishers
having pub_id < "1000"

pub_id
-------------- ---------
0736                   3
0877                   3
(2 rows affected)
```

j This example uses the extension to having that allows columns or expressions not in the select list and not in the group by clause. It determines the average price for each title type, but it excludes those types that do not have more than $10,000 in total sales, even though the sum aggregate does not appear in the results:

```
select type, avg(price)
from titles
group by type
having sum(total_sales) > 10000
```

```
type
------------  ----------
business           13.73
mod_cook           11.49
popular_comp       21.48
trad_cook          15.96

(4 rows affected)
```

group by and *having* and sort orders

- If your server has a case-insensitive sort order, group by ignores the case of the grouping columns. For example, given this data on a case-insensitive server:

```
select lname, amount
from groupdemo
lname           amount
---------- ------------------
Smith               10.00
smith                5.00
SMITH                7.00
Levi                 9.00
Lévi                  20.00
```

  grouping by lname produces these results:

```
select lname, sum(amount)
from groupdemo

 lname
lname
---------- ------------------
Levi                 9.00
Lévi                20.00
Smith                 22.00
```

  The same query on a case- and accent-insensitive server produces these results:

```
 lname
 ---------- ------------------
 Levi                 29.00
 Smith                  22.00
```

Standards

ANSI SQL – Compliance level: Entry-level compliant.

The use of columns within the select list that are not in the group by list and have no aggregate functions is a Transact-SQL extension.

The use of the all keyword is a Transact-SQL extension.

See also

Commands compute clause, declare, select, where clause

Functions Aggregate functions

if...else

Description

Imposes conditions on the execution of a SQL statement.

Syntax

if *logical_expression* [plan "*abstract plan*"]
statements

[else
[if *logical_expression*] [plan "*abstract plan*"]
statement]

Parameters

logical_expression
is an expression (a column name, a constant, any combination of column names and constants connected by arithmetic or bitwise operators, or a subquery) that returns TRUE, FALSE, or NULL. If the expression contains a select statement, the select statement must be enclosed in parentheses.

plan *"abstract plan"*
specifies the abstract plan to use to optimize the query. It can be a full or partial plan, specified in the abstract plan language. Plans can only be specified for optimizable SQL statements, that is, select queries that access tables.

statements
is either a single SQL statement or a block of statements delimited by begin and end.

plan "*abstract plan*"
specifies the abstract plan to use to optimize the query. It can be a full or partial plan, specified in the abstract plan language. Plans can only be specified for optimizable expressions in if clauses, that is, queries that access tables. For more information, see Chapter 30, "Creating and Using Abstract Plans," in the *Performance and Tuning Guide*.

Examples

Example 1 Prints "yes" if 3 is larger than 2:

```
if 3 > 2
    print "yes"
```

Example 2 The if...else condition tests for the presence of authors whose postal codes are 94705, then prints "Berkeley author" for the resulting set:

```
if exists (select postalcode from authors
    where postalcode = "94705")
    print "Berkeley author"
```

Example 3 The if...else condition tests for the presence of user-created objects (all of which have ID numbers greater than 100) in a database. Where user tables exist, the else clause prints a message and selects their names, types, and ID numbers:

```
if (select max(id) from sysobjects) < 100
    print "No user-created objects in this database"
else
 begin
    print "These are the user-created objects"
    select name, type, id
    from sysobjects
    where id > 100
 end
```

Example 4 Since the value for total sales for PC9999 in the titles table is NULL, this query returns FALSE. The else portion of the query is performed when the if portion returns FALSE or NULL. For more information on truth values and logical expressions, see "Expressions" on page 249 in Chapter 4, "Expressions, Identifiers, and Wildcard Characters" of *Reference Manual: Building Blocks*.

```
if (select total_sales
    from titles
    where title_id = "PC9999") > 100
select "true"
else
select "false"
```

Usage

- The statement following an if keyword and its condition is executed if the condition is satisfied (when the logical expression returns TRUE). The optional else keyword introduces an alternate SQL statement that executes when the if condition is not satisfied (when the logical expression returns FALSE).
- The if or else condition affects the performance of only a single SQL statement, unless statements are grouped into a block between the keywords begin and end (see Example 3).

  The statement clause can be an execute command or any other legal SQL statement or statement block.
- If a select statement is used as part of the boolean expression, it must return a single value.
- if...else constructs can be used either in a stored procedure (where they are often used to test for the existence of some parameter) or in *ad hoc* queries (see Examples 1 and 2).

- if tests can be nested either within another if or following an else. The maximum number of if tests you can nest varies with the complexity of any select statements (or other language constructs) that you include with each if...else construct.

  Note When an alter table, create table, or create view command occurs within an if...else block, Adaptive Server creates the schema for the table or view before determining whether the condition is true. This may lead to errors if the table or view already exists.

- If you create tables with varchar, nvarchar, univarchar, or varbinary columns whose total defined width is greater than the maximum allowed row size, a warning message appears, but the table is created. If you try to insert more than the maximum number bytes into such a row, or to update a row so that its total row size is greater than the maximum length, Adaptive Server produces an error message, and the command fails.

Note When a create table command occurs within an if...else block or a while loop, Adaptive Server creates the schema for the table before determining whether the condition is true. This may lead to errors if the table already exists. To avoid this situation, either make sure a view with the same name does not already exist in the database or use an execute statement, as follows:

```
if not exists
    (select * from sysobjects where name="my table")
begin
execute "create table mytable(x int)"
end
```

Standards — ANSI SQL – Compliance level: Transact-SQL extension.

Permissions — if...else permission defaults to all users. No permission is required to use it.

See also — **Commands** begin...end,create procedure

insert

Description

Adds new rows to a table or view.

Syntax

```
insert [into] [database.[owner.]]{table_name|view_name}
        [(column_list)]
        {values (expression [, expression]...)
            |select_statement [plan "abstract plan"] }
```

Parameters

into

is optional.

table_name | *view_name*

is the name of the table or view from which you want to remove rows. Specify the database name if the table or view is in another database, and specify the owner's name if more than one table or view of that name exists in the database. The default value for *owner* is the current user, and the default value for *database* is the current database.

column_list

is a list of one or more columns to which data is to be added. Enclose the list in parentheses. The columns can be listed in any order, but the incoming data (whether in a values clause or a select clause) must be in the same order. If a column has the IDENTITY property, you can substitute the syb_identity keyword for the actual column name.

The column list is necessary when some, but not all, of the columns in the table are to receive data. If no column list is given, Adaptive Server assumes that the insert affects all columns in the receiving table (in create table order).

See "The column list" on page 319 for more information.

values

is a keyword that introduces a list of expressions.

expression
specifies constant expressions, variables, parameters, or null values for the indicated columns. Enclose character and datetime constants in single or double quotes.

You cannot use a subquery as an *expression*.

The values list:

- Must be enclosed in parentheses
- Must match the explicit or implicit column list
- Can use "default" as a value

See "Datatypes" for more information about data entry rules.

select_statement
is a standard select statement used to retrieve the values to be inserted.

plan "*abstract plan*"
specifies the abstract plan to use to optimize the query. It can be a full or partial plan, specified in the abstract plan language. Plans can only be specified for insert...select statements. See Chapter 30, "Creating and Using Abstract Plans," in the *Performance and Tuning Guide* for more information.

Examples

Example 1

```
insert titles
values("BU2222", "Faster!", "business", "1389",
    null, null, null, "ok", "06/17/87", 0)
```

Example 2

```
insert titles
(title_id, title, type, pub_id, notes, pubdate,
    contract)
values ('BU1237', 'Get Going!', 'business',
    '1389', 'great', '06/18/86', 1)
```

Example 3

```
insert newauthors
    select *
    from authors
    where city = "San Francisco"
```

Example 4

```
insert test
    select *
```

```
    from test
    where city = "San Francisco"
```

Example 5

```
insert table1 (col1, col2, col3, col4)
    values (10, 4, default, 34)
```

Usage

- Use insert only to add new rows. Use update to modify column values in a row you have already inserted.

The column list

- The column list determines the order in which values are entered. For example, suppose that you have a table called newpublishers that is identical in structure and content to the publishers table in pubs2. In the example below, the columns in the column list of the newpublishers table match the columns of the select list in the publishers table.

  ```
  insert newpublishers (pub_id, pub_name)
  select pub_id, pub_name
      from publishers
      where pub_name="New Age Data"
  ```

  The pub_id and pub_name for "New Age Data" are stored in the pub_id and pub_name columns of newpublishers.

  In the next example, the order of the columns in the column list of the newpublishers table does not match the order of the columns of the select list of the publishers table.

  ```
  insert newpublishers (pub_id, pub_name)
      select pub_name, pub_id
      from publishers
      where pub_name="New Age Data"
  ```

  The result is that the pub_id for "New Age Data" is stored in the pub_name column of the newpublishers table, and the pub_name for "New Age Data" is stored in the pub_id column of the newpublishers table.

- You can omit items from the column and values lists as long as the omitted columns allow null values (see Example 2).

Validating column values

- insert interacts with the ignore_dup_key, ignore_dup_row, and allow_dup_row options, which are set with the create index command. See create index for more information.

- A rule or check constraint can restrict the domain of legal values that can be entered into a column. Rules are created with the create rule command and bound with sp_bindrule. check constraints are declared with create table.
- A default can supply a value if you do not explicitly enter one. Defaults are created with the create default command and bound with sp_bindefault, or they are declared with create table.
- If an insert statement violates domain or integrity rules (see create rule and create trigger), or if it is the wrong datatype (see create table and Chapter 1, "System and User-Defined Datatypes" in *Reference Manual: Building Blocks*), the statement fails, and Adaptive Server displays an error message.

Treatment of blanks

- Inserting an empty string ("") into a variable character type or text column inserts a single space. char columns are padded to the defined length.
- All trailing spaces are removed from data that is inserted into varchar and univarchar columns, except in the case of a string that contains only spaces. Strings that contain only spaces are truncated to a single space. Strings that are longer than the specified length of a char, nchar, unichar, univarchar, varchar, or nvarchar column are silently truncated unless the string_rtruncation option is set to on.

Inserting into *text* and *image* columns

- An insert of a NULL into a text or an image column does not create a valid text pointer, nor does it a text page as would otherwise occur. Use update to get a valid text pointer for that column.

insert triggers

- You can define a trigger that takes a specified action when an insert command is issued on a specified table.

Using *insert* when Component Integration Services is enabled

- You can send an insert as a language event or as a parameterized dynamic statement to remote servers.

Inserting rows selected from another table

- You can select rows from a table and insert them into the same table in a single statement (see Example 4).

- To insert data with select from a table that has null values in some fields into a table that does not allow null values, provide a substitute value for any NULL entries in the original table. For example, to insert data into an advances table that does not allow null values, substitute 0 for the NULL fields:

  ```
  insert advances
  select pub_id, isnull(advance, 0) from titles
  ```

  Without the isnull function, this command inserts all the rows with non-null values into the advances table, which produces error messages for all the rows where the advance column in the titles table contained NULL.

  If you cannot make this kind of substitution for your data, you cannot insert data containing null values into the columns that have a NOT NULL specification.

  Two tables can be identically structured, and yet be different as to whether null values are permitted in some fields. Use sp_help to see the null types of the columns in your table.

Transactions and *insert*

- When you set chained transaction mode, Adaptive Server implicitly begins a transaction with the insert statement if no transaction is currently active. To complete any inserts, you must commit the transaction, or roll back the changes. For example:

  ```
  insert stores (stor_id, stor_name, city, state)
      values ('999', 'Books-R-Us', 'Fremont', 'AZ')
  if exists (select t1.city
      from stores t1, stores t2
      where t1.city = t2.city
      and t1.state = t2.state
      and t1.stor_id < t2.stor_id)
          rollback transaction
  else
          commit transaction
  ```

  In chained transaction mode, this batch begins a transaction and inserts a new row into the stores table. If it inserts a row containing the same city and state information as another store in the table, it rolls back the changes to stores and ends the transaction. Otherwise, it commits the insertions and ends the transaction. For more information about chained transaction mode, see the *Transact-SQL User's Guide*.

Inserting values into IDENTITY columns

- When inserting a row into a table, do not include the name of the IDENTITY column in the column list or its value in the values list. If the table consists of only one column, an IDENTITY column, omit the column list and leave the values list empty as follows:

  ```
  insert id_table values()
  ```

- The first time you insert a row into a table, Adaptive Server assigns the IDENTITY column a value of 1. Each new row gets a column value that is one higher than the last. This value takes precedence over any defaults declared for the column in the create table or alter table statement or defaults bound to the column with sp_bindefault.

  Server failures can create gaps in IDENTITY column values. The maximum size of the gap depends on the setting of the identity burning set factor configuration parameter. Gaps can also result from manual insertion of data into the IDENTITY column, deletion of rows, and transaction rollbacks.

- Only the table owner, Database Owner, or System Administrator can explicitly insert a value into an IDENTITY column after setting identity_insert *table_name* on for the column's base table. A user can set identity_insert *table_name* on for one table at a time in a database. When identity_insert is on, each insert statement must include a column list and must specify an explicit value for the IDENTITY column.

  Inserting a value into the IDENTITY column allows you to specify a seed value for the column or to restore a row that was deleted in error. Unless you have created a unique index on the IDENTITY column, Adaptive Server does not verify the uniqueness of the value; you can insert any positive integer.

  To insert an explicit value into an IDENTITY column, the table owner, Database Owner, or System Administrator must set identity_insert *table_name* on for the column's base table, not for the view through which it is being inserted.

- The maximum value that can be inserted into an IDENTITY column is $10^{precision} - 1$. Once an IDENTITY column reaches this value, any additional insert statements return an error that aborts the current transaction.

When this happens, use the create table statement to create a new table that is identical to the old one, but that has a larger precision for the IDENTITY column. Once you have created the new table, use either the insert statement or the bcp utility to copy the data from the old table to the new one.

- Use the *@@identity* global variable to retrieve the last value that you inserted into an IDENTITY column. If the last insert or select into statement affected a table with no IDENTITY column, *@@identity* returns the value 0.
- An IDENTITY column selected into a result table observes the following rules with regard to inheritance of the IDENTITY property:
  - If an IDENTITY column is selected more than once, it is defined as NOT NULL in the new table. It does not inherit the IDENTITY property.
  - If an IDENTITY column is selected as part of an expression, the resulting column does not inherit the IDENTITY property. It is created as NULL if any column in the expression allows nulls; otherwise, it is created as NOT NULL.
  - If the select statement contains a group by clause or aggregate function, the resulting column does not inherit the IDENTITY property. Columns that include an aggregate of the IDENTITY column are created NULL; others are created NOT NULL.
  - An IDENTITY column that is selected into a table with a union or join does not retain the IDENTITY property. If the table contains the union of the IDENTITY column and a NULL column, the new column is defined as NULL; otherwise, it is defined as NOT NULL.

Inserting data through views

- If a view is created with check option, each row that is inserted through the view must meet the selection criteria of the view.

  For example, the stores_cal view includes all rows of the stores table for which state has a value of “CA”:

  ```
  create view stores_cal
  as select * from stores
  where state = "CA"
  with check option
  ```

  The with check option clause checks each insert statement against the view’s selection criteria. Rows for which state has a value other than “CA” are rejected.

- If a view is created with check option, all views derived from the *base* view must satisfy the view's selection criteria. Each new row inserted through a derived view must be visible through the base view.

  Consider the view stores_cal30, which is derived from stores_cal. The new view includes information about stores in California with payment terms of "Net 30":

  ```
  create view stores_cal30
  as select * from stores_cal
  where payterms = "Net 30"
  ```

  Because stores_cal was created with check option, all rows inserted or updated through stores_cal30 must be visible through stores_cal. Any row with a state value other than "CA" is rejected.

  Notice that stores_cal30 does not have a with check option clause of its own. This means that you can insert or update a row with a payterms value other than "Net 30" through stores_cal30. The following update statement would be successful, even though the row would no longer be visible through stores_cal30:

  ```
  update stores_cal30
  set payterms = "Net 60"
  where stor_id = "7067"
  ```

- insert statements are not allowed on join views created with check option.
- If you insert or update a row through a join view, all affected columns must belong to the same base table.

Partitoning tables for improved insert performance

- An unpartitioned table with no clustered index consists of a single doubly linked chain of database pages, so each insertion into the table uses the last page of the chain. Adaptive Server holds an exclusive lock on the last page while it inserts the rows, blocking other concurrent transactions from inserting data into the table.

  Partitioning a table with the partition clause of the alter table command creates additional page chains. Each chain has its own last page, which can be used for concurrent insert operations. This improves insert performance by reducing page contention. If the table is spread over multiple physical devices, partitioning also improves insert performance by reducing I/O contention while the server flushes data from cache to disk. For more information about partitioning tables for insert performance, see the *Performance and Tuning Guide*.

Standards

ANSI SQL – Compliance level: Entry-level compliant.

The following are Transact-SQL extensions:

- A union operator in the select portion of an insert statement.
- Qualification of a table or column name by a database name.
- Insertion through a view that contains a join.

Note The FIPS flagger does not detect insertions through a view that contains a join.

Permissions

- insert permission defaults to the table or view owner, who can transfer it to other users.
- insert permission for a table's IDENTITY column is limited to the table owner, Database Owner, and System Administrator.

See also

Commands alter table, create default, create index, create rule, create table, create trigger, dbcc, delete, select, update

Datatypes Chapter 1, "System and User-Defined Datatypes" of *Reference Manual: Building Blocks*.

System procedures sp_bindefault, sp_bindrule, sp_help, sp_helpartition, sp_unbindefault, sp_unbindrule

Utilities bcp

kill

Description — Kills a process.

Syntax — kill *spid*

Parameters — *spid*

is the identification number of the process you want to kill. *spid* must be a constant; it cannot be passed as a parameter to a stored procedure or used as a local variable. Use sp_who to see a list of processes and other information.

Examples

```
kill 1378
```

Usage — To get a report on the current processes, execute sp_who. Following is a typical report:

```
fid spid status     loginame origname hostname blk dbname   cmd
--- ---- --------   -------- -------- -------- --- ------   -----------
 0    1  recv sleep  bird     bird     jazzy     0   master  AWAITING COMMAND
 0    2  sleeping    NULL     NULL               0   master  NETWORK HANDLER
 0    3  sleeping    NULL     NULL               0   master  MIRROR HANDLER
 0    4  sleeping    NULL     NULL               0   master  AUDIT PROCESS
 0    5  sleeping    NULL     NULL               0   master  CHECKPOINT SLEEP
 0    6  recv sleep  rose     rose     petal     0   master  AWAITING COMMAND
 0    7  running     robert   sa       helos     0   master  SELECT
 0    8  send sleep  daisy    daisy    chain     0   pubs2   SELECT
 0    9  alarm sleep lily     lily     pond      0   master  WAITFOR
 0   10  lock sleep  viola    viola    cello     7   pubs2   SELECT
```

The spid column contains the process identification numbers used in the Transact-SQL kill command. The blk column contains the process ID of a blocking process, if there is one. A blocking process (which may have an exclusive lock) is one that is holding resources that are needed by another process. In this example, process 10 (a select on a table) is blocked by process 7 (a begin transaction followed by an insert on the same table).

The status column reports the state of the command. The following table shows the status values and the effects of sp_who:

Table 1-28: Status values reported by sp_who

Status	Description	Effect of kill command
`recv sleep`	Waiting on a network read.	Immediate.
`send sleep`	Waiting on a network send.	Immediate.
`alarm sleep`	Waiting on an alarm, such as waitfor delay "10:00".	Immediate.
`lock sleep`	Waiting on a lock acquisition.	Immediate.

Status	Description	Effect of kill command
sleeping	Waiting on disk I/O or some other resource. Probably indicates a process that is running, but doing extensive disk I/O.	Process is killed when it "wakes up," usually immediately. A few sleeping processes do not wake up, and require an Adaptive Server reboot to clear.
runnable	In the queue of runnable processes.	Immediate.
running	Actively running on one of the server engines.	Immediate.
infected	Adaptive Server has detected a serious error condition; extremely rare.	kill command not recommended. Adaptive Server restart probably required to clear process.
background	A process, such as a threshold procedure, run by Adaptive Server rather than by a user process.	Immediate; use kill with extreme care. Recommend a careful check of sysprocesses before killing a background process.
log suspend	Processes suspended by reaching the last-chance threshold on the log.	Immediate.

To get a report on the current locks and the *spid*s of the processes holding them, use sp_lock.

Standards — ANSI SQL – Compliance level: Transact-SQL extension.

Permissions — kill permission defaults to System Administrators and is not transferable.

See also — **Commands** shutdown

System procedures sp_lock, sp_who

load database

Description

Loads a backup copy of a user database, including its transaction log, that was created with dump database.

Syntax

load database *database_name*
from [compress::]*stripe_device*
[at *backup_server_name*]
[density = *density_value,*
blocksize = *number_bytes,*
dumpvolume = *volume_name,*
file = *file_name*]
[stripe on [compress::]*stripe_device*
[at *backup_server_name*]
[density = *density_value*,
blocksize = *number_bytes*,
dumpvolume = *volume_name*,
file = *file_name*]
[[stripe on [compress::]*stripe_device*
[at *backup_server_name*]
[density = *density_value,*
blocksize = *number_bytes,*
dumpvolume = *volume_name,*
file = *file_name*]]...]
[with {
density = *density_value,*
blocksize = *number_bytes,*
dumpvolume = *volume_name,*
file = *file_name,*
[dismount | nodismount],
[nounload | unload],
listonly [= full],
headeronly,
notify = {client | operator_console}
}]]

Parameters

database_name

is the name of the database that will receive the backup copy. It can be either a database created with the for load option, or an existing database. Loading dumped data to an existing database overwrites all existing data. The receiving database must be at least as large as the dumped database. The database name can be specified as a literal, a local variable, or a stored procedure parameter.

compress::

invokes the decompression of the archived database. For more information about the compress option, see Chapter 27, “Backing Up and Restoring User Databases” in the *System Administration Guide*.

from *stripe_device*
is the device from which data is being loaded. See "Specifying dump devices" on page 342 for information about what form to use when specifying a dump device. For a list of supported dump devices, see the Adaptive Server installation and configuration guides.

at *backup_server_name*
is the name of a remote Backup Server running on the machine to which the dump device is attached. For platforms that use interfaces files, the *backup_server_name* must appear in the interfaces file.

density = *density_value*
is ignored. For more information, see the dump database command.

blocksize = *number_bytes*
overrides the default block size for a dump device. If you specify a block size on UNIX systems, it should be identical to that used to make the dump. For more information, see the dump database command.

dumpvolume = *volume_name*
is the volume name field of the ANSI tape label. load database checks this label when the tape is opened and generates an error message if the wrong volume is loaded.

Note When using load database, the dumpvolume option does not provide an error messages if an incorrect file name is given for the file=*filename* option. The backup server searches the entire tape looking for that file, regardless of an incorrect tape mounted.

---

stripe on *stripe_device*
is an additional dump device. You can use up to 32 devices, including the device named in the to *stripe_device* clause. The Backup Server loads data from all devices concurrently, reducing the time and the number of volume changes required. See "Specifying dump devices" on page 342 for information about how to specify a dump device.

dismount | nodismount
on platforms that support logical dismount – determines whether tapes remain mounted. By default, all tapes used for a load are dismounted when the load completes. Use nodismount to keep tapes available for additional loads or dumps.

nounload | unload
: determines whether tapes rewind after the load completes. By default, tapes do not rewind, allowing you to make additional loads from the same tape volume. Specify unload for the last dump file to be loaded from a multidump volume. This rewinds and unloads the tape when the load completes.

file = *file_name*
: is the name of a particular database dump on the tape volume. If you did not record the dump file names at the time you made the dump, use listonly to display information about all dump files.

listonly [= full]
: displays information about all dump files on a tape volume, but *does not load the database*. listonly identifies the database and device, the date and time the dump was made, and the date and time it can be overwritten. listonly = full provides additional details about the dump. Both reports are sorted by ANSI tape label.

  After listing the files on a volume, the Backup Server sends a volume change request. The operator can either mount another tape volume or terminate the list operation for all dump devices.

  Due to current implementation, the listonly option overrides the headeronly option.

Warning! Do not use load database with listonly on 1/4-inch cartridge tape.

---

headeronly
: displays header information for a single dump file, but *does not load the database*. headeronly displays information about the first file on the tape unless you use the file = *file_name* option to specify another file name. The dump header indicates:

  - Type of dump (database or transaction log)
  - Database ID
  - File name
  - Date the dump was made
  - Character set
  - Sort order
  - Page count
  - Next object ID

notify = {client | operator_console}

overrides the default message destination.

- On operating systems that offer an operator terminal feature, volume change messages are always sent to the operator terminal on the machine on which the Backup Server is running. Use client to route other Backup Server messages to the terminal session that initiated the dump database.
- On operating systems (such as UNIX) that do not offer an operator terminal feature, messages are sent to the client that initiated the dump database. Use operator_console to route messages to the terminal on which the Backup Server is running.

Examples

Example 1 Reloads the database pubs2 from a tape device:

```
load database pubs2
    from "/dev/nrmt0"
```

Example 2 Loads the pubs2 database, using the Backup Server REMOTE_BKP_SERVER. This command names three devices:

```
load database pubs2
        from "/dev/nrmt4" at REMOTE_BKP_SERVER
    stripe on "/dev/nrmt5" at REMOTE_BKP_SERVER
    stripe on "/dev/nrmt0" at REMOTE_BKP_SERVER
```

Example 3 Loads the pubs2 database from a compressed dump file called *dmp090100.dmp* located at */opt/bin/Sybase/dumps*:

