SYBASE®

Feature Guide

EAServer

5.0

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Contents

About This Book

Subject

This book describes EAServer, which is an integrated set of application servers that you use to deploy Web applications that support high-volume traffic, dynamic content, and intensive online transaction processing. The EAServer product set consists of PowerDynamo™ (Dynamo) and Adaptive Server® Anywhere.

Note Products described in this manual may not be available on some UNIX platforms. See the *Release Bulletin* and the *Installation Guide* for a list of products included in your EAServer edition.

Audience

This book is written for new users of EAServer.

How to use this book

The following chapters are included in this book:

- Chapter 1, “Introducing EAServer,” includes a description of EAServer’s features and use.
- Chapter 2, “Developing an EAServer Application,” explains some of the basic concepts and terminology associated with developing component-based EAServer applications.
- Chapter 3, “EAServer Components,” discusses developing EJB, Java, C/C++, and ActiveX components that run on EAServer.
- Chapter 4, “Web Applications,” describes the components of Web applications.
- Chapter 5, “Using PowerDynamo with EAServer,” discusses calling methods in EAServer components from PowerDynamo templates and scripts.
- Chapter 6, “Using Message Bridge for Java with EAServer,” describes how Message Bridge is used to build applications that make use of structured messages, such as XML documents or messages exchanged between enterprise systems or business partners through New Era adapters, using EAServer components.

Related documents

Core EAServer documentation The core EAServer documents are available in HTML format in your EAServer software installation, and in PDF and DynaText format on the *Technical Library* CD.

What's New in EAServer summarizes new functionality in this version.

The *EAServer Cookbook* contains tutorials and explains how to use the sample applications included with your EAServer software.

The *EAServer Feature Guide* (this book) explains application server concepts and architecture, such as supported component models, network protocols, server-managed transactions, and Web applications.

The *EAServer System Administration Guide* explains how to:

- Start the preconfigured Jaguar server and manage it with the EAServer Manager plug-in for Sybase Central™
- Create, configure, and start new application servers
- Define connection caches
- Create clusters of application servers to host load-balanced and highly available components and Web applications
- Monitor servers and application components
- Automate administration and monitoring tasks with command line tools or the Repository API

The *EAServer Programmer's Guide* explains how to:

- Create, deploy, and configure components and component-based applications
- Create, deploy, and configure Web applications, Java servlets, and JavaServer Pages
- Use the industry-standard CORBA and Java APIs supported by EAServer

The *EAServer Web Services Toolkit User's Guide* describes Web services support in EAServer, including:

- Support for standard Web services protocols such as Simple Object Access Protocol (SOAP), Web Services Description Language (WSDL), and Uniform Description, Discovery, and Integration (UDDI)
- Administration tools for deployment and creation of new Web services, WSDL document creation, UDDI registration, and SOAP management

The *EAServer Security Administration and Programming Guide* explains how to:

- Understand the EAServer security architecture
- Configure role-based security for components and Web applications
- Configure SSL certificate-based security for client connections using the Security Manager plug-in for Sybase Central
- Implement custom security services for authentication, authorization, and role membership evaluation
- Implement secure HTTP and IIOP client applications
- Deploy client applications that connect through Internet proxies and firewalls

The *EAServer Performance and Tuning Guide* describes how to tune your server and application settings for best performance.

The *EAServer API Reference Manual* contains reference pages for proprietary EAServer Java classes, ActiveX interfaces, and C routines.

The *EAServer Troubleshooting Guide* describes procedures for troubleshooting problems that EAServer users may encounter. This document is available only online; see the EAServer Troubleshooting Guide at http://www.sybase.com/detail?id=1024509.

Message Bridge for Java™ Message Bridge for Java simplifies the parsing and formatting of structured documents in Java applications. Message Bridge allows you to define structures in XML or other formats, and generates Java classes to parse and build documents and messages that follow the format. The *Message Bridge for Java User's Guide* describes how to use the Message Bridge tools and runtime APIs. This document is included in PDF and DynaText format on your *EAServer 5.0 Technical Library* CD.

Adaptive Server Anywhere documents EAServer includes a limited-license version of Adaptive Server Anywhere for use in running the samples and tutorials included with EAServer. Adaptive Server Anywhere documents are available on the Sybase Web site at http://sybooks.sybase.com/aw.html.

jConnect for JDBC documents EAServer includes the jConnect™ for JDBC™ driver to allow JDBC access to Sybase database servers and gateways. The *Programmer's Reference jConnect for JDBC* is available on the Sybase Web site at http://sybooks.sybase.com/jc.html.