```
load database pubs2 from
    "compress::/opt/bin/Sybase/dumps/dmp090100.dmp"
```

Usage

- The listonly and headeronly options display information about the dump files without loading them.
- Dumps and loads are performed through Backup Server.
- To make sure databases are synchronized correctly so that all the proxy tables have the correct schema to the content of the primary database you just reloaded, you may need to run the alter database *dbname* for proxy_update command on the server hosting the proxy database.
- Table 1-29 describes the commands and system procedures used to restore databases from backups:

Table 1-29: Commands used to restore databases from dumps

Use this command	To do this
create database for load	Create a database for the purpose of loading a dump.

Use this command	To do this
load database	Restore a database from a dump.
load transaction	Apply recent transactions to a restored database.
online database	Make a database available for public use after a normal load sequence or after upgrading the database to the current version of Adaptive Server.
load { database | transaction } with {headeronly | listonly}	Identify the dump files on a tape.
sp_volchanged	Respond to Backup Server's volume change messages.

Restrictions

- If proxy tables are in the database they are be part of the database saveset. The content data of proxy tables is not included in the save; only the pointer is saved and restored.
- You cannot load a dump that was made on a different platform.
- You cannot load a dump that was generated on a server version before version 10.0.
- If a database has cross-database referential integrity constraints, the sysreferences system table stores the *name*—not the ID number—of the external database. Adaptive Server cannot guarantee referential integrity if you use load database to change the database name or to load it onto a different server.
- Each time you add or remove a cross-database constraint or drop a table that contains a cross-database constraint, dump *both* of the affected databases.

Warning! Loading earlier dumps of these databases can cause database corruption. Before dumping a database to load it with a different name or move it to another Adaptive Server, use alter table to drop all external referential integrity constraints.

- load database clears the suspect page entries pertaining to the loaded database from master..sysattributes.
- load database overwrites any existing data in the database.
- After a database dump is loaded, two processes may require additional time before the database can be brought online:

- All unused pages in the database must be zeroed after the load completes. The time required depends on the number of unused pages. If the target database is the same size as the database that is loaded, the Backup Server performs this step. If the target database is larger than the database that is loaded, Adaptive Server performs this step after the Backup Server completes the load. The time required for this step depends on the number of empty pages.
- All transactions in the transaction log included in the database dump must be rolled back or rolled forward. The time required depends on the number and type of transactions in the log. This step is performed by Adaptive Server.

- The receiving database must be as large as or larger than the database to be loaded. If the receiving database is too small, Adaptive Server displays an error message that gives the required size.
- You cannot load from the null device (on UNIX, /dev/null).
- You cannot use load database in a user-defined transaction.

Locking out users during loads

- While you are loading a database, it cannot be in use. load database sets the status of the database to "offline." No one can use the database while its status is "offline." The "offline" status prevents users from accessing and changing the database during a load sequence.
- A database loaded by load database remains inaccessible until online database is issued.

Upgrading database and transaction log dumps

- To restore and upgrade a user database dump from a version 10.0 or later server to the current version of Adaptive Server:

  a Load the most recent database dump.

  b Load, *in order,* all transaction log dumps made since the last database dump.

  Adaptive Server checks the timestamp on each dump to make sure that it is being loaded to the correct database and in the correct sequence.

  c Issue online database to do the upgrade and make the database available for public use.

  d Dump the newly upgraded database immediately after upgrade, to create a dump consistent with the current version of Adaptive Server.

Specifying dump devices

- You can specify the dump device as a literal, a local variable, or a parameter to a stored procedure.
- You can specify a local device as:
  - A logical device name from the sysdevices system table
  - An absolute path name
  - A relative path name

  The Backup Server resolves relative path names using Adaptive Server's current working directory.
- When loading across the network, specify the absolute path name of the dump device. The path name must be valid on the machine on which the Backup Server is running. If the name includes characters other than letters, numbers, or the underscore (_), enclose the entire name in quotes.
- Ownership and permissions problems on the dump device may interfere with use of load commands.
- You can run more than one load (or dump) at the same time, as long as each load uses a different physical device.

Backup Servers

- You must have a Backup Server running on the same machine as Adaptive Server. The Backup Server must be listed in the master..sysservers table. This entry is created during installation or upgrade and should not be deleted.
- If your backup devices are located on another machine, so that you load across a network, you must also have a Backup Server installed on the remote machine.

Volume names

- Dump volumes are labeled according to the ANSI tape labeling standard. The label includes the logical volume number and the position of the device within the stripe set.

- During loads, Backup Server uses the tape label to verify that volumes are mounted in the correct order. This allows you to load from a smaller number of devices than you used at dump time.

Note When dumping and loading across the network, you must specify the same number of stripe devices for each operation.

Changing dump volumes

- If the Backup Server detects a problem with the currently mounted volume, it requests a volume change by sending messages to either the client or its operator console. After mounting another volume, the operator notifies the Backup Server by executing sp_volchanged on any Adaptive Server that can communicate with the Backup Server.

Restoring the system databases

- See the *System Administration Guide* for step-by-step instructions for restoring the system databases from dumps.

Disk mirroring

- At the beginning of a load, Adaptive Server passes Backup Server the primary device name of each logical database and log device. If the primary device has been unmirrored, Adaptive Server passes the name of the secondary device instead. If any named device fails before Backup Server completes its data transfer, Adaptive Server aborts the load.
- If you attempt to unmirror any named device while a load database is in progress, Adaptive Server displays a message. The user executing disk unmirror can abort the load or defer the disk unmirror until after the load completes.
- Backup Server loads the data onto the primary device, then load database copies it to the secondary device. load database takes longer to complete if any database device is mirrored.

Standards

ANSI SQL – Compliance level: Transact-SQL extension.

Permissions

Only a System Administrator, Database Owner, or user with the Operator role can execute load database.

See also

Commands alter database, dbcc, dump database, dump transaction, load transaction, online database

System procedures sp_helpdb, sp_helpdevice, sp_volchanged

load transaction

Description

Loads a backup copy of the transaction log that was created with dump transaction.

Syntax

load tran[saction] *database_name*
from [compress::]*stripe_device*
[at *backup_server_name*]
[density = *density_value*,
blocksize = *number_bytes*,
dumpvolume = *volume_name*,
file = *file_name*]
[stripe on [compress::]*stripe_device*
[at *backup_server_name*]
[density = *density_value*,
blocksize = *number_bytes*,
dumpvolume = *volume_name*,
file = *file_name*]
[[stripe on [compress::]*stripe_device*
[at *backup_server_name*]
[density = *density_value*,
blocksize = *number_bytes*,
dumpvolume = *volume_name*,
file = *file_name*]]...]
[with {
density = *density_value*,
blocksize = *number_bytes*,
dumpvolume = *volume_name*,
file = *file_name*,
[dismount | nodismount],
[nounload | unload],
listonly [= full],
headeronly,
notify = {client | operator_console}
until_time = *datetime*}]]

Parameters

database_name

is the name of the database to receive data from a dumped backup copy of the transaction log. The log segment of the receiving database must be at least as large as the log segment of the dumped database. The database name can be specified as a literal, a local variable, or a parameter of a stored procedure.

compress::

invokes the decompression of the archived transaction log. See Chapter 27, "Backing Up and Restoring User Databases" in the *System Administration Guide* for more information about the compress option.

from *stripe_device*
is the name of the dump device from which you are loading the transaction log. For information about the form to use when specifying a dump device, see “Specifying dump devices” on page 342. For a list of supported dump devices, see the Adaptive Server installation and configuration guides.

at *backup_server_name*
is the name of a remote Backup Server running on the machine to which the dump device is attached. For platforms that use interfaces files, the *backup_server_name* must appear in the interfaces file.

density = *density_value*
overrides the default density for a tape device. *This option is ignored.*

blocksize = *number_bytes*
overrides the default block size for a dump device. If you specify a block size on UNIX systems, it should be identical to that used to make the dump.

dumpvolume = *volume_name*
is the volume name field of the ANSI tape label. load transaction checks this label when the tape is opened and generates an error message if the wrong volume is loaded.

stripe on *stripe_device*
is an additional dump device. You can use up to 32 devices, including the device named in the to *stripe_device* clause. The Backup Server loads data from all devices concurrently, reducing the time and the number of volume changes required. See “Specifying dump devices” on page 342 for information about how to specify a dump device.

dismount | nodismount
on platforms that support logical dismount – determines whether tapes remain mounted. By default, all tapes used for a load are dismounted when the load completes. Use nodismount to keep tapes available for additional loads or dumps.

nounload | unload
determines whether tapes rewind after the load completes. By default, tapes do not rewind, allowing you to make additional loads from the same tape volume. Specify unload for the last dump file to be loaded from a multidump volume. This rewinds and unloads the tape when the load completes.

file = *file_name*
is the name of a particular database dump on the tape volume. If you did not record the dump file names at the time you made the dump, use listonly to display information about all the dump files.

listonly [= full]
: displays information about all the dump files on a tape volume, but *does not load the transaction log*. listonly identifies the database and device, the date and time the dump was made, and the date and time it can be overwritten. listonly = full provides additional details about the dump. Both reports are sorted by ANSI tape label.

  After listing the files on a volume, the Backup Server sends a volume change request. The operator can either mount another tape volume or terminate the list operation for all dump devices.

  In the current implementation, listonly overrides headeronly.

Warning! Do not use load transaction with listonly on 1/4-inch cartridge tape.

---

headeronly
: displays header information for a single dump file, but *does not load the database*. headeronly displays information about the first file on the tape unless you use the file = *file_name* option to specify another file name. The dump header indicates:

  - Type of dump (database or transaction log)
  - Database ID
  - File name
  - Date the dump was made
  - Character set
  - Sort order
  - Page count
  - Next object ID
  - Checkpoint location in the log
  - Location of the oldest begin transaction record
  - Old and new sequence dates

notify = {client | operator_console}
overrides the default message destination.

- On operating systems that offer an operator terminal feature, volume change messages are always sent to the operator terminal on the machine on which the Backup Server is running. Use client to route other Backup Server messages to the terminal session that initiated the dump database.
- On operating systems (such as UNIX) that do not offer an operator terminal feature, messages are sent to the client that initiated the dump database. Use operator_console to route messages to the terminal on which the Backup Server is running.

until_time
loads the transaction log up to a specified time in the transaction log. Only transactions committed before the specified time are saved to the database.

Examples

Example 1 Loads the transaction log for the database pubs2 tape:

```
load transaction pubs2
    from "/dev/nrmt0"
```

Example 2 Loads the transaction log for the pubs2 database, using the Backup Server REMOTE_BKP_SERVER:

```
load transaction pubs2
        from "/dev/nrmt4" at REMOTE_BKP_SERVER
    stripe on "/dev/nrmt5" at REMOTE_BKP_SERVER
    stripe on "/dev/nrmt0" at REMOTE_BKP_SERVER
```

Example 3 Loads the transaction log for pubs2, up to March 20, 1997, at 10:51:43:866 a.m:

```
load transaction pubs2
    from "/dev/ntmt0"
    with until_time = "mar 20, 1997 10:51:43:866am"
```

Usage

- The listonly and headeronly options display information about the dump files without loading them.
- Dumps and loads are performed through Backup Server.
- Table 1-30 describes the commands and system procedures used to restore databases from backups:

Table 1-30: Commands used to restore databases

Use this command	To do this
create database for load	Create a database for the purpose of loading a dump.

Use this command	To do this
load database	Restore a database from a dump.
load transaction	Apply recent transactions to a restored database.
online database	Make a database available for public use after a normal load sequence or after upgrading the database to the current version of Adaptive Server.
load { database | transaction } with {headeronly | listonly}	Identify the dump files on a tape.
sp_volchanged	Respond to the Backup Server's volume change messages.

Restrictions

- You cannot load a dump that was made on a different platform.
- You cannot load a dump that was generated on a version before 10.0 server.
- The database and transaction logs must be at the same release level.
- Load transaction logs in chronological order.
- You cannot load from the null device (on UNIX, /dev/null).
- You cannot use load transaction after an online database command that does an upgrade. The correct sequence for upgrading a database is load database, load transaction, online database.
- Do not issue online database until all transaction logs are loaded. The command sequence is:

  a Load database

  b Load transaction (repeat as needed)

  c Online database

  However, to load additional transaction logs while retaining read-only access to the database (a typical "warm backup" situation), use the dump tran for standby_access option to generate the transaction dumps. You can then issue online database for standby_access for read-only access.
- You cannot use the load transaction command in a user-defined transaction.

Restoring a database

- To restore a database:
  - Load the most recent database dump

    - Load, *in order*, all transaction log dumps made since the last database dump
    - Issue online database to make the database available for public use
- Each time you add or remove a cross-database constraint, or drop a table that contains a cross-database constraint, dump *both* of the affected databases.

  Warning! Loading earlier dumps of these databases can cause database corruption.

- For more information on backup and recovery of Adaptive Server databases, see the *System Administration Guide*.

Recovering a database to a specified time

- You can use the until_time option for most databases that can be loaded or dumped. It does not apply to databases such as master, in which the data and logs are on the same device. Also, you cannot use it on any database that has had a truncated log since the last dump database, such as tempdb.
- The until_time option is useful for the following reasons:
    - It enables you to have a database consistent to a particular time. For example, in an environment with a decision support system (DSS) database and an online transaction processing (OLTP) database, the System Administrator can roll the DSS database to an earlier specified time to compare data between the earlier version and the current version.
    - If a user inadvertently destroys data, such as dropping an important table, you can use the until_time option to back out the errant command by rolling forward the database to a point just before the data was destroyed.
- To effectively use the until_time option after data has been destroyed, you must know the exact time the error took place. You can find out by executing a select getdate() command immediately after the error. For a more precise time using milliseconds, use the convert function, for example:

```
select convert(char(26), getdate(), 109)
--------------------------
Feb 26 1997 12:45:59:650PM
```

- After you load a transaction log using until_time, Adaptive Server restarts the database's log sequence. This means that until you dump the database again, you cannot load subsequent transaction logs after the load transaction using until_time. Dump the database before you dump another transaction log.
- Only transactions that committed before the specified time are saved to the database. However, in some cases, transactions committed shortly after the until_time specification are applied to the database data. This may occur when several transactions are committing at the same time. The ordering of transactions may not be written to the transaction log in time-ordered sequence. In this case, the transactions that are out of time sequence reflected in the data that has been recovered. The time should be less than a second.
- For more information on recovering a database to a specified time, see the *System Administration Guide*.

Locking users out during loads

- While you are loading a database, it cannot be in use. load transaction, unlike load database, does not change the offline/online status of the database. load transaction leaves the status of the database the way it found it. load database sets the status of the database to "offline". No one can use the database while it is "offline." The "offline" status prevents users from accessing and changing the database during a load sequence.
- A database loaded by load database remains inaccessible until online database is issued.

Upgrading database and transaction log dumps

- To restore and upgrade a user database dump from a version 10.0 or later server to the current version of Adaptive Server:
  a Load the most recent database dump.
  b Load, *in order*, all transaction logs generated after the last database dump.
  c Use online database to do the upgrade.
  d Dump the newly upgraded database immediately after the upgrade, to create a dump that is consistent with the current version of Adaptive Server.

Specifying dump devices

- You can specify the dump device as a literal, a local variable, or a parameter to a stored procedure.

- When loading from a local device, you can specify the dump device as:
  - An absolute path name
  - A relative path name
  - A logical device name from the sysdevices system table

  Backup Server resolves relative path names, using Adaptive Server's current working directory.
- When loading across the network, specify the absolute path name of the dump device. (You cannot use a relative path name or a logical device name from the sysdevices system table.) The path name must be valid on the machine on which the Backup Server is running. If the name includes any characters other than letters, numbers or the underscore (_), you must enclose it in quotes.
- Ownership and permissions problems on the dump device may interfere with use of load commands. sp_addumpdevice adds the device to the system tables, but does not guarantee that you can load from that device or create a file as a dump device.
- You can run more than one load (or dump) at the same time, as long as each one uses a different physical device.

Backup Servers

- You must have a Backup Server running on the same machine as your Adaptive Server. The Backup Server must be listed in the master..sysservers table. This entry is created during installation or upgrade and should not be deleted.
- If your backup devices are located on another machine so that you load across a network, you must also have a Backup Server installed on the remote machine.

Volume names

- Dump volumes are labeled according to the ANSI tape-labeling standard. The label includes the logical volume number and the position of the device within the stripe set.

- During loads, Backup Server uses the tape label to verify that volumes are mounted in the correct order. This allows you to load from a smaller number of devices than you used at dump time.

Note When dumping and loading across a network, you must specify the same number of stripe devices for each operation.

Changing dump volumes

- If Backup Server detects a problem with the currently mounted volume, it requests a volume change by sending messages to either the client or its operator console. After mounting another volume, the operator notifies Backup Server by executing sp_volchanged on any Adaptive Server that can communicate with Backup Server.

Restoring the system databases

- For step-by-step instructions for restoring the system databases from dumps, see the *System Administration Guide*.

Disk mirroring

- At the beginning of a load, Adaptive Server passes the primary device name of each logical database device and each logical log device to the Backup Server. If the primary device has been unmirrored, Adaptive Server passes the name of the secondary device instead. If any named device fails before the Backup Server completes its data transfer, Adaptive Server aborts the load.
- If you attempt to unmirror any of the named devices while a load transaction is in progress, Adaptive Server displays a message. The user executing disk unmirror can abort the load, or defer disk unmirror until after the load completes.
- Backup Server loads the data onto the primary device, then load transaction copies it to the secondary device. load transaction takes longer to complete if any database device is mirrored.

Standards

ANSI SQL – Compliance level: Transact-SQL extension.

Permissions

load transaction permission defaults to the Database Owner and operators. It is not transferable.

See also

Commands disk unmirror, dump database, dump transaction, load database, online database

System procedures sp_dboption, sp_helpdb, sp_helpdevice, sp_volchanged

lock table

Description

Explicitly locks a table within a transaction.

Syntax

lock table *table_name* in {share | exclusive } mode
[wait [*numsecs*] | nowait]

Parameters

table_name
specifies the name of the table to be locked.

share | exclusive
specifies the type of lock, shared or exclusive, to be applied to the table.

wait *numsecs*
specifies the number of seconds to wait, if a lock cannot be acquired immediately. If *numsecs* is omitted, specifies that the lock table command should wait until lock is granted.

nowait
causes the command to fail if the lock cannot be acquired immediately.

Examples

Example 1 Tries to acquire a shared table lock on the titles table. If a session-level wait has been set with set lock wait, the lock table command waits for that period of time; otherwise, the server-level wait period is used:

```
begin transaction
lock table titles in share mode
```

Example 2 Tries to acquire an exclusive table lock on the authors table. If the lock cannot be acquired within 5 seconds, the command returns an informational message. Subsequent commands within the transaction continue as they would have without lock table:

```
begin transaction
lock table authors in exclusive mode wait 5
```

Example 3 If a table lock is not acquired within 5 seconds, the procedure checks the user's role. If the procedure is executed by a user with sa_role, the procedure prints an advisory message and proceeds without a table lock. If the user does not have sa_role, the transaction is rolled back:

```
create procedure bigbatch
as
begin transaction
lock table titles in share mode wait 5
if @@error = 12207
begin
    /*
    ** Allow SA to run without the table lock
    ** Other users get an error message
```

```
        */
        if (proc_role("sa_role") = 0)
        begin
        print "You cannot run this procedure at
            this time, please try again later"
        rollback transaction
        return 100
        end
    else
        begin
        print "Couldn't obtain table lock,
            proceeding with default locking."
        end
    end
    /* more SQL here */
    commit transaction
```

Usage

- If you use lock table as the first statement after the set chained on command, this creates a new transaction.
- You can use lock table only within a transaction. The table lock is held for the duration of the transaction.
- The behavior of lock table depends on the wait-time options that are specified in the command or that are active at the session level or server level.
- If the wait and nowait option are not specified, lock table uses either the session-level wait period or the server-level wait period. If a session-level wait has been set using set lock wait, it is used, otherwise, the server-level wait period is used.
- If the table lock cannot be obtained with the time limit (if any), the lock table command returns message 12207. The transaction is not rolled back. Subsequent commands in the transaction proceed as they would have without the lock table command.
- You cannot use lock table on system tables or temporary tables.
- You can issue multiple lock table commands in the same transaction.

Standards

ANSI SQL – Compliance level: Transact-SQL extension.

Permissions

You must have select access permission on the table to use lock table in share mode. You must have delete, insert, or update access permission on the table to use lock table in exclusive mode.

See also

Commands set

mount

Description

Use the mount command to attach the database to the destination or secondary Adaptive Server. The mount command decodes the information in the manifest file and makes the set of databases available. All the required supporting activities are executed, including adding database devices, if necessary, and activating them, creating the catalog entries for the new databases, and recovering them.

Before mounting the databases, use mount with listonly and modify the device pathnames at the destination Adaptive Server. Then use mount to actually mount the databases.

The mount limits the number of databases to eight in a single command.

Warning! For every login that is allowed access to a database on the original Adaptive Server, a corresponding login for the same suid must exist at the destination Adaptive Server.

For permissions to remain unchanged, the login maps at the destination Adaptive Server must be identical to that on the source Adaptive Server.

Syntax

mount database all from <*manifest_file*> [with listonly]

Parameters

manifest_file

The manifest file is the binary file that describes the databases that are present on a set of database devices.

Operations that can perform character translations of the file contents (such as ftp) corrupt the manifest file unless done in binary mode.

Examples

Example 1 Finds the path names listed on the manifest file from the source Adaptive Server:

```
mount database all from "/data/sybase2/mfile1" with listonly
go

"/data/sybase1/d0.dbs" = "1dev1"
"/data/sybase2/d14.dbs" = "1dev13"
```

When you have the path names, you can verify or modify them to meet your criteria at the destination Adaptive Server.

Example 2 When the database is loaded to the secondary Adaptive Server, you then mount it.

```
mount database all from "/data/sybase2/mfile1" using
    "/data/sybase2/d0.dbs" = "1dev1",
```

```
"/data/sybase2/d14.dbs" = "1dev13"
```

When the mount process has completed, the database is still offline. Use the online database command to bring the database online. You do not have to reboot the server.

Usage

Destination changes

Once databases are mounted on the destination Adaptive Server, certain settings are cleared on the mounted database:

- Replication is turned off.
- Audit settings are cleared and turned off.
- Omni options, default remote location, and type are cleared.
- Cache bindings are dropped for both the mounted databases and their objects.
- Recovery order is dropped for the mounted databases and becomes the default dbid order.

System considerations

- You cannot use the mount command in a transaction.
- You cannot mount a database on an HA-configured server.

Performance considerations

When you mount databases onto an Adaptive Server:

- Database IDs for the transported databases must be on the destination Adaptive Server. If the database ID is already in use in the destination Adaptive Server, the mount command displays a warning that dbcc checkalloc must be run on the database. Run checkalloc if the database is not being mounted for temporary use.
- If the dbid is changed, all procedures are marked for recompiling in the database. This increases the time it takes to recover the database at the destination and delays the first execution of the procedure.

Renaming devices

The manifest file contains the device paths known to the source Adaptive Server that created the manifest file. If the destination Adaptive Server accesses the devices with a different path, you can specify the new path to the mount command.

1 Use the mount command with listonly to display the old path:

```
mount database all from "/work2/Mpubs_file" with listonly
```

```
go
"/work2/Devices/pubsdat.dat" = "pubs2dat"
```

2 If the new path for the device pubs2dat is */work2/Devices/pubsdevice.dat*, (the Devices path in Windows) specify the new device in the mount command:

```
mount database all from "/work2/Mpubs_file" using
"/work2/datadevices/pubsdevice.dat" = "pubs2dat"
```

Standards ANSI SQL – Compliance level: Transact-SQL extension.

Permissions mount requires an sa or dba role.

See also **Commands** unmount, quiesce database

nullif

Description

Supports conditional SQL expressions; can be used anywhere a value expression can be used; alternative for a case expression.

Syntax

nullif(*expression*, *expression*)

Parameters

nullif

compares the values of the two expressions. If the first expression equals the second expression, nullif returns NULL. If the first expression does not equal the second expression, nullif returns the first expression.

expression

is a column name, a constant, a function, a subquery, or any combination of column names, constants, and functions connected by arithmetic or bitwise operators. For more information about expressions, see "Expressions" on page 249 in Chapter 4, "Expressions, Identifiers, and Wildcard Characters" of *Reference Manual: Building Blocks*.

Examples

Example 1 Selects the *titles* and *type* from the *titles* table. If the book type is UNDECIDED, nullif returns a NULL value:

```
select title,
    nullif(type, "UNDECIDED")
from titles
```

Example 2 This is an alternative way of writing Example 1:

```
select title,
    case
        when type = "UNDECIDED" then NULL
        else type
    end
from titles
```

Usage

- nullif expression alternate for a case expression.
- nullif expression simplifies standard SQL expressions by allowing you to express a search condition as a simple comparison instead of using a when...then construct.
- nullif expressions can be used anywhere an expression can be used in SQL.
- At least one result of the case expression must return a non-null value. For example the following results in an error message:

```
select price, coalesce (NULL, NULL, NULL)
from titles
All result expressions in a CASE expression must not be NULL.
```

- If your query produces a variety of datatypes, the datatype of a case expression result is determined by datatype hierarchy, as described in "Datatype of mixed-mode expressions" on page 6 in Chapter 1, "System and User-Defined Datatypes" of *Reference Manual: Building Blocks*. If you specify two datatypes that Adaptive Server cannot implicitly convert (for example, char and int), the query fails.

Standards — ANSI SQL – Compliance level: Transact-SQL extension.

Permissions — nullif permission defaults to all users. No permission is required to use it.

See also — **Commands** case, coalesce, select, if...else, where clause

online database

Description

Marks a database available for public use after a normal load sequence; if needed, upgrades a loaded database to the current version of Adaptive Server; brings a database online after loading a transaction log dumped with the for standby_access option.

Syntax

online database *database_name* [for standby_access]

Parameters

database_name
specifies the name of the database to be brought online.

for standby_access
brings the database online on the assumption that the database contains no open transactions.

Examples

Example 1 Makes the pubs2 database available for public use after a load sequence completes:

```
online database pubs2
```

Example 2 Brings the database inventory_db online. Used after loading inventory_db with a transaction-log dump obtained through dump tran...with standby_access:

```
online database inventory_db for standby_access
```

Usage

- online database brings a database online for general use after a normal database or transaction log load sequence.
- When load database is issued, the database's status is set to "offline." The offline status is set in the sysdatabases system table and remains set until online database completes.
- Do *not* issue online database until all transaction logs are loaded. The command sequence is:
  - load database
  - load transaction (there may be more than one load transaction)
  - online database
- If you execute online database against a currently online database, no processing occurs and no error messages are generated.
- online database...for standby_access can only be used with a transaction log that was dumped using dump transaction...with standby_access. If you use online database...for standby_access after loading a transaction log that was dumped without using dump transaction...with standby access, online database generates an error message and fails.

- You can use sp_helpdb to find out whether a database is currently online, online for standby access, or offline.

Upgrading databases

- online database initiates, if needed, the upgrade of a loaded database and transaction log dumps to make the database compatible with the current version of Adaptive Server. After the upgrade completes, the database is made available for public use. If errors occur during processing, the database remains offline.
- online database is required only after a database or transaction log load sequence. It is not required for new installations or upgrades. When Adaptive Server is upgraded to a new version, all databases associated with that server are automatically upgraded.
- online database only upgrades version 10.0 or later user databases.
- After you upgrade a database with online database, dump the newly upgraded database to create a dump that is consistent with the current version of Adaptive Server. You must dump the upgraded database before you can issue a dump transaction command.

Standards

ANSI SQL – Compliance level: Transact-SQL extension.

Permissions

Only a System Administrator, Database Owner, or user with the Operator role can execute online database.

See also

Commands dump database, dump transaction, load database, load transaction

System procedures sp_helpdb

open

Description

Opens a cursor for processing.

Syntax

open *cursor_name*

Parameters

cursor_name
is the name of the cursor to open.

Examples

Opens the cursor named authors_crsr:

```
open authors_crsr
```

Usage

- open opens a cursor. Cursors allow you to modify or delete rows on an individual basis. You must first open a cursor to use the fetch, update, and delete statements. For more information about cursors, see the *Transact-SQL User's Guide*.
- Adaptive Server returns an error message if the cursor is already open or if the cursor has not been created with the declare cursor statement.
- Opening the cursor causes Adaptive Server to evaluate the select statement that defines the cursor (specified in the declare cursor statement) and makes the cursor result set available for processing.
- When the cursor is first opened, it is positioned before the first row of the cursor result set.
- When you set the chained transaction mode, Adaptive Server implicitly begins a transaction with the open statement if no transaction is currently active.

Standards

ANSI SQL – Compliance level: Transact-SQL extension.

Permissions

open permission defaults to all users.

See also

Commands close, declare cursor, fetch

order by clause

Description

Returns query results in the specified column(s) in sorted order.

Syntax

[*Start of* select *statement*]

[order by {[*table_name*.| *view_name*.]*column_name*
| *select_list_number* | *expression*} [asc | desc]
[,{[*table_name*.| *view_name*.] *column_name*
select_list_number|*expression*} [asc
|desc]]...]

[*End of* select *statement*]

Parameters

order by
sorts the results by columns.

asc
sorts the results in ascending order. If you do not specify asc or desc, asc is assumed.

desc
sorts the results in descending order.

Examples

Example 1 Selects the titles whose price is greater than $19.99 and lists them with the titles in alphabetical order:

```
select title, type, price
from titles
where price > $19.99
order by title
```

```
title
        type         price
-------------------------------------------------------------
         ------------ -------------------------
But Is It User Friendly?
         popular_comp                    22.95
Computer Phobic and Non-Phobic Individuals: Behavior Variations
          psychology                     21.59
Onions, Leeks, and Garlic: Cooking Secrets of the Mediterranean
         trad_cook                       20.95
Secrets of Silicon Valley
         popular_comp                   20.00
```

Example 2 Lists the books from the titles table, in descending alphabetical order of the type, and calculates the average price and advance for each type:

```
select type, price, advance
from titles
order by type desc
```

```
compute avg(price), avg(advance) by type
```

Example 3 Lists the title IDs from the titles table, with the advances divided by the total sales, ordered from the lowest calculated amount to the highest:

```
select title_id, advance/total_sales
from titles
order by advance/total_sales
```

```
 title_id
 -------- ------------------------
 MC3026                     NULL
 PC9999                     NULL
 MC2222                       0.00
 TC4203                       0.26
 PS3333                       0.49
 BU2075                       0.54
 MC3021                       0.67
 PC1035                       0.80
 PS2091                       1.11
 PS7777                       1.20
 BU1032                       1.22
 BU7832                       1.22
 BU1111                       1.29
 PC8888                       1.95
 TC7777                       1.95
 PS1372                      18.67
 TC3218                      18.67
 PS2106                      54.05
```

Example 4 Lists book titles and types in order by the type, renaming the columns in the output:

```
select title as BookName, type as Type
from titles
order by Type
```

Usage

- order by returns query results in the specified column(s) in sorted order. order by is part of the select command.
- In Transact-SQL, you can use order by to sort items that do not appear in the select list. You can sort by a column heading, a column name, an expression, an alias name (if specified in the select list), or a number representing the position of the item in the select list (*select_list_number*).
- If you sort by *select_list_number*, the columns to which the order by clause refers must be included in the select list, and the select list cannot be * (asterisk).

- Use order by to display your query results in a meaningful order. Without an order by clause, you cannot control the order in which Adaptive Server returns results.

Restrictions

- The maximum number of columns allowed in an order by clause is 31.
- order by cannot be used on text or image datatype columns.
- Subqueries and view definitions cannot include an order by clause (or a compute clause or the keyword into). Conversely, you cannot use a subquery in an order by list.
- You cannot update the result set of a server- or language- type cursor if it contains an order by clause in its select statement. For more information about the restrictions applied to updatable cursors, see the *Transact-SQL User's Guide*.
- If you use compute by, you must also use an order by clause. The expressions listed after compute by must be identical to or a subset of those listed after order by, must be in the same left-to-right order, must start with the same expression, and must not skip any expressions. For example, if the order by clause is:

  ```
  order by a, b, c
  ```

  the compute by clause can be any (or all) of these:

  ```
  compute by a, b, c
  compute by a, b
  compute by a
  ```

  The keyword compute can be used without by to generate grand totals, grand counts, and so on. In this case, order by is optional.

Collating sequences

- With order by, null values precede all others.
- The sort order (collating sequence) on your Adaptive Server determines how your data is sorted. The sort order choices are binary, dictionary, case-insensitive, case-insensitive with preference, and case- and accent-insensitive. Sort orders that are specific to specific national languages may also be provided.

Table 1-31: Effect of sort order choices

Adaptive Server sort order	Effects on *order by* results
Binary order	Sorts all data according to the numeric byte-value of each character in the character set. Binary order sorts all uppercase letters before lowercase letters. Binary sort order is the only option for multibyte character sets.
Dictionary order	Sorts uppercase letters before their lowercase counterparts (case-sensitive). Dictionary order recognizes the various accented forms of a letter and sorts them after the unaccented form.
Dictionary order, case-insensitive	Sorts data in dictionary order but does not recognize case differences. Uppercase letters are equivalent to their lowercase counterparts and are sorted as described in "Sort rules" in the following section.
Dictionary order, case-insensitive with preference	Sorts an uppercase letter in the preferred position, before its lowercase version. It does not recognize case difference when performing comparisons (for example, in where clauses).
Dictionary order, case- and accent-insensitive	Sorts data in dictionary order, but does not recognize case differences; treats accented forms of a letter as equivalent to the associated unaccented letter. It intermingles accented and unaccented letters in sorting results.

- sp_helpsort reports the sort order installed on Adaptive Server.

Sort rules

- When two rows have equivalent values in Adaptive Server's sort order, the following rules are used to order the rows:
  - The values in the columns named in the order by clause are compared.
  - If two rows have equivalent column values, the binary value of the entire rows is compared byte by byte. This comparison is performed on the row in the order in which the columns are stored internally, not the order of the columns as they are named in the query or in the original create table clause. In brief, data is stored with all the fixed-length columns, in order, followed by all the variable length columns, in order.
  - If rows are equal, row IDs are compared.

    Given this table:

```
create table sortdemo (lname varchar(20),
                       init char(1) not null)
```

    and this data:

```
lname      init
---------- ----
Smith      B
SMITH      C
```

```
smith       A
```

you get these results when you order by *lname*:

```
lname       init
----------- ----
smith       A
Smith       B
SMITH       C
```

Since the fixed-length char data (the init column) is stored first internally, the order by sorts these rows based on the binary values "Asmith", "BSmith" and "CSMITH".

However, if the init is of type varchar, the *lname* column is stored first, and then the init column. The comparison takes place on the binary values "SMITHC", "SmithB", and "smithA", and the rows are returned in that order.

Descending scans

- Use of the keyword desc in an order by clause allows the query optimizer to choose a strategy that eliminates the need for a worktable and a sort step to return results in descending order. This optimization scans the page chain of the index in reverse order, following the previous page pointers on each index page.

  To use this optimization, the columns in the order by clause must match the index order. They can be a subset of the keys, but must be a prefix subset, that is, they must include the first key(s). The descending scan optimization cannot be used if the columns named in the order by clause are a superset of the index keys.

  If the query involves a join, all tables can be scanned in descending key order, as long as the requirements for a prefix subset of keys are met. Descending scan optimization can also be used for one or more tables in a join, while other tables are scanned in ascending order.

- If other user processes are scanning forward to perform updates or deletes, performing descending scans can cause deadlocks. Deadlocks may also be encountered during page splits and shrinks. You can use sp_sysmon to track deadlocks on your server, or you can use the configuration parameter print deadlock information to send deadlock information to the error log.

- If your applications need to return results in descending order, but the descending scans optimization creates deadlock problems, some possible workarounds are:

- Use transaction isolation level 0 scans for descending scans. For more information on the effect of isolation level 0 reads, see the *Performance and Tuning Guide*.
- Disable descending scan optimization with the configuration parameter allow backward scans so that all queries that use desc scan the table in ascending order and sort the result set into descending order. For more information, see the *System Administration Guide*.
- Break problematical descending scans into two steps, selecting the required rows into a temporary table in ascending order in the first step, and selecting from the temporary table in descending order in the second step.

- If a backward scan uses a clustered index that contains overflow pages because duplicate key values are present, the result set returned by the descending scan may not be in exact reverse order of the result set that is returned with an ascending scan. The specified key values are returned in order, but the order of the rows for the identical keys on the overflow pages may be different. For an explanation of how overflow pages in clustered indexes are stored, see the *Performance and Tuning Guide*.

Standards

ANSI SQL – Compliance level: Transact-SQL extension.

Specifying new column headings in the order by clause of a select statement when the union operator is used is a Transact-SQL extension.

See also

Commands compute clause, declare, group by and having clauses, select, where clause

System procedures sp_configure, sp_helpsort, sp_lock, sp_sysmon

prepare transaction

Description	Used by DB-Library in a two-phase commit application to see if a server is prepared to commit a transaction.
Syntax	prepare tran[saction]
Usage	• For more information, see the *Open Client DB-Library Reference Manual*.
Standards	ANSI SQL – Compliance level: Transact-SQL extension.
See also	**Commands** begin transaction, begin transaction, rollback, save transaction

print

Description

Prints a user-defined message on the user's screen.

Syntax

print
{*format_string* | *@local_variable* |
@@global_variable}
[, *arg_list*]

Parameters

format_string

can be either a variable or a string of characters. The maximum length of *format_string* is 1023 bytes.

Format strings can contain up to 20 unique placeholders in any order. These placeholders are replaced with the formatted contents of any arguments that follow *format_string* when the text of the message is sent to the client.

To allow reordering of the arguments when format strings are translated to a language with a different grammatical structure, the placeholders are numbered. A placeholder for an argument appears in this format: " *%nn* !"—a percent sign (%), followed by an integer from 1 to 20, followed by an exclamation point (!). The integer represents the argument number in the string in the argument list. "%1!" is the first argument in the original version, "%2!" is the second argument, and so on.

Indicating the position of the argument in this way makes it possible to translate correctly, even when the order in which the arguments appear in the target language is different.

For example, assume the following is an English message:

```
%1! is not allowed in %2!.
```

The German version of this message is:

```
%1! ist in %2! nicht zulassig.
```

@local_variable

must be of type char, nchar, varchar, or nvarchar, and must be declared within the batch or procedure in which it is used.

@@global_variable

must be of type char or varchar, or be automatically convertible to these types, such as *@@version*. Currently, *@@version* is the only character-type global variable.

arg_list
may be a series of either variables or constants separated by commas. *arg_list* is optional unless a format string containing placeholders of the form "*%nn* !" is provided. In that case, the *arg_list* must have at least as many arguments as the highest numbered placeholder. An argument can be any datatype except text or image; it is converted to a character datatype before being included in the final message.

Examples

Example 1 Prints "Berkeley author" if any authors in the authors table live in the 94705 ZIP code:

```
if exists (select postalcode from authors
where postalcode = '94705')
print "Berkeley author"
```

Example 2 Declares a variable, assigns a value to the variable, and prints the value:

```
declare @msg char(50)
select @msg = "What's up, doc?"
print @msg

What's up, doc?
```

Example 3 Demonstrates the use of variables and placeholders in messages:

```
declare @tabname varchar(30)
select @tabname = "titles"

declare @username varchar(30)
select @username = "ezekiel"

print "The table '%1!' is not owned by the user '%2!'.",
@tabname, @username

The table 'titles' is not owned
by the user 'ezekiel.'
```

Usage

- The maximum output string length of *format_string* plus all arguments after substitution is 1024 bytes.
- If you use placeholders in a format string, keep this in mind: for each placeholder *n* in the string, the placeholders 1 through *n*- 1 must also exist in the same string, although they do not have to be in numerical order. For example, you cannot have placeholders 1 and 3 in a format string without having placeholder 2 in the same string. If you omit a number in a format string, an error message is generated when print is executed.

- The *arg_list* must include an argument for each placeholder in the *format_string*, or the transaction is aborted. You can use more arguments than placeholders.
- To include a literal percent sign as part of the error message, use two percent signs (“%%”) in the *format_string*. If you include a single percent sign (“%”) in the *format_string* that is not used as a placeholder, Adaptive Server returns an error message.
- If an argument evaluates to NULL, it is converted into a zero-length character string. If you do not want zero-length strings in the output, use the isnull function. For example, if *@arg* is null, the following statement prints `I think we have nothing here.`:

```
declare @arg varchar(30)
select @arg = isnull(col1, "nothing") from
table_a where ...
print "I think we have %1! here", @arg
```

- User-defined messages can be added to the system table sysusermessages for use by any application. Use sp_addmessage to add messages to sysusermessages; use sp_getmessage to retrieve messages for use by print and raiserror.
- Use raiserror instead of print to print a user-defined error message and have the error number stored in *@@error*.

Standards

ANSI SQL – Compliance level: Transact-SQL extension.

Permissions

print permission defaults to all users. No permission is required to use it.

See also

Commands declare, raiserror

System procedures sp_addmessage, sp_getmessage

quiesce database

Description

Suspends and resumes updates to a specified list of databases.

Syntax

quiesce database < *tag_name* > hold < *dbname list* > [for external dump]
[to <*manifest_file*> [with override]]

or:

quiesce database *tag_name* release

Parameters

tag_name
is a user-defined name that designates the list of databases to hold or release. The *tag_name* must conform to the rules for identifiers.

database
is a database name.

for external dump
specifies that while updates to the databases in the list are suspended, you will physically copy all affected database devices, using some facility external to Adaptive Server. The copy operation is to serve as a replacement for the combination of dump database and load database.

manifest_file
the binary file which describes the databases that are present on a set of database devices. It can be created only if the set of databases that occupy those devices are isolated, self-contained on those devices.

Since the manifest file is a binary file, operations that can do character translations of the file contents (such as ftp) will corrupt the file unless done in binary mode

Examples

Example 1 Suspends update activity on salesdb and ordersdb:

```
quiesce database report_dbs hold salesdb, ordersdb
```

Example 2 Resumes update activity on the databases labeled report_dbs:

```
quiesce database report_dbs release
```

Example 3 Suspends update activity to the pubs2 database and signifies your intent to make an external copy of this database:

```
quiesce database pubs_tag hold pubs2 for external dump
```

Example 4 Used to create a *manifest* file for a database that is going to be copied to another Adaptive Server:

```
quiesce database pubs_tag hold pubs2 for external dump to
"/work2/sybase1/mpubs_file", with override
```

Usage

- quiesce database used with the hold keyword suspends all updates to the specified database. Transactions cannot update data in suspended databases, and background tasks such as the checkpoint process and housekeeper process skip all databases that are in the suspended state.
- quiesce database used with the release keyword allows updates to resume on databases that were previously suspended.
- quiesce database used with the for external dump clause signifies that you intend to make an external copy of the database. It serves to replace a combination of dump and load database.
- The quiesce database hold and release commands need not be executed from the same user session.
- If the databases specified in the quiesce database hold command contain distributed or multidatabase transactions that are in the prepared state, Adaptive Server waits during a five-second timeout period for those transactions to complete. If the transactions do not complete during the timeout period, quiesce database hold fails.
- If Adaptive Server is executing a dump database or dump transaction command on a database specified in quiesce database hold, the database is suspended only after the dump command completes.
- If you execute a dump database or dump transaction command on a database while updates to the database are suspended, Adaptive Server blocks those commands until the database is released with quiesce database release.
- You can specify a maximum of eight databases in a single quiesce database hold command. If you must suspend updates to additional databases, execute additional quiesce database hold commands.
- To duplicate or copy databases, use quiesce database with the extension for creating the manifest file. The quiesce database effects the quiesce hold by blocking writes in the database, and then creates the manifest file. The command then returns control of the database to the user. You can now use a utility to copy the database to another Adaptive Server. These rules for quiesce database hold must be followed for the copy operation:
  - The copy operation cannot begin until the quiesce database hold process has completed.
  - Every device for every database in the quiesce database command must be copied.

- The copy process must complete before you invoke the quiesce database release.

Permissions

quiesce database permission defaults to System Administrators.

See also

Commands dump database, dump transaction, mount, unmount

System procedures sp_helpdb, sp_who

raiserror

Description

Prints a user-defined error message on the user's screen and sets a system flag to record that an error condition has occurred.

Syntax

raiserror *error_number*
[{*format_string* | *@local_variable*}] [, *arg_list*]
[with errordata *restricted_select_list*]

Parameters

error_number

is a local variable or an integer with a value greater than 17,000. If the *error_number* is between 17,000 and 19,999, and *format_string* is missing or empty (""), Adaptive Server retrieves error message text from the sysmessages table in the master database. These error messages are used chiefly by system procedures.

If *error_number* is 20,000 or greater and *format_string* is missing or empty, raiserror retrieves the message text from the sysusermessages table in the database from which the query or stored procedure originates. Adaptive Server attempts to retrieve messages from either sysmessages or sysusermessages in the language defined by the current setting of *@@langid*.

format_string

is a string of characters with a maximum length of 1024 bytes. Optionally, you can declare *format_string* in a local variable and use that variable with raiserror (see *@local_variable*).

raiserror recognizes placeholders in the character string that is to be printed out. Format strings can contain up to 20 unique placeholders in any order. These placeholders are replaced with the formatted contents of any arguments that follow *format_string*, when the text of the message is sent to the client.

To allow reordering of the arguments, when format strings are translated to a language with a different grammatical structure, the placeholders are numbered. A placeholder for an argument appears in this format: "%nn!"—a percent sign (%), followed by an integer from 1 to 20, followed by an exclamation point (!). The integer represents the argument number in the string in the argument list. "%1!" is the first argument in the original version, "%2!" is the second argument, and so on.

Indicating the position of the argument in this way makes it possible to translate correctly, even when the order in which the arguments appear in the target language is different from their order in the source language.

For example, assume the following is an English message:

```
%1! is not allowed in %2!.
```

The German version of this message is:

```
%1! ist in %2! nicht zulassig.
```

@local_variable
is a local variable containing the *format_string* value. It must be of type char or varchar and must be declared within the batch or procedure in which it is used.

arg_list
is a series of variables or constants separated by commas. *arg_list* is optional unless a format string containing placeholders of the form "%*nn* !" is provided. An argument can be any datatype except text or image; it is converted to the char datatype before being included in the final string.

If an argument evaluates to NULL, Adaptive Server converts it to a zero-length char string.

with errordata
supplies extended error data for Client-Library™ programs.

restricted_select_list
consists of one or more of the following items:

- "*", representing all columns in create table order.
- A list of column names in the order in which you want to see them. When selecting an existing IDENTITY column, you can substitute the syb_identity keyword, qualified by the table name, where necessary, for the actual column name.
- A specification to add a new IDENTITY column to the result table:

  ```
  column_name = identity(precision)
  ```

- A replacement for the default column heading (the column name), in the following forms:

  ```
  column_heading = column_name
  column_name column_heading
  ```

column_name as *column_heading*

The column heading may be enclosed in quotation marks for any of these forms. The heading must be enclosed in quotation marks if it is not a valid identifier (that is, if it is a reserved word, if it begins with a special character, or if it contains spaces or punctuation marks).

- An expression (a column name, constant, function, or any combination of column names, constants, and functions connected by arithmetic or bitwise operators, or a subquery).
- A built-in function or an aggregate.
- Any combination of the items listed above.

The *restricted_select_list* can also perform variable assignment, in the form:

```
@variable = expression
[, @variable = expression ...]
```

Restrictions to *restricted_select_list* are:

- You cannot combine variable assignment with any of the other *restricted_select_list* options.
- You cannot use from, where, or other select clauses in *restricted_select_list*.
- You cannot use "*" to represent all columns in *restricted_select_list*.

For more information, see the *Transact-SQL User's Guide*.

Examples

Example 1 This stored procedure example returns an error if it does not find the table supplied with the *@tabname* parameter:

```
create procedure showtable_sp @tabname varchar(18)
as
if not exists (select name from sysobjects
    where name = @tabname)
    begin
        raiserror 99999 "Table %1! not found.",
        @tabname
    end
else
    begin
        select sysobjects.name, type, crdate, indid
        from sysindexes, sysobjects
        where sysobjects.name = @tabname
        and sysobjects.id = sysindexes.id
    end
```

Example 2 This example adds a message to sysusermessages, then tests the message with raiserror, providing the substitution arguments:

```
sp_addmessage 25001,
"There is already a remote user named '%1!'
for remote server '%2!'."

raiserror 25001, jane, myserver
```

Example 3 This example uses the with errordata option to return the extended error data *column* and *server* to a client application, to indicate which column was involved and which server was used:

```
raiserror 20100 "Login must be at least 5
    characters long" with errordata "column" =
    "login", "server" = @@servername
```

Usage

- User-defined messages can be generated ad hoc, as in Example 1 and Example 3, or they can be added to the system table sysusermessages for use by any application, as shown in Example 2. Use sp_addmessage to add messages to sysusermessages; use sp_getmessage to retrieve messages for use by print and raiserror.
- Error numbers for user-defined error messages must be greater than 20,000. The maximum value is 2,147,483,647 (2^{31} -1).
- The severity level of all user-defined error messages is 16. This level indicates that the user has made a a nonfatal error.
- The maximum output string length of *format_string* plus all arguments after substitution is 1024 bytes.
- If you use placeholders in a format string, keep this in mind: for each placeholder *n* in the string, the placeholders *1* through *n-1* must exist in the same string, although they do not have to be in numerical order. For example, you cannot have placeholders 1 and 3 in a format string without having placeholder 2 in the same string. If you omit a number in a format string, an error message is generated when raiserror is executed.
- If there are too few arguments relative to the number of placeholders in *format_string*, an error message displays and the transaction is aborted. You can have more arguments than placeholders in *format_string*.
- To include a literal percent sign as part of the error message, use two percent signs (‘‘%%’’) in the *format_string*. If you include a single percent sign (‘‘%’’) in the *format_string* that is not used as a placeholder, Adaptive Server returns an error message.

- If an argument evaluates to NULL, it is converted into a zero-length char string. If you do not want zero-length strings in the output, use the isnull function.
- When raiserror is executed, the error number is placed in the global variable *@@error*, which stores the error number that was most recently generated by the system.
- Use raiserror instead of print if you want an error number stored in *@@error*.
- To include an *arg_list* with raiserror, put a comma after *error_number* or *format_string* before the first argument. To include extended error data, separate the first *extended_value* from *error_number*, *format_string*, or *arg_list* using a space (not a comma).

Standards — ANSI SQL – Compliance level: Transact-SQL extension.

Permissions — raiserror permission defaults to all users. No permission is required to use it.

See also — **Commands** declare, print

System procedures sp_addmessage, sp_getmessage

readtext

Description

Reads text and image values, starting from a specified offset and reading a specified number of bytes or characters.

Syntax

```
readtext [[database.]owner.]table_name.column_name
        text_pointer offset size
        [holdlock | noholdlock] [readpast]
        [using {bytes | chars | characters}]
        [at isolation {
            [ read uncommitted | 0 ] |
            [ read committed | 1 ] |
            [ repeatable read | 2 ]|
            [ serializable | 3 ] } ]
```

Parameters

table_name.column_name

is the name of the text or image column. You must include the table name. Specify the database name if the table is in another database, and specify the owner's name if more than one table of that name exists in the database. The default value for *owner* is the current user, and the default value for *database* is the current database.

text_pointer

is a varbinary(16) value that stores the pointer to the text or image data. Use the textptr function to determine this value (see Example 1). text and image data is not stored in the same set of linked pages as other table columns. It is stored in a separate set of linked pages. A pointer to the actual location is stored with the data; textptr returns this pointer.

offset

specifies the number of bytes or characters to skip before starting to read text or image data.

size

specifies the number of bytes or characters of data to read.

holdlock

causes the text value to be locked for reads until the end of the transaction. Other users can read the value, but they cannot modify it.

noholdlock

prevents the server from holding any locks acquired during the execution of this statement, regardless of the transaction isolation level currently in effect. You cannot specify both a holdlock and a noholdlock option in a query.

readpast

specifies that readtext should silently skip rows with exclusive locks, without waiting and without generating a message.

using
specifies whether readtext interprets the *offset* and *size* parameters as a number of bytes (bytes) or as a number of textptr characters (chars or characters are synonymous). This option has no effect when used with a single-byte character set or with image values (readtext reads image values byte by byte). If the using option is not given, readtext interprets the *size* and *offset* arguments as bytes.

at isolation
specifies the isolation level (0, 1, or 3) of the query. If you omit this clause, the query uses the isolation level of the session in which it executes (isolation level 1 by default). If you specify holdlock in a query that also specifies at isolation read uncommitted, Adaptive Server issues a warning and ignores the at isolation clause. For the other isolation levels, holdlock takes precedence over the at isolation clause.

read uncommitted
specifies isolation level 0 for the query. You can specify 0 instead of read uncommitted with the at isolation clause.

read committed
specifies isolation level 1 for the query. You can specify "1" instead of read committed with the at isolation clause.

repeatable read
specifies isolation level 2 for the query. You can specify "2" instead of serializable with the at isolation clause.

serializable
specifies isolation level 3 for the query. You can specify "3" instead of serializable with the at isolation clause.

Examples

Example 1 Selects the second through the sixth character of the copy column:

```
declare @val varbinary(16)
select @val = textptr(copy) from blurbs
where au_id = "648-92-1872"
readtext blurbs.copy @val 1 5 using chars
```

Example 2

```
declare @val varbinary(16)
select @val = textptr(copy) from blurbs readpast
where au_id = "648-92-1872"
readtext blurbs.copy @val 1 5 readpast using chars
```

Usage

- The textptr function returns a 16-byte binary string (text pointer) to the text or image column in the specified row or to the text or image column in the last row returned by the query, if more than one row is returned. It is best to declare a local variable to hold the text pointer, then use the variable with readtext.
- The value in the global variable *@@textsize*, which is the limit on the number of bytes of data to be returned, supersedes the size specified for readtext if it is less than that size. Use set textsize to change the value of *@@textsize*.
- When using bytes as the offset and size, Adaptive Server may find partial characters at the beginning or end of the text data to be returned. If it does, and character set conversion is on, the server replaces each partial character with a question mark (?) before returning the text to the client.
- Adaptive Server must determine the number of bytes to send to the client in response to a readtext command. When the *offset* and *size* are in bytes, determining the number of bytes in the returned text is simple. When the offset and size are in characters, the server must calculate the number of bytes being returned to the client. As a result, performance may be slower when using characters as the *offset* and *size*. The using characters option is useful only when Adaptive Server is using a multibyte character set: it ensures that readtext will not return partial characters.
- You cannot use readtext on text and image columns in views.
- If you attempt to use readtext on text values after changing to a multibyte character set, and you have not run dbcc fix_text, the command fails, and an error message instructs you to run dbcc fix_text on the table.

Using the *readpast* option

- readpast applies only to data-only-locked tables. readpast is ignored if it is specified for an allpages-locked table.
- The readpast option is incompatible with the holdlock option. If both are specified in a command, an error is generated and the command terminates.
- If readtext specifies at isolation read uncommitted, readpast generates a warning, but does not terminate the command.
- If the statement isolation level is set to 3, readpast generates an error and terminates the command.
- If the session-wide isolation level is 3, readpast is silently ignored.

- If the session-wide isolation level is 0, readpast generates a warning, but does not terminate the command.

Standards — ANSI SQL – Compliance level: Transact-SQL extension.

Permissions — readtext requires select permission on the table. readtext permission is transferred when select permission is transferred.

See also — **Commands** set, writetext

System procedures text and image datatypes

reconfigure

Description	The reconfigure command currently has no effect; it is included to allow existing scripts to run without modification. In earlier version, reconfigure was required after sp_configure to implement new configuration parameter settings.
Syntax	reconfigure
Usage	**Note** If you have scripts that include reconfigure, change them at your earliest convenience. Although reconfigure is included in this version, it may not continue to be supported in subsequent versions.
Standards	ANSI SQL – Compliance level: Transact-SQL extension.
Permissions	reconfigure permission defaults to System Administrators and is not transferable.
See also	**System procedures** sp_configure

remove java

Description

Removes one or more Java-SQL classes, packages, or JARs from a database.

Use when Java classes are installed in the database. Refer to *Java in Adaptive Server Enterprise* for more information.

Syntax

```
remove java
        class class_name [, class_name]...
            | package package_name [, package_name]...
            | jar jar_name [, jar_name]...[retain classes]
```

Parameters

class *class_name*

the name of one or more Java classes to be removed from the database. The classes must be installed in the current database.

package *package_name*

the name of one or more Java packages to be removed. The packages must be stored in the current database.

jar *jar_name*

either a SQL identifier or character string value of up to 30 bytes that contains a valid SQL identifier.

Each *jar_name* must be equal to the name of a retained JAR in the current database.

retain classes

specifies that the named JARs are no longer retained in the database, and the retained classes have no associated JAR.

Usage

- If a remove java statement is contained in a stored procedure, the current database is the database that is current when the procedure is created, not the database that is current when the procedure is called.

  If a remove java statement is not contained in a stored procedure, the current database is the database that is current when the remove statement is executed.

- If class or package is specified and any removed class has an associated JAR, then an exception is raised.
- If any stored procedure, table, or view contains a reference to a removed class as the datatype of a column, variable, or parameter, then an exception is raised.
- All removed classes are:
  - Deleted from the current database.

- Unloaded from the Java Virtual Machine (Java VM) of the current connection. The removed classes are not unloaded from the Java VMs of other connections.

- If any exception is raised during the execution of remove java, then all actions of remove java are cancelled.
- You cannot remove a Java-SQL class if that class is directly referenced by a SQLJ stored procedure or function.
- To remove a Java-SQL class from the database, you must:
  a Delete all SQLJ stored procedures or functions that directly reference the class using drop procedure and/or drop function.
  b Delete the Java-SQL class from the database using remove java.

Locks

- When you use remove java, an exclusive table lock is placed on sysxtypes.
- If jar is specified, then an exclusive table lock is placed on sysjars.

Permissions

You must be a System Administrator or Database Owner to use remove java.

See also

System procedures – sp_helpjava

System tables – sysjars, sysxtypes

Utilities – extractjava, installjava

reorg

Description

Reclaims unused space on pages, removes row forwarding, or rewrites all rows in the table to new pages, depending on the option used.

Syntax

reorg reclaim_space *tablename* [*indexname*]
[with {resume, time = *no_of_minutes*}]

reorg forwarded_rows *tablename*
[with {resume,time = *no_of_minutes*}]

reorg compact *tablename*
[with {resume, time = *no_of_minutes*}]

reorg rebuild *tablename* [*indexname*]

Parameters

reclaim_space
reclaims unused space left by deletes and updates. For each data page in a table, if there is unused space resulting from committed deletes or row-shortening updates, reorg reclaim_space rewrites the current rows contiguously, leaving all unused space at the end of the page. If there are no rows on the page, the page is deallocated.

tablename
specifies the name of the table to be reorganized. If *indexname* is specified, only the index is reorganized.

indexname
specifies the name of the index to be reorganized.

with resume
initiates reorganization from the point at which a previous reorg command terminated. Used when the previous reorg command specified a time limit (time = *no_of_minutes*).

with time = *no_of_minutes*
specifies the number of minutes that the reorg command is to run.

forwarded_rows
removes row forwarding.

compact
combines the functions of reorg reclaim_space and reorg forwarded_rows to both reclaim space and undo row forwarding in the same pass.

rebuild
if a table name is specified, rewrites all rows in a table to new pages, so that the table is arranged according to its clustered index (if one exists), with all pages conforming to current space management settings and with no forwarded rows and no gaps between rows on a page. If an index name is specified, reorg rebuilds that index while leaving the table accessible for read and update activities.

Examples

Example 1 Reclaims unused page space in the titles table:

```
reorg reclaim_space titles
```

Example 2 Reclaims unused page space in the index titleind:

```
reorg reclaim_space titles titleind
```

Example 3 Initiates reorg compact on the titles table. reorg starts at the beginning of the table and continues for 120 minutes. If the reorg completes within the time limit, it returns to the beginning of the table and continues until the full time period has elapsed:

```
reorg compact titles with time = 120
```

Example 4 Initiates reorg compact at the point where the previous reorg compact stopped and continues for 30 minutes:

```
reorg compact titles with resume, time = 30
```

Usage

- The table specified in reorg must have a datarows or datapages locking scheme.
- You cannot issue reorg within a transaction.
- reorg rebuild requires that you set the database option select into/bulkcopy/pllsort to true and run checkpoint in the database.
- reorg rebuild requires additional disk space equal to the size of the table and its indexes. You can find out how much space a table currently occupies by using sp_spaceused. You can use sp_helpsegment to check the amount of space available.
- After running reorg rebuild, you must dump the database before you can dump the transaction log.

Standards

ANSI SQL – Compliance level: Transact-SQL extension.

Permissions

You must be a System Administrator or the object owner to issue the reorg command.

See also

Documents For more information, see the *System Administration Guide*.

System procedures sp_chgattribute

return

Description

Exits from a batch or procedure unconditionally and provides an optional return status. Statements following return are not executed.

Syntax

return [*integer_expression*] [plan "abstract plan"]

Parameters

integer_expression
is the integer value returned by the procedure. Stored procedures can return an integer value to a calling procedure or an application program.

plan "*abstract plan*"
specifies the abstract plan to use to optimize the query. It can be a full or partial plan specified in the abstract plan language. Plans can only be specified for optimizable SQL statements, that is, queries that access tables. See Chapter 30, "Creating and Using Abstract Plans," in the *Performance and Tuning Guide* for more information.

Examples

Example 1 If no user name is given as a parameter, the return command causes the procedure to exit after a message has been sent to the user's screen. If a user name is given, the names of the rules created by that user in the current database are retrieved from the appropriate system tables:

```
create procedure findrules @nm varchar(30) = null as
if @nm is null
begin
    print "You must give a user name"
    return
end
else
begin
    select sysobjects.name, sysobjects.id,
    sysobjects.uid
    from sysobjects, master..syslogins
        where master..syslogins.name = @nm
        and sysobjects.uid = master..syslogins.suid
        and sysobjects.type = "R"
end
```

Example 2 If the updates cause the average price of business titles to exceed $15, the return command terminates the batch before any more updates are performed on titles:

```
print "Begin update batch"
update titles
    set price = price + $3
    where title_id = 'BU2075'
update titles
```

```
    set price = price + $3
    where title_id = 'BU1111'
if (select avg(price) from titles
      where title_id like 'BU%') > $15
begin
      print "Batch stopped; average price over $15"
    return
end
update titles
    set price = price + $2
      where title_id = 'BU1032'
```

Example 3 This procedure creates two user-defined status codes: a value of 1 is returned if the contract column contains a 1; a value of 2 is returned for any other condition (for example, a value of 0 on contract or a title_id that did not match a row):

```
create proc checkcontract @param varchar(11)
as
declare @status int
if (select contract from titles where title_id = @param)
= 1
    return 1
else
    return 2
```

Usage

- The return status value can be used in subsequent statements in the batch or procedure that executed the current procedure, but must be given in the form:

  ```
  execute @retval = procedure_name
  ```

  See execute for more information.

- Adaptive Server reserves 0 to indicate a successful return, and negative values in the range -1 to -99 to indicate different reasons for failure. If no user-defined return value is provided, the Adaptive Server value is used. User-defined return status values must not conflict with those reserved by Adaptive Server. Numbers 0 and -1 through -14 are currently in use:

Table 1-32: Adaptive Server error return values

Value	Meaning
0	Procedure executed without error
-1	Missing object
-2	Datatype error
-3	Process was chosen as deadlock victim
-4	Permission error
-5	Syntax error
-6	Miscellaneous user error
-7	Resource error, such as out of space
-8	Nonfatal internal problem
-9	System limit was reached
-10	Fatal internal inconsistency
-11	Fatal internal inconsistency
-12	Table or index is corrupt
-13	Database is corrupt
-14	Hardware error

Values -15 to -99 are reserved for future Adaptive Server use.

- If more than one error occurs during execution, the status with the highest absolute value is returned. User-defined return values always take precedence over Adaptive Server-supplied return values.
- The return command can be used at any point where you want to exit from a batch or procedure. Return is immediate and complete: statements after return are not executed.
- A stored procedure cannot return a NULL return status. If a procedure attempts to return a null value, for example, using return *@status* where *@status* is NULL, a warning message is generated, and a value in the range of 0 to -14 is returned.

Standards — ANSI SQL – Compliance level: Transact-SQL extension.

Permissions — return permission defaults to all users. No permission is required to use it.

See also — **Commands** begin...end, execute, if...else, while

revoke

Description

Revokes permissions or roles from users or roles.

Syntax

To revoke permission to access database objects:

```
revoke [grant option for]
    {all [privileges] | permission_list}
    on { table_name [(column_list)]
        | view_name [(column_list)]
        | stored_procedure_name}
    from {public | name_list | role_name}
    [cascade]
```

To revoke permission to select built-in functions:

```
revoke select
    on [builtin] built-in
    to { name_list | role_name }
```

To revoke permission to create database objects, execute set proxy, or execute set session authorization:

```
revoke {all [privileges] | command_list }
    from {public | name_list | role_name}
```

To revoke a role from a user or another role:

```
revoke role {role_name [, role_name ...]} from
    {grantee [, grantee ...]}
```

To revoke access on some dbcc commands.