Conventions

The formatting conventions used in this manual are:

Formatting example	To indicate
commands and methods	When used in descriptive text, this font indicates keywords such as: • Command names used in descriptive text • C++ and Java method or class names used in descriptive text • Java package names used in descriptive text • Property names in the raw format, as when using jagtool to configure applications rather than EAServer Manager
variable, *package*, or *component*	Italic font indicates: • Program variables, such as *myCounter* • Parts of input text that must be substituted, for example: *Server*.log • File names • Names of components, EAServer packages, and other entities that are registered in the EAServer naming service
File | Save	Menu names and menu items are displayed in plain text. The vertical bar shows you how to navigate menu selections. For example, File | Save indicates "select Save from the File menu."
`package 1`	Monospace font indicates: • Information that you enter in EAServer Manager, a command line, or as program text • Example program fragments • Example output fragments

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.

v **For 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.
4. Select the Certification Report filter, specify a time frame, and click Go.
5. Click a Certification Report title to display the report.

v **For the latest information on EBFs and Updates**

1. Point your Web browser to Technical Documents at http://www.sybase.com/support/techdocs/.
2. Select EBFs/Updates. Enter user name and password information, if prompted (for existing Web accounts) or create a new account (a free service).
3. Specify a time frame and click Go.
4. Select a product.
5. Click an EBF/Update title to display the report.

v **To create 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.

Accessibility features

EAServer 5.0 has been tested for compliance with U.S. government Section 508 Accessibility requirements. The online help for this product is also provided in HTML, JavaHelp, and Eclipse help formats, which you can navigate using a screen reader.

EAServer Manager supports working without a mouse. For more information, see "Keyboard navigation" in Chapter 2, "Sybase Central Overview," in the *EAServer System Administration Guide*.

The WST plug-in for Eclipse supports accessibility features for those that cannot use a mouse, are visually impaired or have other special needs. For information about these features refer to Eclipse help:

1 Start Eclipse

2 Select Help | Help Contents

3 Enter Accessibility in the Search dialog box

4 Select Accessible user interfaces or Accessibility features for Eclipse

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Note You might need to configure your accessibility tool for optimal use. Some screen readers pronounce text based on its case; for example, they pronounce ALL UPPERCASE TEXT as initials, and MixedCase Text as words. You might find it helpful to configure your tool to announce syntax conventions. Consult the documentation for your tool.

For additional information about how Sybase supports accessibility, see Sybase Accessibility at http://www.sybase.com/accessibility. The Sybase Accessibility site includes links to information on Section 508 and W3C standards.

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

Introducing EAServer

This chapter describes the EAServer features.

For a description of the features that are new in this version, see *What's New in EAServer*.

Overview

EAServer is an application server, which includes an integrated set of development tools that you use to deploy Web applications that support high-volume traffic, dynamic content, and intensive online transaction processing. The EAServer product set includes PowerDynamo and Adaptive Server Anywhere.

EAServer provides a framework for deploying the middle-tier logic of distributed component-based applications.

EAServer simplifies the creation and administration of Internet applications that service thousands of clients simultaneously. EAServer components execute on the middle-tier between end-user client applications and remote databases. EAServer provides efficient management of client sessions, security, threads, third-tier database connections, and transaction flow, without requiring specialized knowledge on the part of the component developer.

EAServer's scalability and platform independence allow you to develop your application on inexpensive single processor machines and then deploy the application on an enterprise-grade multiprocessor server.

EAServer provides the following features:

- A scalable, multithreaded, platform-independent execution engine
- Dispatch and stub/proxy support for all major component models, including JavaBeans, PowerBuilder®, Java, ActiveX, and C/C++
- Dynamic HTML support using Java servlet, JavaServer Pages, and PowerDynamo Web sites
- Java 2 Enterprise Edition (J2EE) platform support
- Graphical administration with Sybase Central, including component interface browsing, declarative role-based security, password, and required SSL session characteristics, server and user certificate management, IDL module support, transaction monitoring, and runtime monitoring
- Tight integration with the PowerBuilder development environment
- Transparent client-session and component-lifecycle management
- Connection caching to allow reuse of remote database connections
- Industry-standard naming services to resolve components using logical names rather than server addresses
- Transaction management to simplify the design and implementation of an application's transactions
- Transparent thread-safety features to simplify use of shared data and resources
- Result-set support to enable efficient retrieval of tabular data in client applications

- Declarative, role-based security to restrict client connections and the components that can be invoked by a specific client session
- Identity-based security to restrict intercomponent calls
- Asynchronous messaging support
- Asynchronous processing support
- Web server redirector plug-in forwards client requests directly to a Web server
- EAServer version 5.0 is available as a plug-in for Borland JBuilder version 10. The EAServer plug-in conforms to Section 508 guidelines, and is internationalized and localizable.

The following sections explain these features in detail.

EAServer execution engine

EAServer's runtime engine provides a scalable and platform-independent environment for the execution of component based applications. EAServer is scalable because it is multithreaded and multiprocessor safe.

The EAServer execution environment is the same across all platforms, with the exception of ActiveX component support. ActiveX requires platform support and is currently available only on Windows.

The EAServer runtime engine provides the following services:

- Network listeners for the connections on which clients send remote component invocations. EAServer's core network server technology is based on Sybase's Open Client/Server™ technology. "Network protocol support" on page 7 details the supported application protocols.
- An execution environment for middle-tier components. See "Server-side component support" on page 29.
- A built-in HTTP server. You can use EAServer's HTTP support to deploy your application's Java applets and HTML pages.
- Hosting of Dynamo Web sites so that you can access those sites from a browser.
- Ability to run with different Java virtual machines.

- A JagRepair server that you can use to repair your application server if you cannot start it up because of an incorrect configuration setting.
- Declarative security. You can use roles to authenticate and authorize users. See the *EAServer Security Administration and Programming Guide* for more information.
- Connection caching. You can define caches of connections for interacting with remote databases from EAServer components. See “Connection caching” on page 18 for more information.
- Open Server™ event handler support. See “Support for legacy Open Server applications” on page 22 for more information.

In addition to these built-in services, you can install *service components* that run in the background and provide customized services to clients or other components. See Chapter 33, “Creating Service Components,” in the *EAServer Programmer’s Guide* for more information.

Component support

Components are reusable modules of code that combine related tasks (methods) into a well-defined interface. EAServer components are installed on an EAServer application server and contain the methods that execute business logic and access data sources. You or your administrator install the component’s executable code on the server. Components can be distributed throughout a network, including the Internet or an intranet, on different servers. Installed components can be used by any number of independent applications.

Since EAServer components reside on the server, components do not contain methods to display graphics or user interfaces—that is, EAServer components are inherently nonvisual.

User-interface developers or other component developers can browse a component’s interface in EAServer Manager; in their code, they use a client stub or proxy to invoke the component’s methods. The stub or proxy acts as a local surrogate for the remote component, providing the same method signatures as the component and hiding the details of remote server communication.

EAServer's server-side component support and client-side stub or proxy support are independent. Any EAServer client can execute any type of component. A component of any model can execute components of another model using intercomponent calls without the use of additional gateway software. Additionally, since EAServer uses standard CORBA IIOP as its core network protocol, you can use CORBA client runtimes from other vendors to invoke components installed on EAServer.

All clients and components share a common interface repository. Component interfaces are stored in standard CORBA interface definition language (IDL). Component developers can define, edit, and browse interfaces in EAServer Manager, which allows you to edit interfaces graphically or as raw IDL. You can also define interfaces by importing compiled Java classes, standard-format EJB-JAR files, or ActiveX type libraries.

For more information about the component models that EAServer supports, see Chapter 3, "EAServer Components."

J2EE platform support

EAServer implements the Java 2 Enterprise Edition (J2EE) 1.3 specification, with support for EJB 2.0 components, J2EE applications, J2EE Web applications, object caching, the JavaMail electronic mail API, the connector architecture, Java API for XML Parsing, and the Java Authentication and Authorization Services.

"Component support" on page 4 describes EAServer's supported component models, including EJB.

A Web application is a unit of deployment for interrelated Web content, JavaServer Pages (JSPs), and Java servlets. The Web application contains static files, servlet and JSP implementation classes, and a deployment descriptor that describes how the files, servlets, and JSPs are configured on the host server. See Chapter 21, "Creating Web Applications," in the *EAServer Programmer's Guide* for more information.

J2EE applications allow you to group related EJB 2.0 components and Web applications into a single entity. In this way, you can deploy related business logic components, Java servlets, JavaServer Pages, and Web pages as a single unit between servers. Using the J2EE Application Client model, you can create clients that call the components and Web pages in the application. For more information, see these chapters in the *EAServer Programmer's Guide*:

- Chapter 3, “Managing Applications and Packages in EAServer Manager”
- Chapter 10, “Creating Application Clients”

EAServer supports EJB 2.0 container-managed persistence (CMP) for EJB entity bean components, as well as supporting an automatic persistence model for components of other types. EAServer also supports entity instance and finder-query caching, which can improve performance by minimizing the number of database select queries required to execute business logic. For information on entity components, automatic persistence, and object/query caching, see Chapter 27, “Creating Entity Components,” in the *EAServer Programmer's Guide*.

The JavaMail API provides a standard Java interface to the most widely-used Internet mail protocols. See Chapter 35, “Creating JavaMail,” in the *EAServer Programmer's Guide* for more information.

The J2EE connector architecture enables you to write portable Java applications that can access multiple transactional enterprise information systems. A connector is a specialized connection factory that provides connections for EJBs, Java servlets, JSPs, and CORBA-Java components. For more information, see Chapter 4, “Database Access,” in the *EAServer System Administration Guide*.

EAServer can host Web applications in popular Web servers such as Apache, iPlanet, and Netscape. For more information, see the *EAServer Installation Guide* for your platform.

EAServer implements J2EE version 1.3 security requirements including Java and C++ ORB support and CORBA Secure Interoperable version 2 protocol (CSIv2). For more information see the *EAServer Security Administration and Programming Guide*.

EAServer includes support for the Java API for XML Parsing 1.1. You can configure the parser and transformer implementations for servers, components, Web applications, and application clients.

Java Authentication and Authorization Services (JAAS) provide a framework and standard programming interface for authenticating users and assigning privileges. JAAS is based on the Pluggable Authentication Module standard, which extends the access-control architecture of the Java 2 platform to support user-based authentication and authorization. For more information, see the *EAServer Security Administration and Programming Guide*.