```
revoke dbcc {dbcc_command [on {all | database }]
        [, dbcc_command [on {all | database }], ...]}
    from { user_list | role_list }
```

Parameters

all

when used to revoke permission to access database objects (the first syntax format), all revokes all permissions applicable to the specified object. All object owners can use revoke all with an object name to revoke permissions on their own objects.

Only the System Administrator or the Database Owner can revoke permission to revoke create command permissions (the second syntax format). When used by the System Administrator, revoke all revokes all create permissions (create database, create default, create procedure, create rule, create table, and create view). When the Database Owner uses revoke all, Adaptive Server revokes all create permissions except create database, and prints an informational message.

all does not apply to set proxy or set session authorization.

permission_list

is a list of permissions to revoke. If more than one permission is listed, separate them with commas. The following table illustrates the access permissions that can be granted and revoked on each type of object:

Object	permission_list can include
Table	select, insert, delete, update, references
View	select, insert, delete, update
Column	select, update, references Column names can be specified in either *permission_list* or *column_list* (see Example 2).
Stored procedure	execute

Permissions can be revoked only by the user who granted them.

function_list

is a built-in function. Specifying built-in functions allows you to differentiate between a table and a grantable built-in function with the same name. The functions are set_appcontext, get_appcontext, list_appcontext, and rm_appcontext.

command_list

is a list of commands. If more than one command is listed, separate them with commas. The command list can include create database, create default, create procedure, create rule, create table, create view, set proxy, or set session authorization. create database permission can be revoked only by a System Administrator and only from within the master database.

set proxy and set session authorization are identical; the only difference is that set session authorization follows the SQL standard, and set proxy is a Transact-SQL extension. Revoking permission to execute set proxy or set session authorization revokes permission to become another user in the server. Permissions for set proxy or set session authorization can be revoked only by a System Security Officer, and only from within the master database.

table_name

is the name of the table on which you are revoking permissions. The table must be in your current database. Only one object can be listed for each revoke statement.

column_list

is a list of columns, separated by commas, to which the privileges apply. If columns are specified, only select and update permissions can be revoked.

view_name
is the name of the view on which you are revoking permissions. The view must be in your current database. Only one object can be listed for each revoke statement.

stored _procedure_name
is the name of the stored procedure on which you are revoking permissions. The stored procedure must be in your current database. Only one object can be listed for each revoke statement.

public
is all users. For object access permissions, public excludes the object owner. For object creation permissions or set proxy authorizations, public excludes the Database Owner. You cannot grant permissions with grant option to "public" or to other groups or roles.

name_list
is a list of user and/or group names, separated by commas.

role
is the name of a system or user-defined role. Use revoke role to revoke granted roles from roles or users.

role_name
is the name of a system or user-defined role. This allows you to revoke permissions from all users who have been granted a specific role. The role name can be either a system role or a user-defined role created by a System Security Officer with create role. Either type of role can be granted to a user with the grant role command. In addition, sp_role can be used to grant system roles.

grantee
is the name of a system role, user-defined role, or a user, from whom you are revoking a role.

grant option for
revokes with grant option permissions, so that the user(s) specified in *name_list* can no longer grant the specified permissions to other users. If those users have granted permissions to other users, you must use the cascade option to revoke permissions from those users. The user specified in *name_list* retains permission to access the object, but can no longer grant access to other users. grant option for applies only to object access permissions, not to object creation permissions.

cascade
revokes the specified object access permissions from all users to whom the revokee granted permissions. Applies only to object access permissions, not to object creation permissions. When you use revoke without grant option for, permissions granted to other users by the revokee are also revoked: the cascade occurs automatically.

dbcc_command
is the name of the dbcc command you are granting. It cannot be a variable. Table 1-33 on page 393 lists the valid revoke dbcc commands.

database
is the name of the database on which you are granting permissions. It is used with database-specific dbcc commands to grant permission only on the target database. The grantee must be a valid user in the target database. *database* conforms to the rules for identifiers and cannot be a variable.

If there are multiple granted actions in the same command, *database* must be unique.

See "on all | database parameter and server-level commands" on page 394 for more information.

user_list
is a list of users to whom you are granting the permission, and cannot be a variable.

role_list
is a list of the name of system or user-defined roles to whom you are granting the permission, and cannot be a variable.

Note You cannot grant or revoke dbcc commands to public or groups.

Examples

Example 1 Revokes insert and delete permissions on the titles table from Mary and the "sales" group:

```
revoke insert, delete
on titles
from mary, sales
```

Example 2 Revokes select permission on the get_appcontext function to "public" (which includes all users):

```
revoke select on builtin get_appcontext to public
```

Compare this to the following, which revokes select permission on a table called get_appcontext, if a table with that name exists:

```
revoke select on get_appcontext to public
```

Example 3 Two ways to revoke update permission on the price and advance columns of the titles table from "public":

```
revoke update
on titles (price, advance)
from public
```

or:

```
revoke update (price, advance)
on titles
from public
```

Example 4 Revokes permission from Mary and John to use the create database and create table commands. Because create database permission is being revoked, this command must be executed by a System Administrator from within the master database. Mary and John's create table permission is revoked only within the master database:

```
revoke create database, create table from mary, john
```

Example 5 Revokes permission from Harry and Billy to execute either set proxy or set session authorization to impersonate another user in the server:

```
revoke set proxy from harry, billy
```

Example 6 Revokes permission from users with sso_role to execute either set proxy or set session authorization:

```
revoke set session authorization from sso_role
```

Example 7 Revokes permission from users with vip_role to impersonate another user in the server. vip_role must be a role defined by a System Security Officer with the create role command:

```
revoke set proxy from vip_role
```

Example 8 Revokes all object creation permissions from Mary in the current database:

```
revoke all from mary
```

Example 9 Revokes all object access permissions on the titles table from Mary:

```
revoke all on titles from mary
```

Example 10 Two ways to revoke Tom's permission to create a referential integrity constraint on another table that refers to the price and advance columns in the titles table:

```
revoke references
on titles (price, advance)
from tom
```

or:

```
revoke references (price, advance)
on titles
from tom
```

Example 11 Revokes permission to execute new_sproc from all users who have been granted the "operator" role:

```
revoke execute on new_sproc from oper_role
```

Example 12 Revokes John's permission to grant insert, update, and delete permissions on the authors table to other users. Also revokes from other users any such permissions that John has granted:

```
revoke grant option for
insert, update, delete
on authors
from john
cascade
```

Example 13 Revokes "doctor_role" from "specialist_role":

```
revoke role doctor_role from specialist_role
```

Example 14 Revokes "doctor_role" and "surgeon_role" from "specialist_role" and "intern_role", and from users Mary and Tom:

```
revoke role doctor_role, surgeon_role from
specialist_role, intern_role, mary, tom
```

Example 15 Revokes dbcc privileges from Frank:

```
1> use pubs2
2> go
1> revoke dbcc checkdb on pubs2 from checkdb_role
2> go
1> use master
2> go
1> revoke dbcc checkdb on all to frank
2> go
...
```

Usage

- See the grant command for more information about permissions.
- You can revoke permissions only on objects in your current database.
- You can revoke only permissions that were granted by you.

- You cannot revoke a role from a user while the user is logged in.
- grant and revoke commands are order sensitive. When there is a conflict, the command issued most recently takes effect.
- The word to can be substituted for the word from in the revoke syntax.
- If you do not specify grant option for in a revoke statement, with grant option permissions are revoked from the user along with the specified object access permissions. In addition, if the user has granted the specified permissions to any other users, all of those permissions are revoked. In other words, the revoke cascades.
- A grant statement adds one row to the sysprotects system table for each user, group, or role that receives the permission. If you subsequently revoke the permission from the user or group, Adaptive Server removes the row from sysprotects. If you revoke the permission from only selected group members, but not from the entire group to which it was granted, Adaptive Server retains the original row and adds a new row for the revoke.
- Permission to issue create trigger is granted to users by default. When you revoke permission for a user to create triggers, a revoke row is added in the sysprotects table for that user. To grant permission to issue create trigger, you must issue two grant commands. The first command removes the revoke row from sysprotects; the second inserts a grant row. If you revoke permission to create triggers, the user cannot create triggers even on tables that the user owns. Revoking permission to create triggers from a user affects only the database where the revoke command was issued.

Using the *cascade* option

- revoke grant option revokes the user's ability to grant the specified permission to other users, but does not revoke the permission itself from that user. If the user has granted that permission to others, you must use the cascade option; otherwise, you receive an error message and the revoke fails.

  For example, say you revoke the with grant option permissions from the user Bob on titles, with this statement:

```
revoke grant option for select
on titles
from bob
cascade
```

  - If Bob has not granted this permission to other users, this command revokes his ability to do so, but he retains select permission on the titles table.
  - If Bob has granted this permission to other users, you must use the cascade option. If you do not, you receive an error message and the revoke fails. cascade revokes this select permission from all users to whom Bob has granted it, as well as their ability to grant it to others.

- You cannot use revoke with the cascade option to revoke privileges granted by the table owner. For example, the owner of a table (UserA) can grant privileges to another user (UserB) as in this scenario:

  ```
  create table T1 (...)
  grant select on T1 to UserB
  ```

  However, the System Administrator cannot revoke UserB's privileges using the revoke privileges command with the cascade option as in this statement:

  ```
  revoke select on T1 from UserA cascade
  ```

  This statement revokes the select privileges of the table owner, but does not revoke those privileges from UserB.

  By default, all data manipulation language (DML) operations are revoked implicitly for users other than the table owner. Because the sysprotects table contains no records indicating that the table owner has granted and then revoked privileges, the cascade option is not invoked.

  You must revoke explicitly the select privilege from UserB.

Revoking *set proxy* and *set session authorization*

- To revoke set proxy or set session authorization permission, or to revoke roles, you must be a System Security Officer, and you must be in the master database.
- set proxy and set session authorization are identical, with one exception: set session authorization follows the SQL standard. If you are concerned about using only SQL standard commands and syntax, use set session authorization.
- revoke all does *not* include set proxy or set session authorization permissions.

Revoking from roles, users and groups

- Permissions granted to roles override permissions granted to individual users or groups. Therefore, if you revoke a permission from a user who has been granted a role, and the role has that same permission, the user retains it. For example, say John has been granted the System Security Officer role, and sso_role has been granted permission on the sales table. If John's individual permission on sales is revoked, he can still access sales because his role permissions override his individual permissions.
- Revoking a specific permission from "public" or from a group also revokes it from users who were individually granted the permission.
- Database user groups allow you to grant or revoke permissions to more than one user at a time. A user is always a member of the default group, "public" and can be a member of only one other group. Adaptive Server's installation script assigns a set of permissions to "public."

  Create groups with sp_addgroup and remove groups with sp_dropgroup. Add new users to a group with sp_adduser. Change a user's group membership with sp_changegroup. To display the members of a group, use sp_helpgroup.

revoke dbcc command options

Table 1-33 lists the valid revoke dbcc commands.

Table 1-33: dbcc command options

Command name	Description
checkalloc	Checks the specified database to make sure all of its pages are correctly allocated, and that there are no unused allocated pages.
checkcatalog	Checks for consistency in and between system tables.
checkdb	Runs the same checks as checktable, but on each table in the specified database, including syslogs.
checkstorage	Checks the specified database for: • Allocation • OAM page entries • Page consistency • Text-valued columns • Allocation of text-valued columns • Text-column chains

Command name	Description
checktable	Checks the specified table to make sure that: • Index and data pages are correctly linked. • Indexes are correctly sorted. • All pointers are consistent. • Data information on each page is reasonable. • Page offsets are reasonable.
checkverify	Verifies the results of the most recent run of dbcc checkstorage for the specified database.
fix_text	Upgrades text values after any Adaptive Server character set is converted to a new multibyte character set.
indexalloc	Checks the specified index to make sure all pages are correctly allocated, and that there are no unused allocated pages.
reindex	Checks the integrity of indexes on user tables by running a fast version of dbcc checktable.
tablealloc	Checks the specified table to make sure that all pages are correctly allocated, and that there are no unused allocated pages.
textalloc	Checks for a violation of the format of the root page of a text or image index.
tune	Enables or disables tuning flags for special performance situations.

All of the options in Table 1-33 on page 393 are database-level commands except for tune, which is a server-level command.

See Chapter 25, "Checking Database Consistency" in the *System Administration Guide* for more information on these dbcc commands.

on all | *database* parameter and server-level commands

The on *database* parameter specifies the database on which to invoke the database-level revoke dbcc command. Because on master grants the ability to use dbcc commands on all databases, on master is the same as on all. You must be in the master database to use either the on all and on master parameters.

Neither the on *database* nor on all parameters work when invoking a server-level grant dbcc command such as dbcc tune, because by doing so, you are forcing a server-level command to restrict itself to individual databases. For this reason, using the server-level revoke dbcc tune on master command raises an error.

Standards

ANSI SQL – Compliance level: Transact-SQL extension.

Permissions

Database object access revoke permission for database objects defaults to object owners. An object owner can revoke permission from other users on his or her own database objects.

Command execution Only a System Administrator can revoke create database permission, and only from the master database. Only a System Security Officer can revoke create trigger permission.

Proxy and session authorization Only a System Security Officer can revoke set proxy or set session authorization, and only from the master database.

Roles You can revoke roles only from the master database. Only a System Security Officer can revoke sso_role, oper_role, or a user-defined role from a user or a role. Only System Administrators can revoke sa_role from a user or a role. Only a user who has both sa_role and sso_role can revoke a role that includes sa_role.

Database consistency checking Only System Administrators can run revoke dbcc commands. Database Owners cannot run revoke dbcc.

See also

Commands grant, setuser, set

Functions proc_role

System procedures sp_activeroles, sp_adduser, sp_changedbowner, sp_changegroup, sp_displaylogin, sp_displayroles, sp_dropgroup, sp_dropuser, sp_helpgroup, sp_helprotect, sp_helpuser, sp_modifylogin, sp_role

rollback

Description

Rolls back a user-defined transaction to the named savepoint in the transaction or to the beginning of the transaction.

Syntax

rollback [tran | transaction | work]
[*transaction_name* | *savepoint_name*]

Parameters

tran | transaction | work

specifies that you want to roll back the transaction or the work. If you specify tran, transaction, or work, you can also specify the *transaction_name* or the *savepoint_name*.

transaction_name

is the name assigned to the outermost transaction. It must conform to the rules for identifiers.

savepoint_name

is the name assigned to the savepoint in the save transaction statement. The name must conform to the rules for identifiers.

Examples

Rolls back the transaction:

```
begin transaction
delete from publishers where pub_id = "9906"
rollback transaction
```

Usage

- rollback transaction without a *transaction_name* or *savepoint_name* rolls back a user-defined transaction to the beginning of the outermost transaction.
- rollback transaction *transaction_name* rolls back a user-defined transaction to the beginning of the named transaction. Though you can nest transactions, you can roll back only the outermost transaction.
- rollback transaction *savepoint_name* rolls a user-defined transaction back to the matching save transaction *savepoint_name*.

Restrictions

- If no transaction is currently active, the commit or rollback statement has no effect.
- The rollback command must appear within a transaction. You cannot roll back a transaction after commit has been entered.

Rolling back an entire transaction

- rollback without a savepoint name cancels an entire transaction. All the transaction's statements or procedures are undone.

- If no *savepoint_name* or *transaction_name* is given with the rollback command, the transaction is rolled back to the first begin transaction in the batch. This also includes transactions that were started with an implicit begin transaction using the chained transaction mode.

Rolling back to a savepoint

- To cancel part of a transaction, use rollback with a *savepoint_name*. A savepoint is a marker set within a transaction by the user with the command save transaction. All statements or procedures between the savepoint and the rollback are undone.

  After a transaction is rolled back to a savepoint, it can proceed to completion (executing any SQL statements after that rollback) using commit, or it can be canceled altogether using rollback without a savepoint. There is no limit on the number of savepoints within a transaction.

Rollbacks within triggers and stored procedures

- In triggers or stored procedures, rollback statements without transaction or savepoint names roll back all statements to the first explicit or implicit begin transaction in the batch that called the procedure or fired the trigger.
- When a trigger contains a rollback command without a savepoint name, the rollback aborts the entire batch. Any statements in the batch following the rollback are not executed.
- A remote procedure call (RPC) is executed independently from any transaction in which it is included. In a standard transaction (that is, not using Open Client™ DB-Library two-phase commit), commands executed via an RPC by a remote server are not rolled back with rollback and do not depend on commit to be executed.
- For complete information on using transaction management statements and on the effects of rollback on stored procedures, triggers, and batches, see the *Transact-SQL User's Guide*.

Standards

ANSI SQL – Compliance level: Entry-level compliant.

Transact-SQL extensions Tthe rollback transaction and rollback tran forms of the statement and the use of a transaction name.

Permissions

rollback permission defaults to "public." No permission is required to use it.

See also

Commands begin transaction, commit, create trigger, save transaction

rollback trigger

Description

Rolls back the work done in a trigger, including the data modification that caused the trigger to fire, and issues an optional raiserror statement.

Syntax

```
rollback trigger
        [with raiserror_statement]
```

Parameters

with *raiserror_statement*

specifies a raiserror statement, which prints a user-defined error message and sets a system flag to record that an error condition has occurred. This provides the ability to raise an error to the client when the rollback trigger is executed so that the transaction state in the error reflects the rollback. For information about the syntax and rules defining raiserror_statement, see the raiserror command.

Examples

Rolls back a trigger and issues the user-defined error message 25002:

```
rollback trigger with raiserror 25002
    "title_id does not exist in titles table."
```

Usage

- When rollback trigger is executed, Adaptive Server aborts the currently executing command and halts execution of the rest of the trigger.
- If the trigger that issues rollback trigger is nested within other triggers, Adaptive Server rolls back all work done in these triggers up to and including the update that caused the first trigger to fire.
- Adaptive Server ignores a rollback trigger statement that is executed outside a trigger and does not issue a raiserror associated with the statement. However, a rollback trigger statement executed outside a trigger but inside a transaction generates an error that causes Adaptive Server to roll back the transaction and abort the current statement batch.

Standards

ANSI SQL – Compliance level: Transact-SQL extension.

Permissions

rollback trigger permission defaults to “public.” No permission is required to use it.

See also

Commands create trigger, raiserror, rollback

save transaction

Description

Sets a savepoint within a transaction.

Syntax

save transaction *savepoint_name*

Parameters

savepoint_name
is the name assigned to the savepoint. It must conform to the rules for identifiers.

Examples

After updating the royaltyper entries for the two authors, insert the savepoint percentchanged, then determine how a 10 percent increase in the book's price would affect the authors' royalty earnings. The transaction is rolled back to the savepoint with rollback transaction:

```
begin transaction royalty_change

update titleauthor
set royaltyper = 65
from titleauthor, titles
where royaltyper = 75
and titleauthor.title_id = titles.title_id
and title = "The Gourmet Microwave"

update titleauthor
set royaltyper = 35
from titleauthor, titles
where royaltyper = 25
and titleauthor.title_id = titles.title_id
and title = "The Gourmet Microwave"

save transaction percentchanged

update titles
set price = price * 1.1
where title = "The Gourmet Microwave"

select (price * total_sales) * royaltyper
from titles, titleauthor
where title = "The Gourmet Microwave"
and titles.title_id = titleauthor.title_id

rollback transaction percentchanged

commit transaction
```

Usage

- For complete information on using transaction statements, see the *Transact-SQL User's Guide*.

- A savepoint is a user-defined marker within a transaction that allows portions of a transaction to be rolled back. rollback *savepoint_name* rolls back to the indicated savepoint; all statements or procedures between the savepoint and the rollback are undone.

  Statements preceding the savepoint are not undone—but neither are they committed. After rolling back to the savepoint, the transaction continues to execute statements. A rollback without a savepoint cancels the entire transaction. A commit allows it to proceed to completion.

- If you nest transactions, save transaction creates a savepoint only in the outermost transaction.

- There is no limit on the number of savepoints within a transaction.

- If no *savepoint_name* or *transaction_name* is given with the rollback command, all statements back to the first begin transaction in a batch are rolled back, and the entire transaction is canceled.

Standards

ANSI SQL – Compliance level: Transact-SQL extension.

Permissions

save transaction permission defaults to "public." No permission is required to use it.

See also

Commands begin transaction, commit, rollback

select

Description

Retrieves rows from database objects.

Syntax

select ::=
    select [all | distinct] *select_list*
    [*into_clause*]
    [*from_clause*]
    [*where_clause*]
    [*group_by_clause*]
    [*having_clause*]
    [*order_by_clause*]
    [*compute_clause*]
    [*read_only_clause*]
    [*isolation_clause*]
    [*browse_clause*]
    [*plan_clause*]

select_list ::=

Note For details on *select_list*, see the parameters description.

---

into_clause ::=
    into [[*database*.]*owner*.]*table_name*
    [lock {datarows | datapages | allpages }]
    [with *into_option* [, *into_option*] ...]

    into_option ::=
        | max_rows_per_page = *num_rows*
        | exp_row_size = *num_bytes*
        | reservepagegap = *num_pages*
        | identity_gap = *gap*
        [existing table *table_name*]
        [[external *type*] at "*path_name*"
        [column delimiter *delimiter*]]

from_clause ::=
    from *table_reference* [,*table_reference*]...

    table_reference ::=
        table_view_name | *ANSI_join*

        table_view_name ::=
            [[*database*.]*owner*.] {{*table_name* | *view_name*}
            [as] [*correlation_name*]
            [index {*index_name* | *table_name* }]
            [parallel [*degree_of_parallelism*]]
            [prefetch size][lru | mru]}
        [holdlock | noholdlock]
        [readpast]
        [shared]

ANSI_join ::=
table_reference join_type join *table_reference*
join_conditions
join_type ::= inner | left [outer] | right [outer]
join_conditions ::= on *search_conditions*

where_clause ::=
where *search_conditions*

group_by_clause ::=
group by [all] *aggregate_free_expression*
[, *aggregate_free_expression*]...

having_clause ::=
having *search_conditions*

order_by_clause ::=
order by *sort_clause* [, *sort_clause*]...

sort_clause ::=
{ [[[*database*.]*owner*.]{*table_name*.|*view_name*.}]*column_name*
| *select_list_number*
| *expression* }
[asc | desc]

compute_clause ::=
compute *row_aggregate*(*column_name*)
[, *row_aggregate*(*column_name*)]...
[by *column_name* [, *column_name*]...]

read_only_clause ::=
for {read only | update [of *column_name_list*]}

isolation_clause ::=
at isolation
{ read uncommitted | 0 }
| { read committed | 1 }
| { repeatable read | 2 }
| { serializable | 3 }

browse_clause ::=
for browse

plan_clause ::=
plan "abstract plan"

Parameters

all

includes all rows in the results. all is the default.

distinct

includes only unique rows in the results. distinct must be the first word in the select list. distinct is ignored in browse mode.

Null values are considered equal for the purposes of the keyword distinct: only one NULL is selected, no matter how many are encountered.

select_list

consists of one or more of the following items:

- "*", representing all columns in create table order.
- A list of column names in the order in which you want to see them. When selecting an existing IDENTITY column, you can substitute the syb_identity keyword, qualified by the table name, where necessary, for the actual column name.
- A specification to add a new IDENTITY column to the result table:

  ```
  column_name = identity(precision)
  ```

- A replacement for the default column heading (the column name), in one of these forms:

  ```
  column_heading = column_name
  column_name column_heading
  column_name as column_heading
  ```

  The column heading can be enclosed in quotation marks for any of these forms. The heading must be enclosed in quotation marks if it is not a valid identifier (that is, if it is a reserved word, if it begins with a special character, or if it contains spaces or punctuation marks).

- An expression (a column name, constant, function, or any combination of column names, constants, and functions connected by arithmetic or bitwise operators, or a subquery).
- A built-in function or an aggregate.
- Any combination of the items listed above.

The *select_list* can also assign values to variables, in the form:

```
@variable = expression
    [, @variable = expression ...]
```

You cannot combine variable assignment with any other *select_list* option.

into

creates a new table based on the columns specified in the select list and the rows chosen in the where clause. See "Using select into" in this section.

lock datarows | datapages | allpages

specifies the locking scheme to be used for a table created with a select into command. The default is the server-wide

ting for the configuration parameter lock scheme.

max_rows_per_page
: limits the number of rows on data pages for a table created with select into. Unlike fillfactor, the max_rows_per_page value is maintained when data is inserted or deleted. max_rows_per_page is not supported on data-only-locked tables.

existing table *table_name*
: indicates that you are selecting data into a proxy table. You cannot use this select into any other table type except proxy. The column list in the select list must match the type, length, and number in the proxy table.

at "*path_name*"
: indicates the full path name of the external file you are selecting into. You can only use the at parameter to select into a proxy table.

external [table | file]
: indicates that the type of the external object is either a file or a table. If you do indicate either a file or a table, select into assumes that you are using a table.

column delimeter "*delimiter*"
: indicates the delimiter that you are using to separate columns. If you do not specify a delimiter, select into uses the tab character.

exp_row_size = *num_bytes*
: specifies the expected row size for a table created with the select into command. Valid only for datarows and datapages locking schemes and only for tables that have variable-length rows. Valid values are 0, 1, and any value greater than the minimum row length and less than the maximum row length for the table. The default value is 0, which means that a server-wide default is used.

reservepagegap = *num_pages*
: specifies a ratio of filled pages to empty pages that is to be left as select into allocates extents to store data. This option is valid only for the select into command. For each specified *num_pages*, one empty page is left for future expansion of the table. Valid values are 0 – 255. The default value is 0.

readpast
: specifies that the query should silently skip rows with exclusive locks, without waiting and without generating a message.

with identity_gap
: specifies the identity gap for the table. This value overrides the system identity gap setting for this table only.

value
is the identity gap amount.

If you are creating a table in a select into statement from a table that has a specific identity gap setting, the new table does not inherit the identity gap setting from the parent table. Instead, the new table uses the identity burning set factor setting. To give the new table a specific identity_gap setting, specify the identity gap in the select into statement. You can give the new table an identity gap that is the same as or different from the parent table.

from
indicates which tables and views to use in the select statement. It is required except when the select list contains no column names (that is, it contains constants and arithmetic expressions only):

```
select 5 x, 2 y, "the product is", 5*2 Result

x       y                       Result
------- ------- ------------------ -----------
        5       2 the product is   10
```

At most, a query can reference 50 tables and 14 worktables (such as those created by aggregate functions). The 50-table limit includes:

- Tables (or views on tables) listed in the from clause
- Each instance of multiple references to the same table (self-joins)
- Tables referenced in subqueries
- Tables being created with into
- Base tables referenced by the views listed in the from clause

view_name, *table_name*

lists tables and views used in the select statement. Specify the database name if the table or view is in another database, and specify the owner's name if more than one table or view of that name exists in the database. The default value for *owner* is the current user, and the default value for *database* is the current database.

If there is more than one table or view in the list, separate their names by commas. The order of the tables and views following the keyword from does not affect the results.

You can query tables in different databases in the same statement.

Table names and view names can be given correlation names (aliases), either for clarity or to distinguish the different roles that tables or views play in self-joins or subqueries. To assign a correlation name, give the table or view name, then a space, then the correlation name, like this:

```
select pub_name, title_id
    from publishers pu, titles t
    where t.pub_id = pu.pub_id
```

All other references to that table or view (for example in a where clause) must use the correlation name. Correlation names cannot begin with a numeral.

index *index_name*

specifies the index to use to access *table_name*. You cannot use this option when you select from a view, but you can use it as part of a select clause in a create view statement.

parallel

specifies a parallel partition or index scan, if Adaptive Server is configured to allow parallel processing.

degree_of_parallelism

specifies the number of worker processes that will scan the table or index in parallel. If set to 1, the query executes serially.

prefetch *size*

specifies the I/O size, in kilobytes, for tables bound to caches with large I/Os configured. You cannot use this option when you select from a view, but you can use it as part of a select clause in a create view statement. sp_helpcache shows the valid sizes for the cache an object is bound to or for the default cache. To configure the data cache size, use sp_cacheconfigure.

When using prefetch and designating the prefetch size (*size*), the minimum is 2K and any power of two on the logical page size up to 16K. prefetch size options in kilobytes are:

Logical page size	Prefetch size options
2	2, 4, 8 16
4	4, 8, 16, 32
8	8, 16, 32, 64
16	16, 32, 64, 128

The prefetch size specified in the query is only a suggestion. To allow the size specification, configure the data cache at that size. If you do not configure the data cache to a specific size, the default prefetch size is used.

If Component Integration Services is enabled, you cannot use prefetch for remote servers.

lru | mru

specifies the buffer replacement strategy to use for the table. Use lru to force the optimizer to read the table into the cache on the MRU/LRU (most recently used/least recently used) chain. Use mru to discard the buffer from cache and replace it with the next buffer for the table. You cannot use this option when you select from a view, but you can use it as part of a select clause in a create view statement.

holdlock
: makes a shared lock on a specified table or view more restrictive by holding it until the transaction completes (instead of releasing the shared lock as soon as the required data page is no longer needed, whether or not the transaction has completed).

  The holdlock option applies only to the table or view for which it is specified, and only for the duration of the transaction defined by the statement in which it is used. Setting the transaction isolation level 3 option of the set command implicitly applies a holdlock for each select statement within a transaction. The keyword holdlock is not permitted in a select statement that includes the for browse option. You cannot specify both a holdlock and a noholdlock option in a query.

  If Component Integration Services is enabled, you cannot use holdlock for remote servers.

noholdlock
: prevents the server from holding any locks acquired during the execution of this select statement, regardless of the transaction isolation level currently in effect. You cannot specify both a holdlock and a noholdlock option in a query.

shared
: instructs Adaptive Server to use a shared lock (instead of an update lock) on a specified table or view. This allows other clients to obtain an update lock on that table or view. You can use the shared keyword only with a select clause included as part of a declare cursor statement. For example:

```
declare shared_crsr cursor
for select title, title_id
from titles shared
where title_id like "BU%"
```

  You can use the holdlock keyword in conjunction with shared after each table or view name, but holdlock must precede shared.

ANSI join
: an inner or outer join that uses the ANSI syntax. The from clause specifies which tables are to be joined.

inner
: includes only the rows of the inner and outer tables that meet the conditions of the on clause. The result set of a query that includes an inner join does not include any null supplied rows for the rows of the outer table that do not meet the conditions of the on clause.

outer
includes all the rows from the outer table whether or not they meet the conditions of the on clause. If a row does not meet the conditions of the on clause, values from the inner table are stored in the joined table as null values. The where clause of an ANSI outer join restricts the rows that are included in the query result.

left
left joins retain all the rows of the table reference listed on the left of the join clause. The left table reference is referred to as the outer table or row-preserving table.

In the queries below, T1 is the outer table and T2 is the inner table:

```
T1 left join T2
T2 right join T1
```

right
right joins retain all the rows of the table reference on the right of the join clause (see example above).

search_conditions
used to set the conditions for the rows that are retrieved. A search condition can include column names, expressions, arithmetic operators, comparison operators, the keywords not, like, is null, and, or, between, in, exists, any, and all, subqueries, case expressions, or any combination of these items. See where clause on page 487 for more information.

group by
finds a value for each group. These values appear as new columns in the results, rather than as new rows.

When group by is used with standard SQL, each item in the select list must either have a fixed value in every row in the group or be used with aggregate functions, which produce a single value for each group. Transact-SQL has no such restrictions on the items in the select list. Also, Transact-SQL allows you to group by any expression (except by a column alias); with standard SQL, you can group by a column only.

You can use the aggregates listed in Table 1-34 with group by (*expression* is almost always a column name):

Table 1-34: Results of using aggregates with group by

Aggregate function	Result
sum([all | distinct] *expression*)	Total of the values in the numeric column.
avg([all | distinct] *expression*)	Average of the values in the numeric column.
count([all | distinct] *expression*)	Number of (distinct) non-null values in the column.
count(*)	Number of selected rows.
max(*expression*)	Highest value in the column.
min(*expression*)	Lowest value in the column.

See group by and having clauses on page 301 for more information.

A table can be grouped by any combination of columns—that is, groups can be nested within each other. You cannot group by a column heading; you must use a column name, an expression, or a number representing the position of the item in the select list.

group by all
: includes all groups in the results, even those that do not have any rows that meet the search conditions. See group by and having clauses on page 301 for an example.

aggregate_free_expression
: is an expression that includes no aggregates.

having
: sets conditions for the group by clause, similar to the way that where sets conditions for the select clause. There is no limit on the number of conditions that can be included.

  You can use a having clause without a group by clause.

  If any columns in the select list do not have aggregate functions applied to them and are not included in the query's group by clause (illegal in standard SQL), the meanings of having and where are somewhat different.

  In this situation, a where clause restricts the rows that are included in the calculation of the aggregate, but does not restrict the rows returned by the query. Conversely, a having clause restricts the rows returned by the query, but does not affect the calculation of the aggregate. See group by and having clauses on page 301 for examples.

order by
: sorts the results by columns. In Transact-SQL, you can use order by for items that do not appear in the select list. You can sort by a column name, a column heading (or alias), an expression, or a number representing the position of the item in the **select list** (the *select_list_number*). If you sort by select list number, the columns to which the order by clause refers must be included in the select list, and the select list cannot be * (asterisk).

asc
: sorts results in ascending order (the default).

desc
: sorts results in descending order.

compute
: used with row aggregates (sum, avg, min, max, and count) to generate control break summary values. The summary values appear as additional rows in the query results, allowing you to see detail and summary rows with one statement.

  You cannot use a select into clause with compute.

  If you use compute by, you must also use an order by clause. The columns listed after compute by must be identical to or a subset of those listed after order by, and must be in the same left-to-right order, start with the same expression, and not skip any expressions.

  For example, if the order by clause is `order by a, b, c`, the compute by clause can be any (or all) of these:

  ```
  compute by a, b, c
  compute by a, b
  compute by a
  ```

  The keyword compute can be used without by to generate grand totals, grand counts, and so on. order by is optional if you use compute without by. See compute clause on page 54 for details and examples.

  If Component Integration Services is enabled, compute is not forwarded to remote servers.

for {read only | update}
specifies that a cursor result set is read-only or updatable. You can use this option only within a stored procedure and only when the procedure defines a query for a cursor. In this case, the select is the only statement allowed in the procedure. It defines the for read only or for update option (instead of the declare cursor statement). This method of declaring cursors provides the advantage of page-level locking while fetching rows.

If the select statement in the stored procedure is not used to define a cursor, Adaptive Server ignores the for read only | update option. See the Embedded SQL™ documentation for more information about using stored procedures to declare cursors. For information about read-only or updatable cursors, see the *Transact-SQL User's Guide*.

of *column_name_list*
is the list of columns from a cursor result set defined as updatable with the for update option.

at isolation
specifies the isolation level (0, 1, 2 or 3) of the query. If you omit this clause, the query uses the isolation level of the session in which it executes (isolation level 1 by default). The at isolation clause is valid only for single queries or within the declare cursor statement. Adaptive Server returns a syntax error if you use at isolation:

- With a query using the into clause
- Within a subquery
- With a query in the create view statement
- With a query in the insert statement
- With a query using the for browse clause

If there is a union operator in the query, you must specify the at isolation clause after the last select. If you specify holdlock, noholdlock, or shared in a query that also specifies at isolation read uncommitted, Adaptive Server issues a warning and ignores the at isolation clause. For the other isolation levels, holdlock takes precedence over the at isolation clause. For more information about isolation levels, see the *Transact-SQL User's Guide*.

If Component Integration Services is enabled, you cannot use at isolation for remote servers.

read uncommitted | 0
specifies isolation level 0 for the query.

read committed | 1
specifies isolation level 1 for the query.

repeatable read | 2
specifies transaction isolation level 2 for the query.

serializable | 3
specifies isolation level 3 for the query.

for browse
must be attached to the end of a SQL statement sent to Adaptive Server in a DB-Library browse application. See the *Open Client DB-Library Reference Manual* for details.

plan "*abstract plan*"
specifies the abstract plan to use to optimize the query. It can be a full or partial plan, specified in the abstract plan language. See Chapter 30, "Creating and Using Abstract Plans," in the *Performance and Tuning Guide* for more information.

Examples

Example 1 Selects all rows and columns from the publishers table:

```
select * from publishers

pub_id pub_name                    city                 state
------ --------------------------- -------------------- -----
0736    New Age Books              Boston               MA
0877    Binnet & Hardley           Washington           DC
1389    Algodata Infosystems       Berkeley             CA
```

Example 2 Selects all rows from specific columns of the publishers table:

```
select pub_id, pub_name, city, state from publishers
```

Example 3 Selects all rows from specific columns of the publishers table, substituting one column name and adding a string to the output:

```
select "The publisher's name is",
Publisher = pub_name, pub_id
from publishers

                        Publisher                       pub_id
----------------------- ------------------------------- ------
The publisher's name is New Age Books                   0736
The publisher's name is Binnet & Hardley                0877
The publisher's name is Algodata Infosystems            1389
```

Example 4 Selects all rows from specific columns of the titles table, substituting column names:

```
select type as Type, price as Price
from titles
```

Example 5 Specifies the locking scheme and the reserve page gap for select into:

```
select title_id, title, price
into bus_titles
lock datarows with reservepagegap = 10
from titles
where type = "business"
```

Example 6 Selects only the rows that are not exclusively locked. If any other user has an exclusive lock on a qualifying row, that row is not returned:

```
select title, price
from titles readpast
    where type = "news"
    and price between $20 and $30
```

Example 7 Selects specific columns and rows, placing the results into the temporary table #advance_rpt:

```
select pub_id, total = sum (total_sales)
    into #advance_rpt
from titles
where advance < $10000
    and total_sales is not null
group by pub_id
having count(*) > 1
```

Example 8 Concatenates two columns and places the results into the temporary table #tempnames:

```
select "Author_name" = au_fname + " " + au_lname
    into #tempnames
    from authors
```

Example 9 Selects specific columns and rows, returns the results ordered by type from highest to lowest, and calculates summary information:

```
select type, price, advance from titles
order by type desc
compute avg(price), sum(advance) by type
compute sum(price), sum(advance)
```

Example 10 Selects specific columns and rows, and calculates totals for the price and advance columns:

```
select type, price, advance from titles compute sum(price), sum(advance)
```

Example 11 Creates the coffeetabletitles table, a copy of the titles table which includes only books priced over $20:

```
select * into coffeetabletitles from titles
where price > $20
```

Example 12 Creates the newtitles table, an empty copy of the titles table:

```
select * into newtitles from titles
where 1 = 0
```

Example 13 Updates the existing authors table to include only books priced over $20:

```
select * into authors from titles
where price > $20
```

Example 14 Gives an optimizer hint:

```
select title_id, title
    from titles (index title_id_ind prefetch 16)
    where title_id like "BU%"
```

Example 15 Selects the IDENTITY column from the sales_east and sales_west tables by using the syb_identity keyword:

```
select sales_east.syb_identity,
sales_west.syb_identity
from sales_east, sales_west
```

Example 16 Creates the newtitles table, a copy of the titles table with an IDENTITY column:

```
select *, row_id = identity(10)
into newtitles from titles
```

Example 17 Specifies a transaction isolation level for the query.

```
select pub_id, pub_name
from publishers
at isolation read uncommitted
```

Example 18 Selects from titles using the repeatable read isolation level. No other user can change values in or delete the affected rows until the transaction completes:

```
begin tran
select type, avg(price)
    from titles
    group by type
```

```
at isolation repeatable read
```

Example 19 Gives an optimizer hint for the parallel degree for the query:

```
select ord_num from salesdetail
    (index salesdetail parallel 3)
```

Example 20 Joins the titleauthor and the titles tables on their title_id columns. The result set only includes those rows that contain a price greater than 15:

```
select au_id, titles.title_id, title, price
from titleauthor inner join titles
on titleauthor.title_id = titles.title_id
and price > 15
```

Example 21 The result set contains all the authors from the authors table. The authors who do not live in the same city as their publishers produce null values in the pub_name column. Only the authors who live in the same city as their publishers, Cheryl Carson and Abraham Bennet, produce a non-null value in the pub_name column:

```
select au_fname, au_lname, pub_name
from authors left join publishers
on authors.city = publishers.city
```

Example 22 Create a new table (newtable) from the existing table (oldtable) with an identity gap, you specify it in the select into statement:

```
select identity into newtable
with identity_gap = 20
from oldtable
```

For more information about identity gaps, see "Managing Identity Gaps in Tables" in Chapter 7, "Creating Databases and Tables" in the *Transact-SQL User's Guide*.

Usage

- The keywords in the select statement, as in all other statements, must be used in the order shown in the syntax statement.
- The maximum number of expressions in a select statement is 4096.
- The keyword all can be used after select for compatibility with other implementations of SQL. all is the default. Used in this context, all is the opposite of distinct. All retrieved rows are included in the results, whether or not some are duplicates.

- Except in create table, create view, and select into statements, column headings may include any characters, including blanks and Adaptive Server keywords, if the column heading is enclosed in quotes. If the heading is not enclosed in quotes, it must conform to the rules for identifiers.
- The character string indicated by like cannot be longer than 255 bytes.
- You cannot use the select...for browse option on tables containing more than 255 columns.
- Column headings in create table, create view, and select into statements, as well as table aliases, must conform to the rules for identifiers.
- To insert data with select from a table that has null values in some fields into a table that does not allow null values, you must provide a substitute value for any NULL entries in the original table. For example, to insert data into an advances table that does not allow null values, this example substitutes "0" for the NULL fields:

  ```
  insert advances
  select pub_id, isnull(advance, 0) from titles
  ```

  Without the isnull function, this command would insert all the rows with non-null values into the advances table, and produce error messages for all rows where the advance column in the titles table contained NULL.

  If you cannot make this kind of substitution for your data, you cannot insert data containing null values into the columns with the NOT NULL specification.

  Two tables can be identically structured, and yet be different as to whether null values are permitted in some fields. Use sp_help to see the null types of the columns in your table.
- The default length of the text or image data returned with a select statement is 32K. Use set textsize to change the value. The size for the current session is stored in the global variable *@@textsize*. Certain client software may issue a set textsize command on logging in to Adaptive Server.
- Data from remote Adaptive Servers can be retrieved through the use of remote procedure calls. See create procedure and execute for more information.
- A select statement used in a cursor definition (through declare cursor) must contain a from clause, but it cannot contain a compute, for browse, or into clause. If the select statement contains any of the following constructs, the cursor is considered read-only and not updatable:

- distinct option
- group by clause
- Aggregate functions
- union operator

If you declare a cursor inside a stored procedure with a select statement that contains an order by clause, that cursor is also considered read-only. Even if it is considered updatable, you cannot delete a row using a cursor that is defined by a select statement containing a join of two or more tables. See declare cursor for more information.

- If a select statement that assigns a value to a variable returns more than one row, the last returned value is assigned to the variable. For example:

```
declare @x varchar(40)
select @x = pub_name from publishers
print @x
(3 rows affected)
Algodata Infosystems
```

Using ANSI join syntax

- Before you write queries using the ANSI inner and outer join syntax, read "Outer Joins" in Chapter 4, "Joins: Retrieving Data From Several Tables," in the *Transact-SQL User's Guide*.

Using *select into*

- select into is a two-step operation. The first step creates the new table, and the second step inserts the specified rows into the new table.

Note You can select into a Component Integration Services existing table.

Because the rows inserted by select into operations are not logged, select into commands cannot be issued within user-defined transactions, even if the ddl in tran database option is set to true. Page allocations during select into operations are logged, so large select into operations may fill the transaction log.

If a select into statement fails after creating a new table, Adaptive Server does *not* automatically drop the table or deallocate its first data page. This means that any rows inserted on the first page before the error occurred remain on the page. Check the value of the *@@error* global variable after a select into statement to be sure that no error occurred. Use the drop table statement to remove the new table, then reissue the select into statement.

- The name of the new table must be unique in the database and must conform to the rules for identifiers. You can also select into temporary tables (see Examples 7, 8, and 11).
- Any rules, constraints, or defaults associated with the base table are not carried over to the new table. Bind rules or defaults to the new table using sp_bindrule and sp_bindefault.
- select into does not carry over the base table's max_rows_per_page value, and it creates the new table with a max_rows_per_page value of 0. Use sp_chgattribute to set the max_rows_per_page value.
- The select into/bulkcopy/pllsort option must be set to true (by executing sp_dboption) in order to select into a permanent table. You do not have to set the select into/bulkcopy/pllsort option to true in order to select into a temporary table, since the temporary database is never recovered.

  After you have used select into in a database, you must perform a full database dump before you can use the dump transaction command. select into operations log only page allocations and not changes to data rows. Therefore, changes are not recoverable from transaction logs. In this situation, issuing the dump transaction statement produces an error message instructing you to use dump database instead.

  By default, the select into/bulkcopy/pllsort option is set to false in newly created databases. To change the default situation, set this option to true in the model database.
- select into runs more slowly while a dump database is taking place.
- You can use select into to create a duplicate table with no data by having a false condition in the where clause (see Example 12).
- You must provide a column heading for any column in the select list that contains an aggregate function or any expression. The use of any constant, arithmetic or character expression, built-in functions, or concatenation in the select list requires a column heading for the affected item. The column heading must be a valid identifier or must be enclosed in quotation marks (see Examples 7 and 8).
- Datatypes and nullability are implicitly assigned to literal values when select into is used, such as:

  ```
  select x = getdate() into mytable
  ```

  This results in a non-nullable column, regardless of whether allow nulls by default is on or not. It depends upon how the select commands are used and with what other commands within the syntax.

The convert syntax allows you to explicitly specify the datatype and nullability of the resulting column, not the default.

Wrap getdate with a function that does result in a null, such as:

```
select x = nullif(getdate(), "1/1/1900") into
mytable
```

Or, use the convert syntax:

```
select x = convert(datetime null, getdate()) into
mytable
```

- You cannot use select into inside a user-defined transaction or in the same statement as a compute clause.
- To select an IDENTITY column into a result table, include the column name (or the syb_identity keyword) in the select statement's *column_list*. The new column observes the following rules:
  - If an IDENTITY column is selected more than once, it is defined as NOT NULL in the new table. It does not inherit the IDENTITY property.
  - If an IDENTITY column is selected as part of an expression, the resulting column does not inherit the IDENTITY property. It is created as NULL if any column in the expression allows nulls; otherwise, it is created as NOT NULL.
  - If the select statement contains a group by clause or aggregate function, the resulting column does not inherit the IDENTITY property. Columns that include an aggregate of the IDENTITY column are created NULL; others are NOT NULL.
  - An IDENTITY column that is selected into a table with a union or join does not retain the IDENTITY property. If the table contains the union of the IDENTITY column and a NULL column, the new column is defined as NULL. Otherwise, it is defined as NOT NULL.
- You cannot use select into to create a new table with multiple IDENTITY columns. If the select statement includes both an existing IDENTITY column and a new IDENTITY specification of the form *column_name* = identity*(precision)*, the statement fails.
- If Component Integration Services is enabled, and if the into table resides on Adaptive Server, Adaptive Server uses bulk copy routines to copy the data into the new table. Before doing a select into with remote tables, set the select into/bulkcopy database option to true.

- For information about the Embedded SQL command select into *host_var_list*, see the *Open Client Embedded SQL Reference Manual*.

Converting the NULL properties of a target column with *select...into*

- Use the convert command to change the nullability of a target column into which you are selecting data. For example, the following selects data from the titles table into a target table named temp_titles, but converts the total_sales column from null to not null:

```
select title, convert (char(100) not null,
total_sales)
total_sales
into #tempsales
from titles
```

Specifying a lock scheme with *select...into*

- The lock option, used with select...into, allows you to specify the locking scheme for the table created by the command. If you do not specify a locking scheme, the default locking scheme, as set by the configuration parameter lock scheme, is applied.
- When you use the lock option, you can also specify the space management properties max_rows_per_page, exp_row_size, and reservepagegap.

  You can change the space management properties for a table created with select into, using sp_chgattribute.

Using *index*, *prefetch*, and *lru* | *mru*

- The index, prefetch and lru | mru options specify the index, cache and I/O strategies for query execution. These options override the choices made by the Adaptive Server optimizer. Use them with caution, and always check the performance impact with set statistics io on. For more information about using these options, see the *Performance and Tuning Guide*.

Using *parallel*

- The parallel option reduces the number of worker threads that the Adaptive Server optimizer can use for parallel processing. The *degree_of_parallelism* cannot be greater than the configured max parallel degree. If you specify a value that is greater than the configured max parallel degree, the optimizer ignores the parallel option.
- When multiple worker processes merge their results, the order of rows that Adaptive Server returns may vary from one execution to the next. To get rows from partitioned tables in a consistent order, use an order by clause, or override parallel query execution by using parallel 1 in the from clause of the query.

- A from clause specifying parallel is ignored if any of the following conditions is true:
  - The select statement is used for an update or insert.
  - The from clause is used in the definition of a cursor.
  - parallel is used in the from clause within any inner query blocks of a subquery.
  - The select statement creates a view.
  - The table is the inner table of an outer join.
  - The query specifies min or max on the table and specifies an index.
  - An unpartitioned clustered index is specified or is the only parallel option.
  - The query specifies exists on the table.
  - The value for the configuration parameter max scan parallel degree is 1 and the query specifies an index.
  - A nonclustered index is covered. For information on index covering, see Chapter 9, "How Indexes Work" in the *Performance and Tuning Guide*.
  - The table is a system table or a virtual table.
  - The query is processed using the OR strategy. For an explanation of the OR strategy, see the *Performance and Tuning Guide*.
  - The query returns a large number of rows to the user.

Using *readpast*

- The readpast option allows a select command to access the specified table without being blocked by incompatible locks held by other tasks. readpast queries can only be performed on data-only-locked tables.
- If the readpast option is specified for an allpages-locked table, the readpast option is ignored. The command operates at the isolation level specified for the command or session. If the isolation level is 0, dirty reads are performed, and the command returns values from locked rows and does not block. If the isolation level is 1 or 3, the command blocks when pages with incompatible locks must be read.
- The interactions of session-level isolation levels and readpast on a table in a select command are shown in Table 1-35.

Table 1-35: Effects of session-level isolation levels and readpast

Session isolation level	Effects
0, read uncommitted (dirty reads)	readpast is ignored, and rows containing uncommitted transactions are returned to the user. A warning message is printed.
1, read committed	Rows or pages with incompatible locks are skipped; no locks are held on the rows or pages read Using readpast may produce duplicates and adding the distinct clause does not clear this problem. To resolve this, when using readpast, use a group by clause *in addition to* a distinct clause to avoid duplicates.
2, repeatable read	Rows or pages with incompatible locks are skipped; shared locks are held on all rows or pages that are read until the end of the statement or transaction; holds locks on all pages read by the statement until the transaction completes.
3, serializable	readpast is ignored, and the command executes at level 3. The command blocks on any rows or pages with incompatible locks.

- select commands that specify readpast fail with an error message if they also include any of the following:
  - An at isolation clause, specifying 0 or read uncommitted
  - An at isolation clause, specifying 3 or serializable
  - The holdlock keyword on the same table
- If at isolation 2 or at isolation repeatable read is specified in a select query that specifies readpast, shared locks are held on the readpast tables until the statement or transaction completes.
- If a select command with the readpast option encounters a text column that has an incompatible lock on it, readpast locking retrieves the row, but returns the text column with a value of null. No distinction is made, in this case, between a text column containing a null value and a null value returned because the column is locked.

Standards

ANSI SQL – Compliance level: Entry-level compliant.

The following are Transact-SQL extensions:

- select into to create a new table
- lock clauses
- compute clauses
- Global and local variables
- index clause, prefetch, parallel and lru | mru

- holdlock, noholdlock, and shared keywords
- "*column_heading = column_name*"
- Qualified table and column names
- select in a for browse clause
- The use, within the select list, of columns that are not in the group by list and have no aggregate functions
- at isolation repeatable read | 2 option

Permissions

select permission defaults to the owner of the table or view, who can transfer it to other users.

See also

Commands compute clause, create index, create trigger, delete, group by and having clauses, insert, order by clause, set, union operator, update, where clause

Functions avg, count, isnull, max, min, sum

System procedures sp_cachestrategy, sp_chgattribute, sp_dboption

set

Description

Sets Adaptive Server query-processing options for the duration of the user's work session; sets some options inside a trigger or stored procedure.

Syntax

set *@variable = expression* [, *@variable = expression*...]

set ansinull {on | off}

set ansi_permissions {on | off}

set arithabort [arith_overflow | numeric_truncation]
{on | off}

set arithignore [arith_overflow] {on | off}

set bulk array size *number*

set bulk batch size *number*

set {chained, close on endtran, nocount, noexec, parseonly, procid,
self_recursion, showplan, sort_resources} {on | off}

set char_convert {off | on [with {error | no_error}] |
charset [with {error | no_error}]}

set cis_rpc_handling {on | off}

set [clientname *client_name* | clienthostname
host_name | clientapplname *application_name*]

set cursor rows *number* for *cursor_name*

set {datefirst *number*, dateformat *format*,
language *language*}

set fipsflagger {on | off}

set flushmessage {on | off}

set forceplan {on | off}

set identity_insert [*database*.[*owner*.]]*table_name*
{on | off}
set identity_update *table_name* {on | off}

set jtc {on | off}

set lock { wait [numsecs] | nowait }

set offsets {select, from, order, compute, table,
procedure, statement, param, execute} {on | off}

set parallel_degree *number*

set plan {dump | load } [*group_name*] {on | off}

set plan exists check {on | off}

set plan replace {on | off}

set prefetch [on|off]

```
set proc_output_params on | off
set proc_return_status on | off
set process_limit_action {abort | quiet | warning}
set proxy login_name
set quoted_identifier {on | off}
set role {"sa_role" | "sso_role" | "oper_role" |
        role_name [with passwd "password"]} {on | off}
set {rowcount number, textsize number}
set scan_parallel_degree number
set session authorization login_name
set sort_merge {on | off}
set statistics {io, subquerycache, time} {on | off}
set statistics simulate { on | off }
set strict_dtm_enforcement {on | off}
set string_rtruncation {on | off}
set table count number
set textsize {number}
set transaction isolation level {
        [ read uncommitted | 0 ] |
        [ read committed | 1 ] |
        [ repeatable read | 2 ]|
        [ serializable | 3 ] }
set transactional_rpc {on | off}
```

Parameters

@variable

allows multiple variable assignments in one statement. The set *@variable* = *expression* command is an identical — and an alternative — command to select *@variable* = *expression* in Transact-SQL.

expression

includes constant, function, any combination of constants, and functions connected by arithmetic or bitwise operators, or a subquery.

ansinull

impacts on both aggregate and comparison behaviors:

Aggregate behavior ansinull determines whether evaluation of NULL-valued operands in aggregate functions is compliant with the ANSI SQL standard. If you use set ansinull on, Adaptive Server generates a warning when an aggregate function eliminates a null-valued operand from the calculation.

For example, if you perform the following query on the titles table with set ansinull off (the default value):

```
select max(total_sales) from titles
```

Adaptive Server returns:

```
-----------
      22246
```

However, if you perform the same query with set ansinull on, Adaptive Server returns the same value and an error message because the total_sales column contains NULL values:

```
-----------
      22246
Warning - null value eliminated in set function
```

This message indicates that some entries in total_sales contain NULL instead of a real amount, so you do not have complete data on total sales for all books in this table. However, of the available data, the value returned is the highest.

Comparison behavior The SQL standard requires that if either one of the two operands of an equality comparison is NULL, the result is UNKNOWN. Transact-SQL treats NULL values differently. If one of the operands is a column, parameter, or variable, and the other operand is the NULL constant or a parameter or variable whose value is NULL, the result is either TRUE or FALSE:

- Sybase NULL mode – "`val = NULL`" is true when "`val`" is NULL
- ANSI NULL mode – "`val = NULL`" is unknown when "`val`" is NULL

The ANSI rule for the where and on clauses return rows that are true, and rejects rows that are both false and unknown.

The ANSI rule for a check constraint rejects values that are false. For this reason, unknown or true results are not rejected.

If you:

- Enable ansinull mode – do not use the Sybase NULL comparisons (`val = NULL` or `val != NULL`).
- Expect to use ANSI-null mode during insert and update – do not use the Sybase NULL comparisons in check constraints.

Instead, use the ANSI IS NULL or IS NOT NULL syntax to prevent from having unexpected results.

ansi_permissions
determines whether ANSI SQL permission requirements for delete and update statements are checked. The default is off. Table 1-36 summarizes permission requirements:

Table 1-36: Permissions required for update and delete

Command	Permissions required with set ansi_permissions off	Permissions required with set ansi_permissions on
update	• update permission on columns where values are being set	• update permission on columns where values are being set • select permission on all columns appearing in where clause • select permission on all columns on right side of set clause
delete	• delete permission on table	• delete permission on table • select permission on all columns appearing in where clause

arithabort
determines how Adaptive Server behaves when an arithmetic error occurs. The two arithabort options, arithabort arith_overflow and arithabort numeric_truncation, handle different types of arithmetic errors. You can set each option independently or set both options with a single set arithabort on or set arithabort off statement.

- arithabort arith_overflow specifies Adaptive Server's behavior following a divide-by-zero error or a loss of precision during an explicit or implicit datatype conversion. This type of error is serious. The default setting, arithabort arith_overflow on, rolls back the entire transaction in which the error occurs. If the error occurs in a batch that does not contain a transaction, arithabort arith_overflow on does not roll back earlier commands in the batch; however, Adaptive Server does not execute any statements in the batch that follow the error-generating statement.

  If you set arithabort arith_overflow off, Adaptive Server aborts the statement that causes the error, but continues to process other statements in the transaction or batch.

- arithabort numeric_truncation specifies Adaptive Server's behavior following a loss of scale by an exact numeric type during an implicit datatype conversion. (When an explicit conversion results in a loss of scale, the results are truncated without warning.) The default setting, arithabort numeric_truncation on, aborts the statement that causes the error, but Adaptive Server continues to process other statements in the transaction or batch. If you set arithabort numeric_truncation off, Adaptive Server truncates the query results and continues processing.

arithignore arith_overflow
determines whether Adaptive Server displays a message after a divide-by-zero error or a loss of precision. By default, the arithignore option is set to off. This causes Adaptive Server to display a warning message after any query that results in numeric overflow. To have Adaptive Server ignore overflow errors, use set arithignore on. You can omit the optional arith_overflow keyword without any effect.

bulk array size *number*
: establishes the number of rows that are buffered in local server memory before being transferred using the bulk copy interface.

  Use this option only with Component Integration Services for transferring rows to a remote server using select into.

  View your current setting using the *@@bulkarraysize* global variable.

  number indicates the number of rows to buffer. If the rows being transferred contain text, image or java ADTs, then the bulk copy interface ignores the current setting for array size and uses a value of 1. Also, the array size actually used will never exceed the value of *@@bulkbatchzise*. If *@@bulkbatchsize* is smaller than array size, then the smaller value is used.

  The initial value of the array size is inherited by new connections from the current setting of the configuration property cis bulk insert array size, which defaults to 50. Setting this value to 0 will reset the value to the default.

bulk batch size *number*
: establishes the number of rows transferred to a remote server via select into *proxy_table* when the bulk interface is used. The bulk interface is available to all Adaptive Servers, as well as DirectConnect for Oracle version 12.5.1.

  Use this option only with Component Integration Services for transferring rows to a remote server using select into.

  View your current setting using the *@@bulkbatchsize* global variable.

  The bulk interface allows a commit after a specified number of rows. This allows the remote server to free any log space being consumed by the bulk transfer operation, and enables the transfer of large data sets from one server to another without filling the transaction log.

  The initial value of the batch size is inherited by new connections from the current setting of the configuration property cis bulk insert batch size, which by default is 0. A value of 0 indicates that no rows should be committed until after the last row is transferred.

chained
: begins a transaction just before the first data retrieval or data modification statement at the beginning of a session and after a transaction ends. In chained mode, Adaptive Server implicitly executes a begin transaction command before the following statements: delete, fetch, insert, lock table, open, select, and update. You cannot execute set chained within a transaction.

char_convert
: enables or disables character set conversion between Adaptive Server and a client. If the client is using Open Client DB-Library release 4.6 or later, and the client and server use different character sets, conversion is turned on during the login process and is set to a default based on the character set the client is using. You can also use set char_convert *charset* to start conversion between the server character set and a different client character set.

  charset can be either the character set's ID or a name from syscharsets with a type value of less than 2000.

  set char_convert off turns conversion off so that characters are sent and received unchanged. set char_convert on turns conversion on if it is turned off. If character set conversion was not turned on during the login process or by the set char_convert command, set char_convert on generates an error message.

  If you request character set conversion with set char_convert *charset*, and Adaptive Server cannot perform the requested conversion, the conversion state remains the same as it was before the request. For example, if conversion is set to off prior to the set char_convert *charset* command, conversion remains turned off if the request fails.

  When the with no_error option is included, Adaptive Server does not notify an application when characters from Adaptive Server cannot be converted to the client's character set. Error reporting is initially turned on when a client connects with Adaptive Server: if you do not want error reporting, you must turn it off for each session with set char_convert {on | charset} with no_error. To turn error reporting back on within a session, use set char_convert {on | charset} with error.

  Whether or not error reporting is turned on, the bytes that cannot be converted are replaced with ASCII question marks (?).

  See the *System Administration Guide* for a more complete discussion of error handling in character set conversion.

cis_rpc_handling
: determines whether Component Integration Services handles outbound remote procedure call (RPC) requests by default.

clientapplname
: assigns an application an individual name. This is useful for differentiating among clients in a system where many clients connect to Adaptive Server using the same application name. After you assign a new name to an application, it appears in the sysprocesses table under the new name.

clienthostname
: assigns a host an individual name. This is useful for differentiating among clients in a system where many clients connect to Adaptive Server using the same host name. After you assign a new name to a host, it appears in the sysprocesses table under the new name.

clientname
: assigns a client an individual name. This is useful for differentiating among clients in a system where many clients connect to Adaptive Server using the same client name. After you assign a new name to a user, they appear in the sysprocesses table under the new name.

close on endtran
: causes Adaptive Server to close all cursors opened within a transaction at the end of that transaction. A transaction ends by the use of either the commit or rollback statement. However, only cursors declared within the scope that sets this option (stored procedure, trigger, and so on) are affected. For more information about cursor scopes, see the *Transact-SQL User's Guide*.

  For more information about the evaluated configuration, see the *System Administration Guide*.

cursor rows
: causes Adaptive Server to return the *number* of rows for each cursor fetch request from a client application. The *number* can be a numeric literal with no decimal point or a local variable of type integer. If the *number* is less than or equal to zero, the value is set to 1. You can set the cursor rows option for a cursor, whether it is open or closed. However, this option does not affect a fetch request containing an into clause. *cursor_name* specifies the cursor for which to set the number of rows returned.

datefirst
: uses numeric settings to specify the first day of the week. The us_english language default is Sunday. To set the first day of the week, use the following:

To set the first day of the week as	Use this setting
Monday	1
Tuesday	2
Wednesday	3
Thursday	4
Friday	5
Saturday	6
Sunday (us_english language default)	7

Note Regardless of which day you set as the first day of the week, the value of that first day becomes 1. This value is not the same as the numeric setting you use in set datefirst *n*. For example, if you set Sunday as your first day of the week, its value is 1. If you set Monday as your first day of the week, Monday's value becomes 1. If you set Wednesday as your first day of the week, Wednesday's value becomes 1, and so on.

dateformat
: sets the order of the date parts *month/day/year* for entering datetime , smalldatetime, date or time data. Valid arguments are *mdy*, *dmy*, *ymd*, *ydm*, *myd*, and *dym*. The us_english language default is *mdy*.

explicit_transaction_required
: when set to true, causes any attempts to start an implicit transaction, or send an RPC to a remote server outside a transaction, to fail.

  All other commands succeed.

fipsflagger
: determines whether Adaptive Server displays a warning message when Transact-SQL extensions to entry-level ANSI SQL are used. By default, Adaptive Server does not tell you when you use nonstandard SQL. This option does not disable SQL extensions. Processing completes when you issue the non-ANSI SQL command.

flushmessage
: determines when Adaptive Server returns messages to the user. By default, messages are stored in a buffer until the query that generated them is completed or the buffer is filled to capacity. Use set flushmessage on to return messages to the user immediately, as they are generated.

forceplan
: causes the query optimizer to use the order of the tables in the from clause of a query as the join order for the query plan. forceplan is generally used when the optimizer fails to choose a good plan. Forcing an incorrect plan can have severely bad effects on I/O and performance. For more information, see the *Performance and Tuning Guide*.

identity_insert
: determines whether explicit inserts into a table's IDENTITY column are allowed. (Updates to an IDENTITY column are never allowed.) This option can be used only with base tables. It cannot be used with views or set within a trigger.

  Setting identity_insert *table_name* on allows the table owner, Database Owner, or System Administrator to explicitly insert a value into an IDENTITY column. Inserting a value into the IDENTITY column allows you to specify a seed value for the column or to restore a row that was deleted in error. Unless you have created a unique index on the IDENTITY column, Adaptive Server does not verify the uniqueness of the inserted value; you can insert any positive integer.

  The table owner, Database Owner, or System Administrator can use the set identity_insert *table_name* on command on a table with an IDENTITY column to enable the manual insertion of a value into an IDENTITY column. However, only the following users can actually insert a value into an IDENTITY column, when identity_insert is on:

  - Table owner
  - Database Owner:
    - if granted explicit insert permission on the column by the table owner
    - impersonating the table owner by using the setuser command

  Setting identity_insert *table_name* off restores the default behavior by prohibiting explicit inserts to IDENTITY columns. At any time, you can use set identity_insert *table_name* on for a single database table within a session.

identity_update
: With set identity_update on, you can explicitly update the value of the IDENTITY column on a table. identity_update changes the identity column value for the qualified rows. When identity_update is enabled, you can update the identity value to any value greater than 0. However, if the input value is greater than the identity burn max value, a new set of ID values is allocated, and the identity burn max value on the OAM page is updated accordingly. If update is included in a transaction, the new identity burn max value cannot be rolled back. You can use syb_identity to point to the identity column for update. For example:

  ```
  update table_name set syb_identity = value
  ```

```
where clause
```

Adaptive Server does not check for duplicates entries or verify that entries are unique. You can update an existing value to any positive integer within the range allowed by the column's declared precision. You can check for duplicate entries by creating a unique index on the identity column

jtc
: toggles join transitive closure. For more information, see the *Performance and Tuning Guide*.

language
: is the official name of the language that displays system messages. The language must be installed on Adaptive Server. The default is us_english.

nocount
: controls the display of rows affected by a statement. set nocount on disables the display of rows; set nocount off reenables the count of rows.

noexec
: compiles each query but does not execute it. noexec is often used with showplan. After you set noexec on, no subsequent commands are executed (including other set commands) until you set noexec off.

  compiles each subsequent query but does not execute it. set fmtonly on is often used with showplan for troubleshooting. Set noexec on immediately after executing a query. After you set noexec on, no subsequent commands are executed (including other set commands) until you set noexec off. set noexec can be used in stored procedures.

lock wait
: specifies the length of time that a command waits to acquire locks before aborting and returning an error.

numsecs
: specifies the number of seconds a command is to wait to acquire a lock. Valid values are from 0 to 2147483647, the maximum value for an integer.

lock nowait
: specifies that if a command cannot acquire a lock immediately, it returns an error and fails. set lock nowait is equivalent to set lock wait 0.

offsets
: returns the position of specified keywords (with relation to the beginning of the query) in Transact-SQL statements. The keyword list is a comma-separated list that can include any of the following Transact-SQL constructs: select, from, order, compute, table, procedure, statement, param, and execute. Adaptive Server returns offsets if there are no errors. This option is used in Open Client DB-Library only.

parallel_degree
: specifies an upper limit for the number of worker processes used in the parallel execution of a query. This number must be less than or equal to the number of worker processes per query, as set by the max parallel degree configuration parameter. The *@@parallel_degree* global variable stores the current setting.

parseonly
: checks the syntax of each query and returns any error messages without compiling or executing the query. Do not use parseonly inside a stored procedure or trigger.

plan
: introduces an abstract plan command. For more information, see Chapter 30, "Creating and Using Abstract Plans," in the *Performance and Tuning Guide*.

dump
: enables or disables capturing abstract plans for the current connection. If a *group_name* is not specified, the plans are stored in the default group, ap_stdout.

load
: enables or disables loading abstract plans for the current connection. If a *group_name* is not specified, the plans are loaded from the default group, ap_stdin.

group_name
: is the name of the abstract plan group to use for loading or storing plans.

exists check
: when used with set plan load, stores hash keys for up to 20 queries from an abstract plan group in a per-user cache.

replace
: enables or disables replacing existing abstract plans during plan capture mode. By default, plan replacement is off.

prefetch
enables or disables large I/Os to the data cache.

proc_output_params
controls sending of output parameters that a stored procedure generates back to the client. set proc_output_params off suppresses sending the output parameters back to the client. The default for this parameter is on.

proc_return_status
controls sending of a return status TDS token back to the client. set proc_return_status off suppresses sending the return status token to the client, and isql client does not display the `(return status = 0)` message. The default for this parameter is on.

Warning! If the client application that executes a procedure relies on the success or failure of the procedure based on the return status, then do not use the set proc_return_status off option.

---

process_limit_action
specifies whether Adaptive Server executes parallel queries when an insufficient number of worker processes is available. Under these circumstances, when process_limit_action is set to quiet, Adaptive Server silently adjusts the plan to use a degree of parallelism that does not exceed the number of available processes. If process_limit_action is set to warning when an insufficient number of worker processes are available, Adaptive Server issues a warning message when adjusting the plan; and if process_limit_action is set to abort, Adaptive Server aborts the query and issues an explanatory message an insufficient number of worker processes are available.

procid
returns the ID number of the stored procedure to Open Client DB-Library/C (not to the user) before sending rows generated by the stored procedure.

proxy
allows you to assume the permissions, login name, and suid (server user ID) of *login_name*. For *login_name*, specify a valid login from master..syslogins, enclosed in quotation marks. To revert to your original login name and suid, use set proxy with your original *login_name*.

Note Without explicit permission, neither the "sa_role" nor the "sso_role" can issue the set proxy login_name command. To use set proxy login_name, any user, including the System Security Officer, must have permission explicitly granted by the System Security Officer.

See "Using proxies" on page 452 for more information.

quoted_identifier
determines whether Adaptive Server recognizes delimited identifiers. By default, quoted_identifier is off and all identifiers must conform to the rules for valid identifiers. If you use set quoted_identifier on, you can use table, view, and column names that begin with a nonalphabetic character, include characters that would not otherwise be allowed, or are reserved words, by enclosing the identifiers within double quotation marks. Delimited identifiers cannot exceed 28 bytes, may not be recognized by all front-end products, and may produce unexpected results when used as parameters to system procedures.

When quoted_identifier is on, all character strings enclosed within double quotes are treated as identifiers. Use single quotes around character or binary strings.

role
turns the specified role on or off during the current session. When you log in, all system roles that have been granted to you are turned on. Use set role *role_name* off to turn a role off, and set role *role_name* on to turn it back on again, as needed. System roles are "sa_role", "sso_role", and "oper_role". If you are not a user in the current database, and if there is no "guest" user, you cannot set sa_role off, because there is no server user ID for you to assume.

role_name
is the name of any user-defined role created by the System Security Officer. User-defined roles are not turned on by default. To set user-defined roles to activate at login, the user or the System Security Officer must use set role on.

with *passwd*
specifies the password to activate the role. If a user-defined role has an attached password, you must specify the password to activate the role.

rowcount
causes Adaptive Server to stop processing the query (select, insert, update, or delete) after the specified number of rows are affected. The *number* can be a numeric literal with no decimal point or a local variable of type integer. To turn this option off, use:

```
set rowcount 0
```

scan_parallel_degree
specifies the maximum session-specific degree of parallelism for hash-based scans (parallel index scans and parallel table scans on nonpartitioned tables). This number must be less than or equal to the current value of the max scan parallel degree configuration parameter. The *@@scan_parallel_degree* global variable stores the current setting.

self_recursion
determines whether Adaptive Server allows triggers to cause themselves to fire again (this is called *self recursion*). By default, Adaptive Server does not allow self recursion in triggers. You can turn this option on only for the duration of a current client session; its effect is limited by the scope of the trigger that sets it. For example, if the trigger that sets self_recursion on returns or causes another trigger to fire, this option reverts to off. This option works only within a trigger and has no effect on user sessions.

session authorization
is identical to set proxy, with this exception: set session authorization follows the SQL standard, while set proxy is a Transact-SQL extension.

showplan
generates a description of the processing plan for the query. The results of showplan are of use in performance diagnostics. showplan does not print results when it is used inside a stored procedure or trigger. For parallel queries, showplan output also includes the adjusted query plan at runtime, if applicable. For more information, see the *Performance and Tuning Guide*.

sort_merge
enables or disables the use of sort-merge joins during a session. For more information, see the *Performance and Tuning Guide*.

sort_resources
generates a description of the sorting plan for a create index statement. The results of sort_resources are of use in determining whether a sort operation will be done serially or in parallel. When sort_resouces is on, Adaptive Server prints the sorting plan but does not execute the create index statement. For more information, see Chapter 24, “Parallel Sorting,” in the *Performance and Tuning Guide*.

statistics io
: displays the following statistics information for each table referenced in the statement:

  - the number of times the table is accessed (scan count)
  - the number of logical reads (pages accessed in memory)
  - and the number of physical reads (database device accesses)

  For each command, statistics io displays the number of buffers written.

  If Adaptive Server has been configured to enforce resource limits, statistics io also displays the total I/O cost. For more information, see Chapter 34, "Using the set statistics Commands" in the *Performance and Tuning Guide*.

statistics subquerycache
: displays the number of cache hits, misses, and the number of rows in the subquery cache for each subquery.

statistics time
: displays the amount of time Adaptive Server used to parse and compile for each command. For each step of the command, statistics time displays the amount of time Adaptive Server used to execute the command. Times are given in milliseconds and timeticks, the exact value of which is machine-dependent.

statistics simulate
: specifies that the optimizer should use simulated statistics to optimize the query.

strict_dtm_enforcement
: determines whether the server propagates transactions to servers that do not support Adaptive Server transaction coordination services. The default value is inherited from the value of the strict dtm enforcement configuration parameter.

string_rtruncation
: determines whether Adaptive Server raises a SQLSTATE exception when an insert or update command truncates a char, unichar, varchar or univarchar string. If the truncated characters consist only of spaces, no exception is raised. The default setting, off, does not raise the SQLSTATE exception, and the character string is silently truncated.

table count
: sets the number of tables that Adaptive Server considers at one time while optimizing a join. The default used depends on the number of tables in the join:

Tables joined	Tables considered at a time
2 – 25	4
26 – 37	3
38 – 50	2

Valid values are 0 – 8. A value of 0 resets the default behavior. A value greater than 8 defaults to 8. table count may improve the optimization of certain join queries, but it increases the compilation cost.

textsize
: specifies the maximum size in bytes of text or image type data that is returned with a select statement. The *@@textsize* global variable stores the current setting. To reset textsize to the default size (32K), use:

```
set textsize 0
```

The default setting is 32K in isql. Some client software sets other default values.

transaction isolation level
: sets the transaction isolation level for your session. After you set this option, any current or future transactions operate at that isolation level.

read uncommitted | 0
: scans at isolation level 0 do not acquire any locks. Therefore, the result set of a level 0 scan may change while the scan is in progress. If the scan position is lost due to changes in the underlying table, a unique index is required to restart the scan. In the absence of a unique index, the scan may be aborted.

By default, a unique index is required for a level 0 scan on a table that does not reside in a read-only database. You can override this requirement by forcing the Adaptive Server to choose a nonunique index or a table scan, as follows:

```
select * from table_name (index table_name)
```

Activity on the underlying table may cause the scan to be aborted before completion.

read committed | 1
: By default, Adaptive Server's transaction isolation level is read committed or 1, which allows shared read locks on data.

repeatable read | 2
: prevents nonrepeatable reads.

serializable | 3
: specify isolation level 3, Adaptive Server applies a holdlock to all select and readtext operations in a transaction, which holds the queries' read locks until the end of that transaction. If you also set chained mode, that isolation level remains in effect for any data retrieval or modification statement that implicitly begins a transaction.

transactional_rpc
: controls the handling of remote procedure calls. If this option is set to on, when a transaction is pending, the RPC is coordinated by Adaptive Server. If this option is set to off, the remote procedure call is handled by the Adaptive Server site handler. The default value is inherited from the value of the enable xact coordination configuration parameter.

Examples

Example 1 Tells Adaptive Server to evaluate NULL-valued operands of equality (=) and inequality (!=) comparisons and aggregate functions in compliance with the entry level ANSI SQL standard:

```
set ansinull on
```

When you use set ansinull on, aggregate functions and row aggregates raise the following SQLSTATE warning when Adaptive Server finds null values in one or more columns or rows:

```
Warning - null value eliminated in set function
```

If the value of either the equality or the inequality operands is NULL, the comparison's result is UNKNOWN. For example, the following query returns no rows in ansinull mode:

```
select * from titles where price = null
```

If you use set ansinull off, the same query returns rows in which price is NULL.

Example 2 Activates character set conversion, setting it to a default based on the character set the client is using. Adaptive Server also notifies the client or application when characters cannot be converted to the client's character set:

```
set char_convert on with error
```

Example 3 Specifies that Component Integration Services handles outbound RPC requests by default:

```
set cis_rpc_handling on
```

Example 4 Assigns this user:

- The client name alison
- The host name money1
- The application name webserver2

```
set clientname 'alison'
set clienthostname 'money1'
set clientapplname 'webserver2'
```

Example 5 Returns five rows for each succeeding fetch statement requested by a client using *test_cursor*:

```
set cursor rows 5 for test_cursor
```

Example 6 Inserts a value of 100 into the IDENTITY column of the stores_south table, then prohibits further explicit inserts into this column. Note the use of the syb_identity keyword; Adaptive Server replaces the keyword with the name of the IDENTITY column:

```
set identity_insert stores_south on
go
insert stores_south (syb_identity)
values (100)
go
set identity_insert stores_south off
go
```

Example 7 Enables idenity_update and updates tables with values 1 and 10, respectively, then disables identity_update:

```
set identity_update t1 on
update t1 set c2 = 10 where c1 =1
select * from t1
c1              c2

_ _ _ _ _       _ _ _ _
1                 10

set identity_update t1 off
```

Example 8 Tells Adaptive Server to display a warning message if you use a Transact-SQL extension:

```
set fipsflagger on
```

Then, if you use nonstandard SQL, like this:

```
use pubs2
```

```
go
```

Adaptive Server displays:

```
SQL statement on line number 1 contains Non-ANSI text.
The error is caused due to the use of use database.
```

Example 9 Subsequent commands in the session or stored procedure return an error and fail if they cannot get requested locks immediately:

```
set lock nowait
```

Example 10 Subsequent commands in the current session or stored procedure wait indefinitely long to acquire locks:

```
set lock wait
```

Example 11 Subsequent commands in the session or stored procedure wait 5 seconds to acquire locks before generating an error message and failing:

```
set lock wait 5
```

Example 12 Enables capturing abstract plans to the dev_plans group:

```
set plan dump dev_plans on
```

Example 13 Enables loading of abstract plans from the dev_plans group for queries in the current session:

```
set plan load dev_plans on
```

Example 14 Suppresses the output of parameter information:

```
1> create procedure sp_pout (@x int output) as select @x = @x + 1
2> go

1> set proc_output_params off
2> go

1> declare @x int
2> select @x = 1
3> exec sp_pout @x output
4> print "Value of @x returned from sproc is: %1!", @x
5> go

(1 row affected)
(return status = 0)
Value of @x returned from sproc is: 2
```

If you do not perform set proc_output_params off, the output after `(return status = 0)` includes the following:

```
Return parameters:
```

```
 -----------
           2
```

Example 15 Suppresses the output of both parameters and the return status TDS token:

```
set proc_output_params OFF
go

set proc_return_status OFF
go

declare @x int
select @x = 2
exec sp_pout @x output
print "Value of @x returned from sproc is: %1!", @x
go

(1 row affected)
Value of @x returned from sproc is: 3
(1 row affected)
```

In addition, you can also suppress the lines reporting the number of rows affected to generate output with no extra messages using the set nocount on option before running this batch.

Example 16 The user executing this command now operates within the server as the login “mary” and Mary’s server user ID:

```
set proxy "mary"
```

Example 17 For each insert, update, delete, and select statement, Adaptive Server stops processing the query after it affects the first four rows. For example:

```
select title_id, price from titles
title_id  price
--------  ----------
BU1032         19.99
BU1111         11.95
BU2075          2.99
BU7832         19.99

(4 rows affected)

set rowcount 4
```

Example 18 Tells Adaptive Server to treat any character string enclosed in double quotes as an identifier. The table name "!*&strange_table" and the column name "emp's_name" are legal identifier names while quoted_identifier is on:

```
set quoted_identifier on
go
create table "!*&strange_table"
     ("emp's_name" char(10),
     age int)
go
set quoted_identifier off
go
```

Example 19 Activates the "doctor" role. This command is used by users to specify the roles they want activated:

```
set role doctor_role on
```

Example 20 Deactivates the user's System Administrator role for the current session:

```
set role "sa_role" off
```

Example 21 Activates the "doctor" role when the user enters the password:

```
set role doctor_role with passwd "physician" on
```

Example 22 Deactivates the "doctor" role:

```
set role doctor_role off
```

Example 23 Specifies a maximum degree of parallelism of 4 for parallel index scans and parallel table scans on nonpartitioned tables:

```
set scan_parallel_degree 4
```

Example 24 An alternative way of stating example 5:

```
set session authorization "mary"
```

Example 25 For each query, returns a description of the processing plan, but does not execute it:

```
set showplan, noexec on
go
select * from publishers
go
```

Example 26 Causes Adaptive Server to generate an exception when truncating a char, unichar, or nchar string:

```
set string_rtruncation on
```

If an insert or update statement would truncate a string, Adaptive Server displays:

```
string data, right truncation
```

Example 27 Sets the limit on text or image data returned with a select statement to 100 bytes:

```
set textsize 100
```

Example 28 Specifies that when a transaction is pending, the RPC is handled by the Component Integration Services access methods rather than by the Adaptive Server site handler:

```
set transactional_rpc on
```

Example 29 All subsequent queries in the session run at the repeatable reads transaction isolation level:

```
set transaction isolation level 2
```

Example 30 Implements read-locks with each select statement in a transaction for the duration of that transaction:

```
set transaction isolation level 3
```

Usage

- Some set options can be grouped together, as follows:
  - parseonly, noexec, prefetch, showplan, rowcount, and nocount control the way a query is executed. It does not make sense to set both parseonly and noexec on. The default setting for rowcount is 0 (return all rows); the default for the others is off.
  - The statistics options display performance statistics after each query. The default setting for the statistics options is off. For more information about noexec, prefetch, showplan and statistics, see the *Performance and Tuning Guide*.
  - You can update up to 1024 columns in the set clause using literals, variables, or expressions returned from a subquery.
  - offsets and procid are used in DB-Library to interpret results from Adaptive Server. The default setting for these options is on.
  - datefirst, dateformat, and language affect date functions, date order, and message display. If used within a trigger or stored procedure, these options do not revert to their previous settings.

In the default language, us_english, datefirst is 1 (Sunday), dateformat is *mdy*, and messages are displayed in us_english. Some language defaults (including us_english) produce Sunday=1, Monday=2, and so on; others produce Monday=1, Tuesday=2, and so on.

set language implies that Adaptive Server should use the first weekday and date format of the language it specifies, but does not override an explicit set datefirst or set dateformat command issued earlier in the current session.

- cursor rows and close on endtran affect the way Adaptive Server handles cursors. The default setting for cursor rows with all cursors is 1. The default setting for close on endtran is off.
- chained and transaction isolation level allow Adaptive Server to handle transactions in a way that is compliant with the SQL standards.

fipsflagger, string_rtruncation, ansinull, ansi_permissions, arithabort, and arithignore affect aspects of Adaptive Server error handling and compliance to SQL standards.

Note The arithabort and arithignore options were redefined for version 10.0 and later. If you use these options in your applications, examine them to verify they are still producing the desired effect.

- You can use the cis_rpc_handling and transactional_rpc options only when Component Integration Services is enabled.
- When the quoted_identifier option is set to on, you do not need to use double quotes around an identifier if the syntax of the statement requires that a quoted string contain an identifier. For example:

  ```
  set quoted_identifier on
  create table "1one" (c1 int)
  ```

  However, object_id requires a string, so you must include the table name in quotes to select the information:

  ```
  select object_id('1one')
  -----------------------
    896003192
  ```

  You can include an embedded double quote in a quoted identifier by doubling the quote:

  ```
  create table "embedded""quote" (c1 int)
  ```

However, there is no need to double the quote when the statement syntax requires the object name to be expressed as a string:

```
select object_id('embedded"quote')
```

- parallel_degree and scan_parallel_degree limit the degree of parallelism for queries, if Adaptive Server is configured for parallelism. When you use these options, you give the optimizer a hint to limit parallel queries to use fewer worker processes than allowed by the configuration parameters. Setting these parameters to 0 restores the server-wide configuration values.

  If you specify a number that is greater than the numbers allowed by the configuration parameters, Adaptive Server issues a warning message and uses the value set by the configuration parameter.

- If you use the set command inside a trigger or stored procedure, most set options revert to their former settings after the trigger or procedure executes.

  The following options do not revert to their former settings after the procedure or trigger executes, but remain for the entire Adaptive Server session or until you explicitly reset them:

  - datefirst
  - dateformat
  - identity_insert
  - language
  - quoted_identifier

- If you specify more than one set option, the first syntax error causes all following options to be ignored. However, the options specified before the error are executed, and the new option values are set.

- If you assign a user a client name, host name, or application name, these assignments are only active for the current session. You must reassign these the next time the user logs in. Although the new names appear in sysprocesses, they are not used for permission checks, and sp_who still shows the client connection as belonging to the original login. For more information about setting user processes, see the *System Administration Guide*.

- All set options except showplan and char_convert take effect immediately. showplan takes effect in the following batch. Here are two examples that use set showplan on:

```
set showplan on
select * from publishers
go
pub_id  pub_name               city       state
------- ---------------------  ---------- ---
0736    New Age Books          Boston      MA
0877    Binnet & Hardley       Washington  DC
1389    Algodata Infosystems   Berkeley    CA

(3 rows affected)
```

But:

```
set showplan on
go
select * from publishers
go
QUERY PLAN FOR STATEMENT 1 (at line 1).
    STEP 1
        The type of query is SELECT

        FROM TABLE
            publishers
        Nested iteration
        Table Scan
        Ascending Scan.
        Positioning at start of table.

pub_id  pub_name              city        state
------  --------------------  ----------  ----
0736    New Age Books         Boston      MA
0877    Binnet & Hardley      Washington  DC
1389    Algodata Infosystems  Berkeley    CA

(3 rows affected)
```

Roles and *set* options

- When you log in to Adaptive Server, all system-defined roles granted to you are automatically activated. User-defined roles granted to you are not automatically activated. To automatically activate user-defined roles granted to you, use sp_modifylogin. See sp_modifylogin in *Reference Manual: Procedures*. Use set role *role_name* on or set role *role_name* off to turn roles on and off.

For example, if you have been granted the System Administrator role, you assume the identity (and user ID) of Database Owner in the current database. To assume your real user ID, execute this command:

```
set role "sa_role" off
```

If you are not a user in the current database, and if there is no "guest" user, you cannot set sa_role off.

- If the user-defined role you intend to activate has an attached password, you must specify the password to turn the role on. Thus, you would enter:

```
set role "role_name" with passwd "password" on
```

Distributed transactions, CIS, and *set* options

- The behavior of the cis rpc handling configuration property and the set transactional_rpc commands changed with the introduction of ASTC. In versions earlier than 12.0, enabling cis rpc handling caused *all* RPCs to be routed through CIS's Client-Library connection. As a result, whenever cis rpc handling was enabled, transactional_rpc behavior occurred whether or not it had been specifically set. As of Adaptive Server 12.0, this behavior has changed. If cis rpc handling is enabled and transactional_rpc is off, RPCs within a transaction are routed through the site handler. RPCs executed outside a transaction are sent via CIS's Client-Library connection.
- When Adaptive Server distributed transaction management services are enabled, you can place RPCs within transactions. These RPCs are called *transactional RPCs*. A transactional RPC is an RPC whose work can be included in the context of a current transaction. This remote unit of work can be committed or rolled back along with the work performed by the local transaction.

  To use transactional RPCs, enable CIS and distributed transaction management with sp_configure, then issue the set transactional_rpc command. When set transactional_rpc is on and a transaction is pending, the Adaptive Server (as opposed to the Adaptive Server site handler) coordinates the RPC.

  The set transactional_rpc command default is off. The set cis_rpc_handling command overrides the set transactional_rpc command. If you set cis_rpc_handling on, all outbound RPCs are handled by Component Integration Services.
- See the *Component Integration Services User's Guide* for a discussion of using set transactional_rpc, set cis_rpc_handling, and sp_configure.

Using proxies

Note Without explicit permission, neither the "sa_role" nor the "sso_role" can issue the set proxy login_name command. To use set proxy login_name, any user, including the System Security Officer, must have permission explicitly granted by the System Security Officer.

- Before you can use the set proxy or set session authorization command, a System Security Officer must grant permission to execute set proxy or set session authorization from the master database.
- Executing set proxy or set session authorization with the original *login_name* reestablishes your previous identity.
- You cannot execute set proxy or set session authorization from within a transaction.
- Adaptive Server permits only one level of login identity change. Therefore, after you use set proxy or set session authorization to change identity, you must return to your original identity before changing it again. For example, assume that your login name is "ralph". To create a table as "mary", create a view as "joe", then return to your own login identity. Use the following statements:

```
set proxy "mary"
    create table mary_sales
    (stor_id  char(4),
    ord_num   varchar(20),
    date      datetime)
grant select on mary_sales to public
set proxy "ralph"
set proxy "joe"
    create view joes_view (publisher, city,
        state)
    as select stor_id, ord_num, date
    from mary_sales
set proxy "ralph"
```

Using *lock wait*

- By default, an Adaptive Server task that cannot immediately acquire a lock waits until incompatible locks are released, then continues processing. This is equivalent to set lock wait with no value specified in the *numsecs* parameter.
- You can set a server-wide lock wait period by using sp_configure with the lock wait period option.

- lock wait period, with the session-level setting set lock wait nnn, is only applicable for user-defined tables. These settings have no influence on system tables.
- A lock wait period defined at the session level or in a stored procedure with the set lock command overrides a server-level lock-wait period.
- If set lock wait is used by itself, with no value for *numsecs*, all subsequent commands in the current session wait indefinitely to acquire requested locks.
- sp_sysmon reports the number of times that tasks waiting for a lock could not acquire the lock within the waiting period.

Repeatable-reads transaction isolation level

- The repeatable-reads isolation level, also known as transaction isolation level 2, holds locks on all pages read by the statement until the transaction completes.
- A nonrepeatable read occurs when one transaction reads rows from a table and a second transaction can modify the same rows and commit the changes before the first transaction completes. If the first transaction rereads the rows, they now have different values, so the initial read is not repeatable. Repeatable reads hold shared locks for the duration of a transaction, blocking transactions that update the locked rows or rows on the locked pages.

Using simulated statistics

- You can load simulated statistics into a database using the simulate mode of the optdiag utility program. If set statistics simulate on has been issued in a session, queries are optimized using simulated statistics, rather than the actual statistics for a table.

Global variables affected by *set* options

- Table 1-37 lists the global variables that contain information about the session options controlled by the set command.

Table 1-37: Global variables containing session options

Global variable	Description
@@char_convert	Contains 0 if character set conversion not in effect. Contains 1 if character set conversion is in effect.
@@isolation	Contains the current isolation level of the Transact-SQL program. *@@isolation* takes the value of the active level (0, 1, or 3).
@@options	Contains a hexadecimal representation of the session's set options.
@@parallel_degree	Contains the current maximum parallel degree setting.

Global variable	Description
@@rowcount	Contains the number of rows affected by the last query. *@@rowcount* is set to 0 by any command that does not return rows, such as an if, update, or delete statement. With cursors, *@@rowcount* represents the cumulative number of rows returned from the cursor result set to the client, up to the last fetch request. *@@rowcount* is updated even when nocount is on.
@@scan_parallel_degree	Contains the current maximum parallel degree setting for nonclustered index scans.
@@textsize	Contains the limit on the number of bytes of text or image data a select returns. Default limit is 32K bytes for isql; the default depends on the client software. Can be changed for a session with set textsize.
@@tranchained	Contains the current transaction mode of the Transact-SQL program. *@@tranchained* returns 0 for unchained or 1 for chained.

Using *fipsflagger* with Java in the database

- When fipsflagger is on, Adaptive Server displays a warning message when these extensions are used:
  - The installjava utility
  - The remove java command
  - Column and variable declarations that reference Java classes as datatypes
  - Statements that use Java-SQL expressions for member references
- The status of fipsflagger does not affect arithmetic expressions performed by Java methods.
- For more information about Java in the database, see *Java in Adaptive Server Enterprise*.

Standards

ANSI SQL – Compliance level: Transact-SQL extension.

The ANSI SQL standard specifies behavior that differs from Transact-SQL behavior in earlier Adaptive Server versions. Compliant behavior is enabled by default for all Embedded-SQL precompiler applications. Other applications needing to match this standard of behavior can use the set options listed in Table 1-38.

Table 1-38: Options to set for entry level ANSI SQL compliance

Option	Setting
ansi_permissions	on
ansinull	on
arithabort	off
arithabort numeric_truncation	on
arithignore	off
chained	on
close on endtran	on
fipsflagger	on
quoted_identifier	on
string_rtruncation	on
transaction isolation level	3

Permissions

In general, set permission defaults to all users and no special permissions are required to use it. Exceptions include set role, set proxy, and set session authorization.

To use set role, a System Administrator or System Security Officer must have granted you the role. If you gain entry to a database only because you have a certain role, you cannot turn that role off while you are using the database. For example, if you are not normally authorized to use a database info_plan, but you use it as a System Administrator, Adaptive Server returns an error message if you try to set sa_role off while you are still in info_plan.

To use set proxy or set session authorization, you must have been granted permission by a System Security Officer.

See also

Commands create trigger, fetch, grant, insert, lock table, revoke

Functions convert

Utilities isql, optdiag

setuser

Description — Allows a Database Owner to impersonate another user.

Syntax — setuser ["*user_name*"]

Examples — The Database Owner temporarily adopts Mary's identity in the database in order to grant Joe permissions on authors, a table owned by Mary:

```
setuser "mary"
go
grant select on authors to joe
setuser
go
```

Usage

- The Database Owner uses setuser to adopt the identity of another user in order to use another user's database object, to grant permissions, to create an object, or for some other reason.
- When the Database Owner uses the setuser command, Adaptive Server checks the permissions of the user being impersonated instead of the permissions of the Database Owner. The user being impersonated must be listed in the sysusers table of the database.
- setuser affects permissions only in the local database. It does not affect remote procedure calls or accessing objects in other databases.
- The setuser command remains in effect until another setuser command is given or until the current database is changed with the use command.
- Executing the setuser command with no user name reestablishes the Database Owner's original identity.
- System Administrators can use setuser to create objects that will be owned by another user. However, since a System Administrator operates outside the permissions system, she or he cannot use setuser to acquire another user's permissions.

Standards — ANSI SQL – Compliance level: Transact-SQL extension.

Permissions — setuser permission defaults to the Database Owner and is not transferable.

See also — **Commands** grant, revoke, use

shutdown

Description

Shuts down the Adaptive Server from which the command is issued, its local Backup Server, or a remote Backup Server. This command can be issued only by a System Administrator.

Syntax

shutdown [*srvname*] [with {wait | nowait}]

Parameters

srvname
is the logical name by which the Backup Server is known in the Adaptive Server's sysservers system table. This parameter is not required when shutting down the local Adaptive Server.

with wait
is the default. This shuts down the Adaptive Server or Backup Server gracefully.

with nowait
shuts down the Adaptive Server or Backup Server immediately, without waiting for currently executing statements to finish.

Note Use of shutdown with nowait can lead to gaps in IDENTITY column values.

Examples

Example 1 Shuts down the Adaptive Server from which the shutdown command is issued:

```
shutdown
```

Example 2 Shuts down the Adaptive Server immediately:

```
shutdown with nowait
```

Example 3 Shuts down the local Backup Server:

```
shutdown SYB_BACKUP
```

Example 4 Shuts down the remote Backup Server REM_BACKUP:

```
shutdown REM_BACKUP
```

Usage

- Unless you use the nowait option, shutdown attempts to bring Adaptive Server down gracefully by:
  - Disabling logins (except for the System Administrator)
  - Performing a checkpoint in every database
  - Waiting for currently executing SQL statements or stored procedures to finish

Shutting down the server without the nowait option minimizes the amount of work that must be done by the automatic recovery process.

- Unless you use the nowait option, shutdown *backup_server* waits for active dumps and/or loads to complete. Once you issue a shutdown command to a Backup Server, no new dumps or loads that use this Backup Server can start.
- Use shutdown with nowait only in extreme circumstances. In Adaptive Server, issue a checkpoint command before executing a shutdown with nowait.
- You can halt only the local Adaptive Server with shutdown; you cannot halt a remote Adaptive Server.
- You can halt a Backup Server only if:
  - It is listed in your sysservers table. Use sp_addserver to add entries to sysservers.
  - It is listed in the interfaces file for the Adaptive Server where you execute the command.
- Use sp_helpserver to determine the name by which a Backup Server is known to the Adaptive Server. Specify the Backup Server's name— not its *network_name*—as the *srvname* parameter. For example:

```
sp_helpserver
name         network_name   status                                id
----------   -------------  ------------------------------------ --
REM_BACKUP   WHALE_BACKUP   timeouts, no net password encryption 3
SYB_BACKUP   SLUG_BACKUP    timeouts, net password encryption    1
eel          eel                                                 0
whale        whale          timeouts, no net password encryption 2
```

To shut down the remote Backup Server named WHALE_BACKUP, use:

```
shutdown REM_BACKUP
```

Standards ANSI SQL – Compliance level: Transact-SQL extension.

Permissions shutdown permission defaults to System Administrators and is not transferable.

See also **Commands** alter database

System procedures sp_addserver, sp_helpserver

truncate table

Description

Removes all rows from a table.

Syntax

truncate table [[*database*.]*owner*.]*table_name*

Parameters

table_name

is the name of the table to truncate. Specify the database name if the table is in another database, and specify the owner's name if more than one table of that name exists in the database. The default value for *owner* is the current user, and the default value for *database* is the current database.

Examples

Removes all data from the authors table:

```
truncate table authors
```

Usage

- truncate table deletes all rows from a table. The table structure and all the indexes continue to exist until you issue a drop table command. The rules, defaults, and constraints that are bound to the columns remain bound, and triggers remain in effect.
- Adaptive Server no longer uses distribution pages; statistical information is now stored in the tables sysstatistics and systabstats.

  During truncate table, statistical information is no longer deleted (deallocated), so you need not run update statistics after adding data.

  truncate table does not delete statistical information for the table.
- truncate table is equivalent to—but faster than—a delete command without a where clause. delete removes rows one at a time and logs each deleted row as a transaction; truncate table deallocates whole data pages and makes fewer log entries. Both delete and truncate table reclaim the space occupied by the data and its associated indexes.
- Because the deleted rows are not logged individually, truncate table cannot fire a trigger.
- You cannot use truncate table if another table has rows that reference it. Delete the rows from the foreign table, or truncate the foreign table, then truncate the primary table.
- You cannot use the truncate table command on a partitioned table. Unpartition the table with the unpartition clause of the alter table command before issuing the truncate table command.

  You can use the delete command without a where clause to remove all rows from a partitioned table without first unpartitioning it. This method is generally slower than truncate table, since it deletes one row at a time and logs each delete operation.

Standards	ANSI SQL – Compliance level: Entry-level compliant.
Permissions	truncate table permission defaults to the table owner and is not transferable. To truncate a system audit table (sysaudits_01, sysaudits_02, sysaudits_03, and so on, through sysaudits_08), you must be a System Security Officer.
See also	**Commands** create trigger, delete, drop table

union operator

Description

Returns a single result set that combines the results of two or more queries. Duplicate rows are eliminated from the result set unless the all keyword is specified.

Syntax

```
select select_list [into clause]
                   [from clause] [where clause]
                   [group by clause] [having clause]
        [union [all]
            select select_list
                   [from clause] [where clause]
                   [group by clause] [having clause] ]...
        [order by clause]
        [compute clause]
```

Parameters

union
creates the union of data specified by two select statements.

all
includes all rows in the results; duplicates are not removed.

into
creates a new table based on the columns specified in the select list and the rows chosen in the where clause. The first query in the union operation is the only one that can contain an into clause.

Examples

Example 1 The result set includes the contents of the stor_id and stor_name columns of both the sales and sales_east tables:

```
select stor_id, stor_name from sales
union
select stor_id, stor_name from sales_east
```

Example 2 The into clause in the first query specifies that the results table holds the final result set of the union of the specified columns of the publishers, stores, and stores_east tables:

```
select pub_id, pub_name, city into results
from publishers
union
select stor_id, stor_name, city from stores
union
select stor_id, stor_name, city from stores_east
```

Example 3 First, the union of the specified columns in the sales and sales_east tables is generated. Then, the union of that result with publishers is generated. Finally, the union of the second result and authors is generated:

```
select au_lname, city, state from authors
```

```
union
((select stor_name, city, state from sales
union
select stor_name, city, state from sales_east)
union
select pub_name, city, state from publishers)
```

Usage

- The total number of tables that can appear on all sides of a union query is 256.
- You can use union in select statements, for example:

  ```
  create view
  select * from Jan1998Sales
  union all
  select * from Feb1998Sales
  union all
  ```

- The order by and compute clauses are allowed only at the end of the union statement to define the order of the final results or to compute summary values.
- The group by and having clauses can be used only within individual queries and cannot be used to affect the final result set.
- The default evaluation order of a SQL statement containing union operators is left-to-right.
- Since union is a binary operation, parentheses must be added to an expression involving more than two queries to specify evaluation order.
- The first query in a union statement may contain an into clause that creates a table to hold the final result set. The into statement must be in the first query, or you receive an error message (see Example 2).
- The union operator can appear within an insert...select statement. For example:

  ```
  insert into sales.overall
    select * from sales
    union
    select * from sales_east
  ```

- All select lists in a SQL statement must have the same number of expressions (column names, arithmetic expressions, aggregate functions, and so on). For example, the following statement is invalid because the first select list contains more expressions than the second:

  ```
  /* Example of invalid command--shows imbalance */ /*
  in select list items */
  ```

```
select au_id, title_id, au_ord from titleauthor
union
select stor_id, date from sales
```

- Corresponding columns in the select lists of union statements must occur in the same order, because union compares the columns one-to-one in the order given in the individual queries.
- The column names in the table resulting from a union are taken from the *first* individual query in the union statement. To define a new column heading for the result set, do it in the first query. Also, to refer to a column in the result set by a new name (for example, in an order by statement), refer to it by that name in the first select statement. For example, the following query is correct:

```
select Cities = city from stores
union
select city from stores_east
order by Cities
```

- The descriptions of the columns that are part of a union operation do not have to be identical. Table 1-39 lists the rules for the datatypes and the corresponding column in the result table.

Table 1-39: Resulting datatypes in union operations

Datatype of columns in union operation	Datatype of corresponding column in result table
Not datatype-compatible (data conversion is not handled implicitly by Adaptive Server)	Error returned by Adaptive Server.
Both are fixed-length character with lengths L1 and L2	Fixed-length character with length equal to the greater of L1 and L2.
Both are fixed-length binary with lengths L1 and L2	Fixed-length binary with length equal to the greater of L1 and L2.
Either or both are variable-length character	Variable-length character with length equal to the maximum of the lengths specified for the column in the union.
Either or both are variable-length binary	Variable-length binary with length equal to the maximum of the lengths specified for the columns in the union.
Both are numeric datatypes (for example, smallint, int, float, money)	A datatype equal to the maximum precision of the two columns. For example, if a column in table A is of type int and the corresponding column in table B is of type float, then the datatype of the corresponding column of the result table is float, because float is more precise than int.
Both column descriptions specify NOT NULL	Specifies NOT NULL.

Restrictions

- You cannot use the union operator in a subquery.

- You cannot use the union operator with the for browse clause.
- You cannot use the union operator on queries that select text or image data.

Standards

ANSI SQL – Compliance level: Entry-level compliant

The following are Transact-SQL extensions:

- The use of union in the select clause of an insert statement
- Specifying new column headings in the order by clause of a select statement when the union operator is present in the select statement

See also

Commands compute clause, declare, group by and having clauses, order by clause, select, where clause

Functions convert

unmount

Description

The unmount command shuts down the database and drops it from the Adaptive Server. The devices are also deactivated and dropped. The database and its pages are not altered when they are unmounted. The database pages remain on the OS devices. Once the unmount command completes, you can disconnect and move the devices at the source Adaptive Server if necessary. Use the *manifest_file* extension to create the manifest file for use at the secondary Adaptive Server.

The unmount command limits the number of databases to eight in a single command.

Warning! The unmount command removes a database and all its information from the Adaptive Server. Use the unmount command only when you want to remove the database from one Adaptive Server to another Adaptive Server.

Syntax

unmount database <*dbname list*> to <*manifest_file*>

Parameters

dbname list

the database being unmounted. You can unmount more than one database.

manifest_file

the binary file that describes the databases that are present on a set of database devices. It can be created only if the set of databases that occupy those devices are isolated and self-contained on those devices.

Since the manifest file is a binary file, operations that perform character translations of the file contents (such as ftp) will corrupt the file unless done in binary mode.

Examples

unmount databases from an Adaptive Server and create the manifest file for the database:

```
unmount database pubs2 to "/work2/Devices/Mpubs2_file"
```

Usage

You cannot:

- Unmount system databases. However, you can unmount sybsystemprocs.
- Unmount proxy databases or user created temporary databases.
- Use the unmount command in a transaction.
- Unmount a database on an HA-configured server.

Standards

ANSI SQL – Compliance level: Entry-level compliant.

See also

Commands mount, quiesce database

update

Description

Changes data in existing rows, either by adding data or by modifying existing data.

Syntax

```
update [[database.]owner.]{table_name | view_name}
        set [[[database.]owner.]{table_name.|view_name.}]
            column_name1 =
                {expression1 | NULL | (select_statement)} |
            variable_name1 =
                {expression1 | NULL | (select_statement)}
            [, column_name2 =
                {expression2 | NULL | (select_statement)}]... |
            [, variable_name2 =
                {expression2 | NULL | (select_statement)}]...

        [from [[database.]owner.]{view_name [readpast]|
            table_name [readpast]
                [(index {index_name | table_name}
                [ prefetch size ][lru|mru])]}
            [,[[database.]owner.]{view_name [readpast]|
            table_name [readpast]
                [(index {index_name | table_name }
                [ prefetch size ][lru|mru])]}]
        ...]
        [where search_conditions]
        [plan "abstract plan"]

update [[database.]owner.]{table_name | view_name}
        set [[[database.]owner.]{table_name.|view_name.}]
            column_name1 =
                {expression1 | NULL | (select_statement)} |
            variable_name1 =
                {expression1 | NULL | (select_statement)}
            [, column_name2 =
                {expression2 | NULL | (select_statement)}]... |
            [, variable_name2 =
                {expression2 | NULL | (select_statement)}]...
        where current of cursor_name
```

Parameters

table_name | *view_name*

is the name of the table or view to update. Specify the database name if the table or view is in another database, and specify the owner's name if more than one table or view of that name exists in the database. The default value for *owner* is the current user, and the default value for *database* is the current database.

set
specifies the column name or variable name and assigns the new value. The value can be an expression or a NULL. When more than one column name or variable name and value are listed, they must be separated by commas.

from
uses data from other tables or views to modify rows in the table or view you are updating.

readpast
causes the update command to modify unlocked rows only on datarows-locked tables, or rows on unlocked pages, for datapages-locked tables. update...readpast silently skips locked rows or pages rather than waiting for the locks to be released.

where
is a standard where clause (see where clause).

index {*index_name* | *table_name*}
index_name specifies the index to be used to access *table_name*. You cannot use this option when you update a view.

prefetch *size*
specifies the I/O size, in kilobytes, for tables bound to caches with large I/Os configured. You cannot use this option when you update a view. sp_helpcache shows the valid sizes for the cache to which an object is bound or for the default cache. To configure the data cache size, use sp_cacheconfigure.

When using prefetch and designating the prefetch size (*size*), the minimum is 2K and any power of two on the logical page size up to 16K. prefetch size options in kilobytes are:

Logical page size	Prefetch size options
2	2, 4, 8 16
4	4, 8, 16, 32
8	8, 16, 32, 64
16	16, 32, 64, 128

The prefetch size specified in the query is only a suggestion. To allow the size specification configure the data cache at that size. If you do not configure the data cache to a specific size, the default prefetch size is used.

If Component Integration Services is enabled, you cannot use prefetch for remote servers.

lru | mru
: specifies the buffer replacement strategy to use for the table. Use lru to force the optimizer to read the table into the cache on the MRU/LRU (most recently used/least recently used) chain. Use mru to discard the buffer from cache and replace it with the next buffer for the table. You cannot use this option when you update a view.

where current of
: causes Adaptive Server to update the row of the table or view indicated by the current cursor position for *cursor_name*.

index_name
: is the name of the index to be updated. If an index name is not specified, the distribution statistics for all the indexes in the specified table are updated.

plan "*abstract plan*"
: specifies the abstract plan to use to optimize the query. It can be a full or partial plan, specified in the abstract plan language. See Chapter 30, "Creating and Using Abstract Plans," in the *Performance and Tuning Guide* for more information.

Examples

Example 1 All the McBaddens in the authors table are now MacBaddens:

```
update authors
set au_lname = "MacBadden"
where au_lname = "McBadden"
```

Example 2 Modifies the total_sales column to reflect the most recent sales recorded in the sales and salesdetail tables. This assumes that only one set of sales is recorded for a given title on a given date, and that updates are current:

```
update titles
set total_sales = total_sales + qty
from titles, salesdetail, sales
where titles.title_id = salesdetail.title_id
    and salesdetail.stor_id = sales.stor_id
    and salesdetail.ord_num = sales.ord_num
    and sales.date in
        (select max(sales.date) from sales)
```

Example 3 Changes the price of the book in the titles table that is currently pointed to by title_crsr to $24.95:

```
update titles
set price = 24.95
where current of title_crsr
```

Example 4 Finds the row for which the IDENTITY column equals 4 and changes the price of the book to $18.95. Adaptive Server replaces the syb_identity keyword with the name of the IDENTITY column:

```
update titles
set price = 18.95
where syb_identity = 4
```

Example 5 Updates the titles table using a declared variable:

```
declare @x money
select @x = 0
update titles
    set total_sales = total_sales + 1,
    @x = price
    where title_id = "BU1032"
```

Example 6 Updates rows on which another task does not hold a lock:

```
update salesdetail set discount = 40
        from salesdetail readpast
    where title_id like "BU1032"
        and qty > 100
```

Usage

- Use update to change values in rows that have already been inserted. Use insert to add new rows.
- You can refer to as many as 15 tables in an update statement.
- update interacts with the ignore_dup_key, ignore_dup_row, and allow_dup_row options set with the create index command. See create index for more information.
- You can define a trigger that takes a specified action when an update command is issued on a specified table or on a specified column in a table.

Using variables in *update* statements

- You can assign variables in the set clause of an update statement, similarly to setting them in a select statement.
- Before you use a variable in an update statement, you must declare the variable using declare, and initialize it with select, as shown in Example 5.
- Variable assignment occurs for every qualified row in the update.
- When a variable is referenced on the right side of an assignment in an update statement, the current value of the variable changes as each row is updated. The **current value** is the value of the variable just before the update of the current row. The following example shows how the current value changes as each row is updated.

Suppose you have the following statement:

```
declare @x int
select @x=0
update table1
    set C1=C1+@x, @x=@x+1
    where column2=xyz
```

The value of C1 before the update begins is 1. The following table shows how the current value of the *@x* variable changes after each update:

Row	Initial C1 value	Initial @x value	Calculations: C1+@x= updated C1	Updated C1 value	Calculations: @x+1= updated @x	Updates value
A	1	0	1+0	1	0+1	1
B	1	1	1+1	2	1+1	2
C	2	2	2+2	4	2+1	3
D	4	3	4+3	7	3+1	4

- When multiple variable assignments are given in the same update statement, the values assigned to the variables can depend on their order in the assignment list, but they might not always do so. For best results, do not rely on placement to determine the assigned values.
- If multiple rows are returned and a nonaggregating assignment of a column to a variable occurs, then the final value of the variable is the last row processed; therefore, it might not be useful.
- An update statement that assigns values to variables need not set the value of any qualified row.
- If no rows qualify for the update, the variable is not assigned.
- A variable that is assigned a value in the update statement cannot be referenced in subquery in that same update statement, regardless of where the subquery appears in that update statement.
- A variable that is assigned a value in the update statement cannot be referenced in a where or having clause in that same update statement.
- In an update driven by a join, a variable that is assigned a value in the right hand side of the update statement uses columns from the table that is not being updated. The result value depends on the join order chosen for the update and the number of rows that qualify from the joined table.
- Updating a variable is not affected by a rollback of the update statement because the value of the updated variable is not stored on disk.

Using *update* with transactions

- When you set chained transaction mode on, and no transaction is currently active, Adaptive Server implicitly begins a transaction with the update statement. To complete the update, you must either commit the transaction or rollback the changes. For example:

```
update stores set city = 'Concord'
    where stor_id = '7066'
if exists (select t1.city, t2.city
    from stores t1, stores t2
    where t1.city = t2.city
    and t1.state = t2.state
    and t1.stor_id < t2.stor_id)
        rollback transaction
else
        commit transaction
```

  This batch begins a transaction (using chained transaction mode) and updates a row in the stores table. If it updates a row containing the same city and state information as another store in the table, it rolls back the changes to the stores table and ends the transaction. Otherwise, it commits the updates and ends the transaction.

- Adaptive Server does not prevent you from issuing an update statement that updates a single row more than once in a given transaction. For example, both of these updates affect the price of the book with title_id MC2022, since its type id “mod_cook”:

```
begin transaction
update titles
set price = price + $10
where title_id = "MC2222"
update titles
set price = price * 1.1
where type = "mod_cook"
```

Using joins in updates

- Performing joins in the from clause of an update is an Transact-SQL extension to the ANSI standard SQL syntax for updates. Because of the way an update statement is processed, updates from a single statement do not accumulate. That is, if an update statement contains a join, and the other table in the join has more the one matching value in the join column, the second update is not based on the new values from the first update but on the original values. The results are unpredictable, since they depend on the order of processing. Consider this join:

```
update titles set total_sales = total_sales + qty
    from titles t, salesdetail sd
    where t.title_id = sd.title_id
```

The total_sales value is updated only once for each title_id in titles, for *one* of the matching rows in salesdetail. Depending on the join order for the query, on table partitioning, or on the indexes available, the results can vary each time. But each time, only a single value from salesdetail is added to the total_sales value.

If the intention is to return the sum of the values that match the join column, the following query, using a subquery, returns the correct result:

```
update titles set total_sales = total_sales +
    (select isnull(sum(qty),0)
        from salesdetail sd
        where t.title_id = sd.title_id)
    from titles t
```

Using *update* with character data

- Updating variable-length character data or text columns with the empty string ("") inserts a single space. Fixed-length character columns are padded to the defined length.
- All trailing spaces are removed from variable-length column data, except when a string contains only spaces. Strings that contain only spaces are truncated to a single space. Strings longer than the specified length of a char, nchar, unichar, varchar, univarchar, or nvarchar column are silently truncated unless you set string_rtruncation on.
- An update to a text column initializes the text column, assigns it a valid text pointer, and allocates at least one text page.

Using *update* with cursors

- To update a row using a cursor, define the cursor with declare cursor, then open it. The cursor name cannot be a Transact-SQL parameter or a local variable. The cursor must be updatable, or Adaptive Server returns an error. Any update to the cursor result set also affects the base table row from which the cursor row is derived.
- The *table_name* or *view_name* specified with an update...where current of must be the table or view specified in the first from clause of the select statement that defines the cursor. If that from clause references more than one table or view (using a join), you can specify only the table or view being updated.

After the update, the cursor position remains unchanged. You can continue to update the row at that cursor position, provided another SQL statement does not move the position of that cursor.

- Adaptive Server allows you to update columns that are not specified in the list of columns of the cursor's *select_statement*, but that are part of the tables specified in the *select_statement*. However, when you specify a *column_name_list* with for update, and you are declaring the cursor, you can update only those specific columns.

Updating IDENTITY columns

- You cannot update a column with the IDENTITY property, either through its base table or through a view. To determine whether a column was defined with the IDENTITY property, use sp_help on the column's base table.
- An IDENTITY column selected into a result table observes the following rules with regard to inheritance of the IDENTITY property:
  - If an IDENTITY column is selected more than once, it is defined as NOT NULL in the new table. It does not inherit the IDENTITY property.
  - If an IDENTITY column is selected as part of an expression, the resulting column does not inherit the IDENTITY property. It is created as NULL if any column in the expression allows nulls; otherwise, it is NOT NULL.
  - If the select statement contains a group by clause or aggregate function, the resulting column does not inherit the IDENTITY property. Columns that include an aggregate of the IDENTITY column are created NULL; others are created NOT NULL.
  - An IDENTITY column that is selected into a table with a union or join does not retain the IDENTITY property. If the table contains the union of the IDENTITY column and a NULL column, the new column is defined as NULL. Otherwise, it is defined as NOT NULL.

Updating data through views

- You cannot update views defined with the distinct clause.
- If a view is created with check option, each row that is updated through the view must remain visible through the view. For example, the stores_cal view includes all rows of the stores table where state has a value of "CA". The with check option clause checks each update statement against the view's selection criteria:

```
create view stores_cal
as select * from stores
where state = "CA"
with check option
```

An update statement such as this one fails if it changes state to a value other than “CA”:

```
update stores_cal
set state = "WA"
where store_id = "7066"
```

- If a view is created with check option, all views derived from the base view must satisfy the view’s selection criteria. Each row updated through a *derived* view must remain visible through the base view.

  Consider the view stores_cal30, which is derived from stores_cal. The new view includes information about stores in California with payment terms of “Net 30”:

  ```
  create view stores_cal30
  as select * from stores_cal
  where payterms = "Net 30"
  ```

  Because stores_cal was created with check option, all rows updated through stores_cal30 must remain visible through stores_cal. Any row that changes state to a value other than “CA” is rejected.

  Notice that stores_cal30 does not have a with check option clause of its own. Therefore, you can update a row with a *payterms* value other than “Net 30” through stores_cal30. For example, the following update statement would be successful, even though the row would no longer be visible through stores_cal30:

  ```
  update stores_cal30
  set payterms = "Net 60"
  where stor_id = "7067"
  ```

- You cannot update a row through a view that joins columns from two or more tables, unless both of the following conditions are true:
  - The view has no with check option clause, and
  - All columns being updated belong to the same base table.
- update statements are allowed on join views that contain a with check option clause. The update fails if any of the affected columns appear in the where clause in an expression that includes columns from more than one table.

- If you update a row through a join view, all affected columns must belong to the same base table.

Using *index*, *prefetch*, or *lru* | *mru*

- index, prefetch, and lru | mru override the choices made by the Adaptive Server optimizer. Use them with caution, and always check the performance impact with set statistics io on. For more information about using these options, see the *Performance and Tuning Guide*.

Using *readpast*

- The readpast option applies only to data-only-locked tables. readpast is ignored if it is specified for an allpages-locked table.
- The readpast option is incompatible with the holdlock option. If both are specified in the same select command, an error is generated and the command terminates.
- If the session-wide isolation level is 3, the readpast option is ignored.
- If the transaction isolation level for a session is 0, update commands using readpast do not issue warning messages. For datapages-locked tables, these commands modify all rows on all pages that are not locked with incompatible locks. For datarows-locked tables, they affect all rows that are not locked with incompatible locks.
- If an update command with the readpast option applies to two or more text columns, and the first text column checked has an incompatible lock on it, readpast locking skips the row. If the column does not have an incompatible lock, the command acquires a lock and modifies the column. Then, if any subsequent text column in the row has an incompatible lock on it, the command blocks until it can obtain a lock and modify the column.
- For more information on readpast locking, see the *Performance and Tuning Guide*.

Standards

ANSI SQL – Compliance level: Entry-level compliant.

The following are Transact-SQL extensions:

- The use of a from clause or a qualified table or column name are Transact-SQL extensions detected by the FIPS flagger. Updates through a join view or a view of which the target list contains an expression are Transact-SQL extensions that cannot be detected until run time and are not flagged by the FIPS flagger.
- The use of variables.

- readpast

Permissions

update permission defaults to the table or view owner, who can transfer it to other users.

If set ansi_permissions is on, you need update permission on the table being updated and, in addition, you must have select permission on all columns appearing in the where clause and on all columns following the set clause. By default, ansi_permissions is off.

See also

Commands alter table, create default, create index, create rule, create trigger, insert, where clause

Functions ptn_data_pgs

System procedures sp_bindefault, sp_bindrule, sp_help, sp_helpartition, sp_helpindex, sp_unbindefault, sp_unbindrule

update all statistics

Description	Updates all statistics information for a given table.
Syntax	update all statistics *table_name*
Parameters	*table_name* is the name of the table for which statistics are being updated.
Examples	Updates index and partition statistics for the salesdetail table: `update all statistics salesdetail`
Usage	• update all statistics updates all statistics information for a given table. Adaptive Server keeps statistics about the distribution of pages within a table, and uses these statistics when considering whether or not to use a parallel scan in query processing on partitioned tables, and which index(es) to use in query processing. The optimization of your queries depends on the accuracy of the stored statistics. • update all statistics updates statistics for all columns in a table and updates partition statistics, if the table is partitioned. • If the table is not partitioned, update all statistics runs only update statistics on the table. • If the table is partitioned and has no indexes, update all statistics runs update partition statistics on the table. If the table is partitioned and has indexes, update all statistics runs update statistics and update partition statistics on the table.
Standards	ANSI SQL – Compliance level: Transact-SQL extension.
Permissions	update all statistics permission defaults to the table owner and is not transferrable.
See also	*Commands* – update statistics, update partition statistics

update partition statistics

Description

Updates information about the number of pages in each partition for a partitioned table.

Syntax

update partition statistics *table_name* [*partition_number*]

Parameters

table_name
is the name of a partitioned table.

partition_number
is the number of the partition for which you are updating information. If you do not specify a partition number, update partition statistics updates the number of data pages in all partitions in the specified table.

Usage

- Adaptive Server keeps statistics about the distribution of pages within a partitioned table and uses these statistics when considering whether to use a parallel scan in query processing. The optimization of your queries depends on the accuracy of the stored statistics. If Adaptive Server crashes, the distribution information could be inaccurate.

  To see if the distribution information is accurate, use the data_pgs function to determine the number of pages in the table, as follows:

  ```
  select data_pgs(sysindexes.id, doampg)
     from sysindexes
     where sysindexes.id = object_id("table_name")
  ```

  Then, use sp_helpartition on the table and add up the numbers in the "ptn_data_pgs" column of the output. The sum of the total of the number of pages that sp_helpartition reports should be slightly greater than the number returned by data_pgs because sp_helpartition's page count includes OAM pages.

  If the distribution information is inaccurate, run update partition statistics on the table. While updating the distribution information, update partition statistics locks the OAM page and the control page of the partition.

- When you run update partition statistics on a table that contains data, or you create an index on a table that contains data, the controlpage column in syspartitions is updated to point to the control page for the partition.

- update partition statistics updates control page values used to estimate the number of pages in a table. These statistics are used by sp_helpartition.

Standards

ANSI SQL – Compliance level: Transact-SQL extension.

Permissions

update partition statistics permission defaults to the table owner and is not transferable.

See also

Commands alter table, update all statistics

Functions ptn_data_pgs

System procedures sp_helpartition

update statistics

Description

Updates information about the distribution of key values in specified indexes or for specified columns, for all columns in an index or for all columns in a table.

Syntax

update statistics *table_name*
[[*index_name*] | [(*column_list*)]]
[using *step* values]
[with consumers = *consumers*]

update index statistics *table_name* [*index_name*]
[using *step* values]
[with consumers = *consumers*]

Parameters

table_name

When used with update statistics, *table_name* is the name of the table with which the index is associated. *table_name* is required, since Transact-SQL does not require index names to be unique in a database.

index_name

is the name of the index to be updated. If an index name is not specified, the distribution statistics for all the indexes in the specified table are updated.

column_list

is a comma-separated list of columns.

using *step* values

specifies the number of histogram steps. The default value is 20, for columns where no statistics exist. If you need to change the default for the this, use sp_configure. If statistics for a column already exist in sysstatistics, the default value is the current number of steps.

with consumers = *consumers*

specifies the number of consumer processes to be used for a sort when *column_list* is provided and parallel query processing is enabled.

index

specifies that statistics for all columns in an index are to be updated.

Examples

Example 1 Generates statistics for the price column of the titles table:

```
update statistics titles (price) using 40 values
```

Example 2 Generates statistics for all columns in all indexes of the authors table:

```
update index statistics authors
```

Example 3 Generates statistics for all columns in the au_names_ix index of the authors table:

```
update index statistics authors au_names_ix
```

Usage

- Adaptive Server keeps statistics about the distribution of the key values in each index, and uses these statistics in its decisions about which index(es) to use in query processing.
- When you create a nonclustered index on a table that contains data, update statistics is automatically run for the new index. When you create a clustered index on a table that contains data, update statistics is automatically run for all indexes.
- The optimization of your queries depends on the accuracy of the statistics. If there is significant change in the key values in your index, you should rerun update statistics on that index or column. Use the update statistics command if a great deal of data in an indexed column has been added, changed, or removed (that is, if you suspect that the distribution of key values has changed).
- update statistics, when used with a table name and an index name, updates statistics for the leading column of an index. If update statistics is used with just a table name, it updates statistics for the leading columns of all indexes on the table.
- update index statistics, when used with a table name and an index name, updates statistics for all columns in the specified index. If update index statistics is used with just a table name, it updates statistics for all columns in all indexes of the table.
- Specifying the name of an unindexed column or the nonleading column of an index generates statistics for that column without creating an index.
- Specifying more than one column in a column list generates or updates a histogram for the first column, and density statistics for all prefix subsets of the list of columns.
- If you use update statistics to generate statistics for a column or list of columns, update statistics must scan the table and perform a sort.
- The with consumers clause is designed for use on partitioned tables on RAID devices, which appear to Adaptive Server as a single I/O device, but which are capable of producing the high throughput required for parallel sorting. For more information, see Chapter 24, “Parallel Sorting,” in the *Performance and Tuning Guide*.
- Table 1-40 shows the types of scans performed during update statistics, the types of locks acquired, and when sorts are needed.

Table 1-40: Locking, scans, and sorts during update statistics

update statistics specifying	Scans and sorts performed	Locking
Table name		
Allpages-locked table	Table scan, plus a leaf-level scan of each nonclustered index	Level 1; shared intent table lock, shared lock on current page
Data-only-locked table	Table scan, plus a leaf-level scan of each nonclustered index and the clustered index, if one exists	Level 0; dirty reads
Table name and clustered index name		
Allpages-locked table	Table scan	Level 1; shared intent table lock, shared lock on current page
Data-only-locked table	Leaf level index scan	Level 0; dirty reads
Table name and nonclustered index name		
Allpages-locked table	Leaf level index scan	Level 1; shared intent table lock, shared lock on current page
Data-only-locked table	Leaf level index scan	Level 0; dirty reads
Table name and column name		
Allpages-locked table	Table scan; creates a worktable and sorts the worktable	Level 1; shared intent table lock, shared lock on current page
Data-only-locked table	Table scan; creates a worktable and sorts the worktable	Level 0; dirty reads

- The update index statistics command generates a series of update statistics operations that use the same locking, scanning, and sorting as the equivalent index-level and column-level command. For example, if the salesdetail table has a nonclustered index named sales_det_ix on salesdetail(stor_id, ord_num, title_id), this command:

  ```
  update index statistics salesdetail
  ```

  performs these update statistics operations:

  ```
  update statistics salesdetail sales_det_ix
  update statistics salesdetail (ord_num)
  update statistics salesdetail (title_id)
  ```

- The update all statistics commands generates a series of update statistics operations for each index on the table, followed by a series of update statistics operations for all unindexed columns, followed by an update partition statistics operation.

- update statistics is not run on system tables in the master database during upgrade from earlier versions. Indexes exist on columns queried by most system procedures, and running update statistics on these tables is not required for normal usage. However, running update statistics is allowed on all system tables in all databases, except those that are not normal tables. These tables, which are built from internal structures when queried, include syscurconfigs, sysengines, sysgams, syslisteners, syslocks, syslogs, syslogshold, sysmonitors, sysprocesses, syssecmechs, systestlog and systransactions.

create index and stored procedures

Adaptive Server automatically recompiles stored procedures after executing update statistics statements. Although adhoc queries that you start before executing update statistics still continue to work, they do not take advantage of the new statistics.

In Adaptive Server versions 12.5 and earlier, update statistics was ignored by cached stored procedures.

Standards

ANSI SQL – Compliance level: Transact-SQL extension.

Permissions

update statistics permission defaults to the table owner and is not transferable. The command can also be executed by the Database Owner, who can impersonate the table owner by running the setuser command.

See also

Commands – delete statistics

use

Description

Specifies the database with which you want to work.

Syntax

use *database_name*

Parameters

database_name
is the name of the database to open.

Examples

```
use pubs2
go
```

The current database is now pubs2.

Usage

- The use command must be executed before you can reference objects in a database.
- use cannot be included in a stored procedure or a trigger.
- sp_addalias adds an alias, which permits a user to use a database under another name to gain access to that database.

Standards

ANSI SQL – Compliance level: Transact-SQL extension.

Permissions

If the database has a "guest" account, all users can use the database. If the database does not have a "guest" account, you must be a valid user in the database, have an alias in the database, or be a System Administrator or System Security Officer.

See also

Commands create database, drop database

System procedures sp_addalias, sp_adduser, sp_modifylogin

waitfor

Description

Specifies a specific time, a time interval, or an event for the execution of a statement block, stored procedure, or transaction.

Syntax

waitfor { delay *time* | time *time* | errorexit | processexit | mirrorexit }

Parameters

delay
: instructs Adaptive Server to wait until the specified amount of time has passed, up to a maximum of 24 hours.

time
: instructs Adaptive Server to wait until the specified time.

time
: a time in one of the acceptable formats for date/time data, or a variable of character type. You cannot specify dates—the date portion of the date/time value is not allowed. You can use the datatype time for this information.

errorexit
: instructs Adaptive Server to wait until a kernel or user process terminates abnormally.

processexit
: instructs Adaptive Server to wait until a kernel or user process terminates for any reason.

mirrorexit
: instructs Adaptive Server to wait for a mirror failure.

Examples

Example 1 At 2:20 p.m., the chess table is updated with my next move, and a procedure called sendmail inserts a row in a table owned by Judy, notifying her that a new move now exists in the chess table:

```
begin
    waitfor time "14:20"
    insert chess(next_move)
        values('Q-KR5')
    execute sendmail 'judy'
end
```

Example 2 After 10 seconds, Adaptive Server prints the message specified:

```
declare @var char(8)
select @var = "00:00:10"
begin
    waitfor delay @var
    print "Ten seconds have passed.  Your time
        is up."
```

```
end
```

Example 3 After any process exits abnormally, Adaptive Server prints the message specified:

```
begin
    waitfor errorexit
    print "Process exited abnormally!"
end
```

Usage

- After issuing the waitfor command, you cannot use your connection to Adaptive Server until the time or event that you specified occurs.
- You can use waitfor errorexit with a procedure that kills the abnormally terminated process, to free system resources that would otherwise be taken up by an infected process.
- To find out which process terminated, check the sysprocesses table with sp_who.
- The time you specify with waitfor time or waitfor delay can include hours, minutes, and seconds. Use the format "hh:mi:ss", as described in "Date and time datatypes" on page 19 in Chapter 1, "System and User-Defined Datatypes" of *Reference Manual: Building Blocks*.

  The following example instructs Adaptive Server to wait until 4:23 p.m:

  ```
  waitfor time "16:23"
  ```

  This statement instructs Adaptive Server to wait for 1 hour and 30 minutes:

  ```
  waitfor delay "01:30"
  ```

- Changes in system time (such as setting the clock back for Daylight Savings Time) can delay the waitfor command.
- You can use waitfor mirrorexit within a DB-Library program to notify users when there is a mirror failure.

Standards

ANSI SQL – Compliance level: Transact-SQL extension.

Permissions

waitfor permission defaults to all users. No permission is required to use it.

See also

Commands begin...end

Datatypes Date and time datatypes

System procedures sp_who

where clause

Description

Sets the search conditions in a select, insert, update, or delete statement.

Syntax

Search conditions immediately follow the keyword where in a select, insert, update, or delete statement. If you use more than one search condition in a single statement, connect the conditions with and or or.

where [not] *expression comparison_operator expression*

where [not] *expression* [not] like "*match_string*"
[escape "*escape_character* "]

where [not] *expression* is [not] null

where [not]
expression [not] between *expression* and *expression*

where [not]
expression [not] in ({*value_list* | *subquery*})

where [not] exists (*subquery*)

where [not]
expression comparison_operator
{any | all} (*subquery*)

where [not] *column_name join_operator column_name*

where [not] *logical_expression*

where [not] *expression* {and | or} [not] *expression*

where [not] *time_period1* overlaps *time_period2*

Parameters

not

negates any logical expression or keywords such as like, null, between, in, and exists.

expression

is a column name, a constant, a function, a subquery, or any combination of column names, constants, and functions connected by arithmetic or bitwise operators. For more information about expressions, see “Expressions” on page 249 in Chapter 4, “Expressions, Identifiers, and Wildcard Characters” of *Reference Manual: Building Blocks*.

comparison_operator

is one of the following:

Operator	Meaning
=	Equal to
>	Greater than
<	Less than
>=	Greater than or equal to
<=	Less than or equal to
!=	Not equal to
<>	Not equal to
!>	Not greater than
!<	Not less than

In comparing char, nchar, unichar, varchar, univarchar, and nvarchar data, < means closer to the beginning of the alphabet and > means closer to the end of the alphabet.

Case and special character evaluations depend on the collating sequence of the operating system on the machine on which Adaptive Server is located. For example, lowercase letters may be greater than uppercase letters, and uppercase letters may be greater than numbers.

Trailing blanks are ignored for the purposes of comparison. For example, “Dirk” is the same as “Dirk ”.

In comparing dates, < means earlier and > means later. Put quotes around all character and date data used with a comparison operator. For example:

```
= "Bennet"
> "94609"
```

See “User-defined datatypes” on page 44 in Chapter 1, “System and User-Defined Datatypes” of *Reference Manual: Building Blocks* for more information about data entry rules.

like
is a keyword indicating that the following character string (enclosed by single or double quotes) is a matching pattern. like is available for char, varchar, unichar, univarchar, nchar, nvarchar, datetime, date and time columns, but not to search for seconds or milliseconds.

You can use the keyword like and wildcard characters with datetime and date data as well as with char and varchar. When you use like with datetime or date and time values, Adaptive Server converts the dates to standard datetime format, then to varchar. Since the standard storage format does not include seconds or milliseconds, you cannot search for seconds or milliseconds with like and a pattern.

It is a good idea to use like when you search for date/ time values, since date/time entries may contain a variety of date parts. For example, if you insert the value "9:20" into a column named arrival_time, the following clause would not find it because Adaptive Server converts the entry into "Jan 1, 1900 9:20AM.":

```
where arrival_time = '9:20'
```

However, the following clause would find it:

```
where arrival_time like '%9:20%'
```

match_string
is a string of characters and wildcard characters enclosed in quotes. Table 1-41 lists the wildcard characters.

Table 1-41: Wildcard characters

Wildcard character	Meaning
%	Any string of 0 or more characters
_	Any single character
[ ]	Any single character within the specified range ([a-f]) or set ([abcdef])
[^]	Any single character that is not within the specified range ([^a-f]) or set ([^abcdef])

escape
specifies an escape character with which you can search for literal occurrences of wildcard characters.

escape_character
is any single character. For more information, see "Using the escape clause" on page 270 in Chapter 4, "Expressions, Identifiers, and Wildcard Characters" of *Reference Manual: Building Blocks*.

is null
searches for null values.

between
: is the range-start keyword. Use and for the range-end value. The following range is inclusive:

```
where @val between x and y
```

The following range is not:

```
x and @val < y
```

Queries using between return no rows if the first value specified is greater than the second value.

and
: joins two conditions and returns results when both of the conditions are true.

When more than one logical operator is used in a statement, and operators are usually evaluated first. However, you can change the order of execution with parentheses.

in
: allows you to select values that match any one of a list of values. The comparator can be a constant or a column name, and the list can be a set of constants or, more commonly, a subquery. For information on using in with a subquery, see the *Transact-SQL User's Guide*. Enclose the list of values in parentheses.

value_list
: is a list of values. Put single or double quotes around character values, and separate each value from the following one with a comma (see example 7). The list can be a list of variables, for example:

```
in (@a, @b, @c)
```

However, you cannot use a variable containing a list, such as the following, for a values list:

```
@a = "'1', '2', '3'"
```

exists
: is used with a subquery to test for the existence of some result from the subquery. For more information, see the *Transact-SQL User's Guide*.

subquery
: is a restricted select statement (order by and compute clauses and the keyword into are not allowed) inside the where or having clause of a select, insert, delete, or update statement, or a subquery. For more information, see the *Transact-SQL User's Guide*.

any
is used with >, <, or = and a subquery. It returns results when any value retrieved in the subquery matches the value in the where or having clause of the outer statement. For more information, see the *Transact-SQL User's Guide*.

all
is used with > or < and a subquery. It returns results when all values retrieved in the subquery match the value in the where or having clause of the outer statement. For more information, see the *Transact-SQL User's Guide*.

column_name
is the name of the column used in the comparison. Qualify the column name with its table or view name if there is any ambiguity. For columns with the IDENTITY property, you can specify the syb_identity keyword, qualified by a table name where necessary, rather than the actual column name.

join_operator
is a comparison operator or one of the join operators =* or *=. For more information, see the *Transact-SQL User's Guide*.

logical_expression
is an expression that returns TRUE or FALSE.

or
joins two conditions and returns results when either of the conditions is true.

When more than one logical operator is used in a statement, or operators are normally evaluated after and operators. However, you can change the order of execution with parentheses.

Examples

Example 1

```
where advance * $2 > total_sales * price
```

Example 2 Finds all the rows in which the phone number does not begin with 415:

```
where phone not like '415%'
```

Example 3 Finds the rows for authors named Carson, Carsen, Karsen, and Karson:

```
where au_lname like "[CK]ars[eo]n"
```

Example 4 Finds the row of the sales_east table in which the IDENTITY column has a value of 4:

```
where sales_east.syb_identity = 4
```

Example 5

```
where advance < $5000 or advance is null
```

Example 6

```
where (type = "business" or type = "psychology") and advance > $5500
```

Example 7

```
where total_sales between 4095 and 12000
```

Example 8 Finds the rows in which the state is one of the three in the list:

```
where state in ('CA', 'IN', 'MD')
```

Example 9 Compares two time periods and determines whether they overlap each other. The first period begins March 16, 1994 and lasts for one month. The second period begins March 31, 1994 and lasts until December 31, 1994. The predicate returns a value of TRUE because the two periods have points in common:

```
where (date "1994-03-16", interval +"1" month) overlaps
(date "1994-03-31", date "1994-12-31")
```

Usage

- where and having search conditions are identical, except that aggregate functions are not permitted in where clauses. For example, this clause is legal:

  ```
  having avg(price) > 20
  ```

  This clause is not legal:

  ```
  where avg(price) > 20
  ```

  For examples, see Chapter 2, "Transact-SQL Functions" in *Reference Manual: Building Blocks* for information on the use of aggregate functions, and group by and having clauses on page 301.

- Joins and subqueries are specified in the search conditions: see the *Transact-SQL User's Guide* for full details.

- The number of and and or conditions in a where clause is limited only by the amount of memory available to run the query.

- The pattern string included in the like predicate is limited only by the size of string that can be placed in a varchar.

- There are two ways to specify literal quotes within a char or varchar entry. The first method is to use two quotes. For example, if you began a character entry with a single quote, and you want to include a single quote as part of the entry, use two single quotes:

```
'I don''t understand.'
```

Or use double quotes:

```
"He said, ""It's not really confusing."""
```

The second method is to enclose a quote in the opposite kind of quotation mark. In other words, surround an entry containing double quotes with single quotes (or vice versa). Here are some examples:

```
'George said, "There must be a better way."'
"Isn't there a better way?"
'George asked, "Isn"t there a better way?"'
```

- To enter a character string that is longer than the width of your screen, enter a backslash (\) before going to the next line.
- If a column is compared to a constant or variable in a where clause, Adaptive Server converts the constant or variable into the datatype of the column so that the optimizer can use the index for data retrieval. For example, float expressions are converted to int when compared to an int column. For example:

```
where int_column = 2
```

selects rows where *int_column* = 2.

- When Adaptive Server optimizes queries, it evaluates the search conditions in where and having clauses, and determines which conditions are search arguments (SARGs) that can be used to choose the best indexes and query plan. All of the search conditions are used to qualify the rows. For more information on search arguments, see the *Performance and Tuning Guide*.

Standards

ANSI SQL – Compliance level: Entry-level compliant.

See also

Commands delete, execute, group by and having clauses, insert, select, update

Datatypes Date and time datatypes

System procedures sp_helpjoins

while

Description

Sets a condition for the repeated execution of a statement or statement block. The statement(s) are executed repeatedly, as long as the specified condition is true.

Syntax

while *logical_expression* [plan "*abstract plan*"]
statement

Parameters

logical_expression
is any expression that returns TRUE, FALSE, or NULL.

plan "*abstract plan*"
specifies the abstract plan to use to optimize the query. It can be a full or partial plan, specified in the abstract plan language. Plans can only be specified for optimizable SQL statements, that is, queries that access tables. See Chapter 30, "Creating and Using Abstract Plans," in the *Performance and Tuning Guide* for more information.

statement
can be a single SQL statement, but is usually a block of SQL statements delimited by begin and end.

Examples

If the average price is less than $30, double the prices of all books in the titles table. As long as it is still less than $30, the while loop keeps doubling the prices. In addition to determining the titles whose price exceeds $20, the select inside the while loop indicates how many loops were completed (each average result returned by Adaptive Server indicates one loop):

```
while (select avg(price) from titles) < $30
begin
    select title_id, price
        from titles
        where price > $20
    update titles
        set price = price * 2
end
```

Usage

- The execution of statements in the while loop can be controlled from inside the loop with the break and continue commands.
- The continue command causes the while loop to restart, skipping any statements after the continue. The break command causes an exit from the while loop. Any statements that appear after the keyword end, which marks the end of the loop, are executed. The break and continue commands are often activated by if tests.

  For example:

```
while (select avg(price) from titles) < $30
begin
        update titles
        set price = price * 2
    if (select max(price) from titles) > $50
        break
    else
        if (select avg(price) from titles) > $30
           continue
        print "Average price still under $30"
end

select title_id, price from titles
        where price > $30
```

This batch continues to double the prices of all books in the titles table as long as the average book price is less than $30. However, if any book price exceeds $50, the break command stops the while loop. The continue command prevents the print statement from executing if the average exceeds $30. Regardless of how the while loop terminates (either normally or because of the break command), the last query indicates which books are priced over $30.

- If two or more while loops are nested, the break command exits to the next outermost loop. All the statements after the end of the inner loop run, then the next outermost loop restarts.

Warning! If a create table or create view command occurs within a while loop, Adaptive Server creates the schema for the table or view before determining whether the condition is true. This may lead to errors if the table or view already exists.

Standards — ANSI SQL – Compliance level: Transact-SQL extension.

Permissions — while permission defaults to all users. No permission is required to use it.

See also — **Commands** begin...end, break, continue, goto label

writetext

Description

Permits minimally logged, interactive updating of an existing text or image column.

Syntax

writetext [[*database*.]*owner*.]*table_name.column_name*
text_pointer [readpast] [with log] *data*

Parameters

table_name.column_name
is the name of the table and text or image column to update. Specify the database name if the table is in another database, and specify the owner's name if more than one table of that name exists in the database. The default value for *owner* is the current user, and the default value for *database* is the current database.

text_pointer
a varbinary(16) value that stores the pointer to the text or image data. Use the textptr function to determine this value, as shown in example 1. text and image data is not stored in the same set of linked pages as other table columns. It is stored in a separate set of linked pages. A pointer to the actual location is stored with the data; textptr returns this pointer.

readpast
specifies that the command should modify only unlocked rows. If the writetext command finds locked rows, it skips them, rather than waiting for the locks to be released.

with log
logs the inserted text or image data. The use of this option aids media recovery, but logging large blocks of data quickly increases the size of the transaction log, so make sure that the transaction log resides on a separate database device. See create database, sp_logdevice, and the *System Administration Guide* for details.

data
is the data to write into the text or image column. text data must be enclosed in quotes. image data must be preceded by "0x". Check the information about the client software you are using to determine the maximum length of text or image data that can be accommodated by the client.

Examples

Example 1 This example puts the text pointer into the local variable *@val*. Then, writetext places the text string "hello world" into the text field pointed to by *@val*:

```
declare @val varbinary(16)
select @val = textptr(copy) from blurbs
    where au_id = "409-56-7008"
```

```
writetext blurbs.copy @val with log "hello world"
```

Example 2

```
declare @val varbinary(16)
select @val = textptr(copy)
from blurbs readpast
    where au_id = "409-56-7008"
writetext blurbs.copy @val readpast with log "hello
world"
```

Usage

- The maximum length of text that can be inserted interactively with writetext is approximately 120K bytes for text and image data.
- By default, writetext is a minimally logged operation; only page allocations and deallocations are logged, but the text or image data is not logged when it is written into the database. To use writetext in its default, minimally logged state, a System Administrator must use sp_dboption to set select into/bulkcopy/pllsort to true.
- writetext updates text data in an existing row. The update completely replaces all of the existing text.
- writetext operations are not caught by an insert or update trigger.
- writetext requires a valid text pointer to the text or image column. For a valid text pointer to exist, a text column must contain either actual data or a null value that has been explicitly entered with update.

  Given the table textnull with columns textid and *x*, where *x* is a text column that permits nulls, this update sets all the text values to NULL and assigns a valid text pointer in the text column:

  ```
  update textnull
  set x = null
  ```

  No text pointer results from an insert of an explicit null:

  ```
  insert textnull values (2,null)
  ```

  And, no text pointer results from an insert of an implicit null:

  ```
  insert textnull (textid)
  values (2)
  ```

- insert and update on text columns are logged operations.
- You cannot use writetext on text and image columns in views.

- If you attempt to use writetext on text values after changing to a multibyte character set, and you have not run dbcc fix_text, the command fails, and an error message is generated, instructing you to run dbcc fix_text on the table.
- writetext in its default, non-logged mode runs more slowly while a dump database is taking place.
- The Client-Library functions dbwritetext and dbmoretext are faster and use less dynamic memory than writetext. These functions can insert up to 2GB of text data.

Using the *readpast* option

- The readpast option applies only to data-only-locked tables. readpast is ignored if it is specified for an allpages-locked table.
- If the session-wide isolation level is 3, the readpast option is silently ignored.
- If the transaction isolation level for a session is 0, writetext commands using readpast do not issue warning messages. These commands at session isolation level 0 modify the specified text column if the text column is not locked with incompatible locks.

Standards

ANSI SQL – Compliance level: Transact-SQL extension.

Permissions

writetext permission defaults to the table owner, who can transfer it to other users.

See also

Commands readtext

Datatypes Converting text and image datatypes

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