Network protocol support

EAServer supports the following protocols:

- **Internet Inter-ORB Protocol (IIOP)** IIOP is the standard protocol for communication between CORBA ORBs over TCP/IP networks. All EAServer client models except MASP use IIOP or IIOP tunnelled inside of SSL (referred to as IIOPS). IIOP connections can also be tunnelled inside of HTTP to allow connections through firewalls that do not allow passage of IIOP traffic, as discussed in "HTTP tunnelling support" on page 8.
- **Sybase Tabular Data Stream™ (TDS)** TDS is a proprietary protocol used in two-tier database applications that connect to Sybase database servers or gateways. Two types of clients connect to EAServer using TDS:
  - **MASP** MASP and TDS allow you to incorporate EAServer components into applications that were developed with traditional two-tier development tools.
  - **Legacy Open Server clients** If you have converted an Open Server application to run in EAServer, legacy clients for the application connect to EAServer using TDS.

  To separate MASP and Open Server requests, EAServer requires different listener ports for each type of client. To support MASP clients, your server must have at least one TDS listener installed. You must define an Open Server listener to support legacy Open Server clients.
- **Hypertext Transfer Protocol (HTTP)** HTTP is used by Web browsers for file downloads and uploads. EAServer provides HTTP support to allow you to deploy HTML pages and Java applets on EAServer itself.
- **Secure Sockets Layer (SSL)** The SSL protocol allows connections to be secured using public-key encryption and authentication algorithms. "SSL support" on page 8 describes EAServer's SSL support.

To enable support for each protocol, you must define a *listener* in EAServer Manager. The listener configuration specifies a server address (host name and port number) as well as the network protocol and security settings to be used by clients that connect to that listener. SSL support requires installation of a server certificate. See the *EAServer Security Administration and Programming Guide* for more information.

HTTP 1.1 support

EAServer supports for HTTP/1.1, and complies with features listed as must and required for *origin server* and *client* in the W3C spec for HTTP/1.1. For more information about HTTP/1.1, see the HTTP/1.1 specification at http://www.w3.org/Protocols/rfc2616/rfc2616.html.

HTTP tunnelling support

Almost all network firewalls allow HTTP traffic to pass, but some reject IIOP packets. When IIOP traffic is tunnelled inside of HTTP, your clients can connect to EAServer through a firewall that does not allow IIOP traffic to pass.

EAServer's Java client ORB performs HTTP tunnelling automatically using the designated IIOP port. No additional configuration or proxies are required. When connecting, the EAServer client-side ORB first tries to open an IIOP connection to the specified address and port. If the IIOP connection fails, the ORB tries an HTTP-tunnelled connection to the same address and port. The default behavior is appropriate when some users connect through firewalls that require tunnelling and others do not; the same application can serve both types. If you know HTTP tunnelling is always required for a Java client, you can set the ORBHttp property to cause the ORB to use HTTP tunnelling without trying plain IIOP connections first.

The C++ client ORB supports tunnelling when clients explicitly request it by setting the ORBHttp property.

SSL support

The SSL protocol allows connections to be secured using public-key encryption and authentication algorithms that are based on digital certificates. SSL is a *wrapper* protocol: packets for another protocol are secured by embedding them inside of SSL packets. For example, HTTPS is HTTP-secured by embedding each HTTP packet within an SSL packet. Likewise, IIOPS is IIOP embedded within SSL. HTTPS and IIOPS are also commonly called *secure HTTP* and *secure IIOP*, respectively.

EAServer provides native SSL protocol support. Specifically, EAServer's built-in SSL driver supports dynamic negotiation, cached and shared sessions, and authorization for client and server using X.509 Digital Certificate Support.

In EAServer Manager, you configure a secure IIOP or HTTP port by defining an IIOP or HTTP listener, then associating a security profile with the listener. The security profile designates a server certificate which is sent to clients to verify that the connection ends at the intended server. The security profile also specifies the connection's required security settings, such as:

- Whether a client certificate is required to open connections. The client certificate serves as proof of the client user's identity.
- What data security options, such as the encryption algorithm, are used to secure data transmitted over the connection.

For detailed instructions on configuring secure ports, see the *EAServer Security Administration and Programming Guide*.

On the client-side, the following types of clients can open SSL connections to EAServer:

- Java applets hosted by SSL-capable Web browsers.
- Java applications
- C++ clients
- PowerBuilder clients
- ActiveX clients

Dynamic HTML support

You can use Java servlets, JavaServer Pages (JSPs), or PowerDynamo Web sites to dynamically create HTML pages and interactive HTML forms. Both PowerDynamo and Java servlets can call methods in EAServer components.

Java servlets are Java classes that use the standard javax.servlet API to respond to HTTP requests. EAServer can host Java servlets natively, and you can use EAServer Manager to associate logical paths in a HTTP URL with a Java servlet. JavaServer Pages extend the HTML page description language, allowing you to embed Java scriptlets within HTML tags. See these chapters in the *EAServer Programmer's Guide* for more information:

- Chapter 22, "Creating Java Servlets"
- Chapter 24, "Creating JavaServer Pages"

If you have the PowerBuilder IDE, you can deploy JSP-based Web applications from PowerBuilder to EAServer. For more information, see *Working with Web and JSP Targets* in your PowerBuilder documentation.

PowerDynamo Web sites contain static HTML pages and dynamic pages implemented in the DynaScript language. You can configure EAServer to host PowerDynamo Web sites natively. Chapter 3, "Creating and Configuring Servers," in the *EAServer System Administration Guide* describes how to configure EAServer to host PowerDynamo Web sites. See the *PowerDynamo User's Guide* for information on creating Web sites and dynamic pages.

PowerDynamo Web site conversion utility

EAServer 5.0 includes the Dyn2JSP utility to convert PowerDynamo™ Web sites into JSP-based J2EE Web applications. Sybase recommends that you migrate your PowerDynamo Web sites to the J2EE model. Support for PowerDynamo will be removed from later versions of EAServer. For information on using the Dyn2JSP utility, see the HTML documentation included in the *PDynamo2JSP* directory of the installation.

Web server redirector plug-in

EAServer hosts Web applications and functions as a Web server. You can install a redirector plug-in on the Web server host that allows you to send client requests directly to the Web server. The redirector plug-in enables communication between the Web server and the EAServer HTTP protocol listener. The redirector plug-in forwards requests to EAServer that need to access servlets, JSPs, and so on. EAServer processes the requests and returns the results back to the Web server.

EAServer 5.0 includes redirector plug-ins for the Web servers described in Table 1-1. For more information, see the *EAServer Installation Guide*.

Table 1-1: Web server redirector plug-ins

Platform	Web servers supported
Solaris	Netscape 3.6.*x*, iPlanet 4.1, Sun ONE (iPlanet 6.0), Apache 1.3 and 2.0.*x*
Windows	Netscape 3.6.*x*, Apache 1.3 and 2.0.*x*, iPlanet 4.1, Sun ONE (iPlanet 6.0), Microsoft IIS (Internet Information Server) 5.0
HP-UX	Apache 1.3.26
AIX	iPlanet 4.1

Administration and development tools

Sybase Central is a common management framework for Sybase application and database servers. EAServer provides two Sybase Central plug-ins for use by developers and administrators:

- EAServer Manager provides graphical administration facilities for EAServer, including support for development, deployment, runtime monitoring of applications, and management of the server's SSL digital certificate database.
- Standalone Security Manager can be installed on client machines where a full EAServer installation is not required and provides a graphical user interface for managing SSL digital certificates, which can be used by end users to manage the certificates used in client applications.

For detailed instructions on running EAServer Manager and the standalone Security Manager, see the *EAServer System Administration Guide* and the *EAServer Security Administration and Programming Guide*.

Development support

Sybase PowerBuilder has been integrated with EAServer. Using this tool, you can develop, deploy, and debug EAServer components entirely within the development environment. You can also generate the proxies required for client application development. For more information, see the *Application Techniques* manual included in the PowerBuilder documentation.

Application developers using other tools can use EAServer Manager to view the method definitions for any installed component in EAServer Manager. You can view and edit method definitions graphically, or you can directly edit the IDL datatype and interface definitions with EAServer Manager's IDL editor. Interface definitions can be imported from existing Java classes, ActiveX component type library files, or from standard CORBA IDL files. See "Defining Component Interfaces" in the *EAServer Programmer's Guide* for more information.

EAServer Manager also generates stub classes for use in Java and C++ client applications and ActiveX type libraries for use in ActiveX client applications.

Deployment support

To simplify application deployment, EAServer Manager defines the following basic, middle-tier application units:

- **Clusters** A cluster represents a set of servers that share configuration information and run the same set of components. For applications with thousands of clients, clusters provide support for load balancing and high availability. EAServer Manager includes a synchronization feature, which replicates component files and configuration information from a primary server to other servers in a cluster.
- **Servers** A server represents one EAServer runtime process. Each server has its own network addresses for client session connections and for HTTP (HTML) connections. All servers on one host machine share the same configuration repository. For administration purposes, you can connect to any server on the host machine to configure other servers on the same host.

- **Applications** Applications allow you to group packages (groups of related components) and Web applications (bundled static Web content, servlets, and JSPs) into a single unit for easy deployment between servers.
- **Packages** A package organizes components into cohesive, secure units that can be easily deployed on another EAServer installation. Packages can be exported, or saved, as a Java archive (JAR) file. The package archive includes the definition of all components in a package, plus any supporting files (such as source code and client files) that you specify. Package archives exported from one server can easily be imported for redeployment on another server.

  Roles attached to packages control access to components in a package. For more information about roles and package security, see the *EAServer Security Administration and Programming Guide*.
- **Components** A component definition consists of the component's method signatures and other properties, such as component type, transaction support, threading model, and the name of the Java class or executable library that implements the component.
- **Web applications** Web applications allow you to group static Web content, servlets, and JSPs into a single unit for easy deployment and configuration.
- **Web components** You can install servlets and JSPs in a Web application as Web components. This allows you to configure request path mappings and other useful settings within the Web application properties.

Before a client application can execute a component, the component must be installed in an EAServer package, and that package must be installed in the server to which the client connects.

Hot refresh support

EAServer Manager includes an option that allows you to refresh components, packages, and servers, enabling you to test and debug component implementation changes without restarting the server.

Runtime monitoring support

The EAServer Manager plug-in for Sybase Central provides allows you to remotely view server log files and to monitor statistics for component execution and network activity.

Use the EAServer Manager File Viewer to connect to EAServer and view the contents of these server log files:

- The EAServer log file, where the server records errors related to component execution.

- The HTTP protocol request and error log files, where EAServer's built-in Web server records successful and unsuccessful file requests.

Runtime Monitoring allows you to view statistics on component and network activity. You can view counts of active client sessions, components, and transactions.

See the *EAServer System Administration Guide* for more information on these features.

Certificate management support

EAServer Manager | Certificates folder (server) or the standalone Security Manager (client) allows you to manage the server and user certificates that are required for SSL-protocol support. This allows you to:

- **Install server certificates** Server certificates are required to establish secure IIOP and HTTP ports. The certificate is presented to the client application as proof that the application has connected to the server that the user intends to interact with.
- **Install Certificate Administrator (CA) certificates** CA certificates, also called **signing certificates**, are attached to client and server certificates to validate the origin of the certificate. For example, if you obtain a certificate from VeriSign, your certificate will include a copy of the VeriSign CA certificate. Using the Certificates folder you can install CA certificates into EAServer and indicate which CAs are trusted. When client applications present certificates to EAServer, the signing certificate must be present in the list of trusted CAs in the Certificates folder | Trusted CAs folder or the connection fails.
- **Issue certificates for testing purposes** EAServer Manager | Certificates folder allows you to create new client and server certificates for use in testing your applications. To deploy Internet applications, you must obtain server certificates from a well-known Certificate Authority (CA) such as VeriSign or Thawte. Certificates signed by the internal Sybase Jaguar User Test CA will not be recognized by client browsers unless the end user has installed the Sybase Test CA in their browser's database of trusted CAs.

See the *EAServer Security Administration and Programming Guide* for more information on SSL certificates.

jagtool and jagant

jagtool is a command-line interface that allows you to automate some of EAServer's development and deployment tasks. jagant lets you run jagtool commands from Jakarta Ant build files.

Ant is similar to make, but is platform-independent, and allows you to incorporate jagtool commands into build files. This powerful feature allows you to write build files that automate many development and deployment tasks. For more information, see Chapter 12, "Using jagtool and jagant," in the *EAServer System Administration Guide*.

Repository versioning support

The EAServer configuration repository stores configuration and implementation files for installed application entities such as components, Web applications, JSPs, and Java servlets. Repository versioning allows you to save numbered versions of an entity. Each version archive contains configuration properties and implementation files associated with the entity. For example, before undertaking a new development phase, you might save a new major version of your J2EE application.

Client-session and component-lifecycle management

EAServer client sessions are established internally by the client stubs and proxies that applications use to invoke EAServer component methods. A component's lifecycle determines how instances are allocated, bound to client sessions, and destroyed. EAServer manages both client sessions and component lifecycles without requiring any specialized knowledge on the part of the application developer.

Client-session management

Client applications use a stub or proxy object to invoke methods on EAServer. Internally, the stub or proxy object establishes a network connection between EAServer and a remote client. All the stub/proxy models discussed in "Client stub and proxy support" on page 31 require user-authentication parameters to instantiate a stub or proxy object. The communication protocol is also determined when the stub or proxy object is instantiated. Once the stub or proxy object exists, all details of network communication are hidden from the application developer.

The user name determines which components a client session can access. If a component does not allow access to the user, then attempts to instantiate a proxy or stub fail. The *EAServer Security Administration and Programming Guide* describes security support in detail.

All stubs and proxies use IIOP to communicate with EAServer. MASP clients use the TDS protocol. "Network protocol support" on page 7 discusses client protocols in detail.

Component-lifecycle management

A component's lifecycle determines how instances of a component are allocated, bound to specific client sessions, and destroyed. In the simplest case, an instance is allocated for each stub or proxy created by the client and is destroyed when the client explicitly requests destruction or when it disconnects, whichever happens first.

More sophisticated components can be coded to support instance pooling. Instance pooling allows EAServer to maintain a cache of component instances and bind them to client sessions on an as-needed basis. Instance pooling requires the following changes to your component:

- The component must provide activate and deactivate methods. EAServer calls the activate method just before an instance is bound to a client session. activate must be able to reset the component to an as-allocated state. EAServer calls deactivate just before an instance is unbound from a client session (that is, made idle again).
- Methods in the component must use the EAServer transaction state primitives to request early deactivation—see Chapter 2, "Understanding Transactions and Component Lifecycles," in the *EAServer Programmer's Guide*.

For components that support EAServer transactions, the time between EAServer's activate and deactivate calls coincides with the beginning and end of that instance's participation in an EAServer transaction.

Using components that support instance pooling increases the scalability of your application. Instance pooling eliminates execution time and memory consumption that would otherwise be spent allocating unnecessary component instances.

Chapter 2, "Understanding Transactions and Component Lifecycles," in the *EAServer Programmer's Guide* describes how components participate in instance pooling and EAServer transactions.

Load balancing and failover

In the simplest scenario, your application's components are deployed to one server, and all clients connect to that server to execute the component's business logic. This scenario works well when the number of simultaneous clients is not too large.

For applications with thousands of clients, you can define an EAServer cluster with several redundant servers to run the application's components. The cluster allows load balancing and failover as follows:

- **Load balancing** EAServer can use load balancing, which optimizes performance for your EAServer cluster by adjusting the load across the servers, based on load metrics and a distribution policy or based on a random algorithm. When a client resolves the name of an EAServer component, the name server returns several candidate server addresses. When you allow the algorithm to randomly distribute the processing load over servers in the cluster, the client ORB tries the addresses in random order. When you specify the load metrics and distribution policy, the load is distributed according to each server's current load.
- **Failover** Components can be configured to allow automatic failover that is transparent to client applications. If a component allows automatic failover, the client ORB automatically reconnects to another server within the cluster when a previously connected server goes offline.

  In-memory failover support allows component state to be maintained on a pair of servers, without incurring the overhead of using a remote database to store component state. See Chapter 28, "Configuring Persistence for Stateful Session Components," in the *EAServer Programmer's Guide* for more information about in-memory stateful failover.

For more information, see Chapter 7, "Load Balancing, Failover, and Component Availability," in the *EAServer System Administration Guide*.

Coded character set conversions

EAServer supports multiple coded character sets for clients and components. When a client and component use different coded character sets, EAServer automatically converts character data from one character set to another. For example, if the client uses the roman8 character set and the component uses iso_1, EAServer converts string parameters and return values automatically from roman8 to iso_1 when the client calls the component methods.

In accordance with the Java and ActiveX standards, Java components, Java clients, ActiveX components, and ActiveX clients all use 16-bit Unicode. Unicode contains mappings for all characters in all other known coded character sets.

For C and C++ components, you can specify code sets using EAServer Manager. The server Codeset property specifies the default for all C and C++ components (this property is set on the General tab in the Server Properties window). You can override the default for an individual component by setting the Codeset component property (located on the General tab of the Component Properties window).

For C++ clients, you can specify a character set when initializing the EAServer client ORB by setting the ORBCodeSet property. See Chapter 15, "Creating CORBA C++ Clients," in the *EAServer Programmer's Guide* for more information.

For MASP clients, the code set is specified as an Open Client or ODBC property before the client connection is opened. See Appendix A, "Executing Methods As Stored Procedures," in the *EAServer Programmer's Guide* for more information.

Naming services

When multiple servers are involved in your application, the naming service allows you to specify logical server names rather than server addresses. For example, instead of connecting to your finance component server at host badger using port 9000, you can specify the initial naming context for that server, such as *USA/MyCompany/FinanceServer*. Components are identified by specifying an initial server name context plus the package and component name. For example:

```
USA/MyCompany/FinanceServer/FinancePackage/PayrollAdmin
```

This layer of abstraction allows you to move a server to another host without affecting deployed client applications. Naming does require that one EAServer installation use a well-known, stable host and port. This server acts as the name server for other servers that participate in your application, and clients connect to that server to resolve name requests.

You can use either persistent or transient storage for the naming database. For transient storage, EAServer builds the name database in memory when it starts, based on the contents of the EAServer configuration repository. For persistent storage, you must provide a third-party directory server that accepts connections using the Lightweight Directory Access Protocol (LDAP). When using persistent storage, EAServer connects to the third-party directory server to create and edit name database entries, and to resolve client name requests.

Configuring naming services

Naming configuration for a multiserver application is briefly summarized as follows:

1 Choose one server to act as name server for the application. You can configure this server to store names in memory (transient storage), or to store names in a third-party directory server (persistent storage).

2 Configure each of the remaining servers to connect to the designated EAServer naming server to resolve names. Each server also updates the name space when packages and components are added or deleted in EAServer Manager.

For detailed instructions, see Chapter 5, "Naming Services," in the *EAServer System Administration Guide*.

Client APIs for naming

For Java and C++ clients, EAServer provides industry-standard client-side APIs for naming services.

For Java clients, EAServer provides implementations of the CORBA standard CosNaming API and the Java Naming and Directory (JNDI) API. See Chapter 8, "Creating Enterprise JavaBeans Clients," and Chapter 12, "Creating CORBA Java Clients," in the *EAServer Programmer's Guide* and for more information.

For C++ clients, EAServer provides an implementation of the CORBA standard CosNaming API. See Chapter 15, "Creating CORBA C++ Clients," in the *EAServer Programmer's Guide* for more information.

PowerBuilder clients use the naming service implicitly. The name resolution is performed automatically when you create EAServer component instances using the CreateInstance and Lookup functions of the Connection object. You can browse the naming service using the CosNaming API, but such complexity is not necessary. For more information, see the *Application Techniques* manual in the PowerBuilder documentation.

ActiveX clients use the naming service implicitly.

Connection caching

Connection caching allows EAServer components to share pools of preallocated connections to a remote database server, avoiding the overhead imposed when each instance of a component creates a separate connection. Components that support transactions must use a connection from an EAServer connection cache to interact with remote databases.

For components coded in C, EAServer supports Open DataBase Connectivity (ODBC) and Client-Library™ connection caches. For Java components, EAServer provides JDBC connection caches. Each component model provides an interface for connection pooling. See Chapter 26, "Using Connection Management," in the *EAServer Programmer's Guide* for more information.

The J2EE connector architecture enables you to write portable Java applications that can access multiple transactional enterprise information systems. A connector is a specialized connection factory that provides connections for EJBs, Java servlets, JSPs, and CORBA-Java components.

Transaction management

EAServer's transaction management feature allows you to specify a transaction coordinator—Java Transaction Service (JTS) or Microsoft Distributed Transaction Coordinator (DTC)—and define a component's transactional semantics as part of the component interface. See Chapter 2, "Understanding Transactions and Component Lifecycles," in the *EAServer Programmer's Guide* for more information.

Result-set support

EAServer methods can return tabular data to the calling client. This feature can be useful for the following reasons:

- **Use with data-aware controls** Some front-end tools provide objects that can automatically display a result set. For example, if using PowerBuilder, you can return results in a or DataStore object from component methods and display the results using a DataWindow® control in the client. PowerBuilder's DataWindow technology, available in both Web and PowerBuilder clients, allows you to display result sets and synchronize updates with a minimum of coding.
- **Efficiency** For tasks that require returning tabular data, using an EAServer result set is the most efficient alternative. Common uses of result sets include menu and pick-list population. For example, in an online clothing catalog, you need to list in-stock sizes for each item.

  The EAServer result set allows data to be sent all at once (rather than requiring a get-next-row method and one client-server round trip per method). A large EAServer result set can be sent with less overhead than is required to encapsulate tabular data as an object and send a serialized version of the object to the client.

Each component model provides an interface that allows you to define result sets from scratch or to forward results from a remote database query directly to the client. See Chapter 25, "Sending Result Sets," in the *EAServer Programmer's Guide* for more information.

For information on using the PowerBuilder DataWindow, see the PowerBuilder *Application Techniques* manual.

Support for asynchronous messaging

Chapter 31, "Using the Message Service," in the *EAServer Programmer's Guide* describes EAServer messaging support. The EAServer message service supports the Java Message Service (JMS) 1.0.2 specification, which addresses the demands of distributed systems in a coherent manner. JMS offers an API and a set of semantics that prescribe the interface and general behavior of a messaging service.

The message service allows you to publish or send messages to a queue, where they are stored until they can be delivered to the queue's recipient, which is either a client or a component. The message service provides a pull-style mechanism for client notification and a push-style mechanism for component notification. Clients can check their queue for new messages, or spawn a thread to wait for a message's arrival. Components can also check for new messages and they can register to be notified when messages arrive in their queue.

The message service provides transient and persistent message storage for message consumers and allows message producers to send messages to a particular message queue, or to publish messages with specific topics, available to all message queues.

The message service is implemented as an EAServer component with interfaces specified in standard CORBA IDL. Consequently, it can be used by all types of clients and components.

Asynchronous processing support

Most server processing is driven by client interaction. However, some tasks are best performed asynchronously. For example, you may need to maintain copies of cached data retrieved from a slower source, update search indexes on a regular schedule, or perform lengthy calculations. EAServer provides two vehicles to support asynchronous processing:

- Service components can be used for processing that must run continuously for the life of the server process, or must be performed once each time the server is started. Service components run in a thread that is started when the server starts. See Chapter 33, "Creating Service Components," in the *EAServer Programmer's Guide* for more information.
- The EAServer thread manager allows you to run threads at any time. Threads started by the thread manager execute independently of the client or component that starts them, and can be configured to run once or periodically at regular intervals. See Chapter 32, "Using the Thread Manager," in the *EAServer Programmer's Guide* for more information.

External processing

EAServer's C++ component model allows you incorporate legacy C and C++ business logic code into a component. However, if legacy code is unstable, it can cause the server to crash.

Beginning in version 4.0, you can configure C++ components to execute within a dedicated external process. EAServer spawns a subprocess to execute the component, and issues component invocations using interprocess communication. See Chapter 14, "Creating CORBA C++ Components," in the *EAServer Programmer's Guide* for more information.

Systems management support

EAServer 5.0 includes enhanced support for remote systems management. The implementation is based on the Java Management Extensions (JMX) agent management framework. It provides the following enhancements:

- Allows you to create management beans (MBeans) that can be run in a JMX framework.
- Supports both SNMP and JMX management tools.
- Allows you to monitor servers, clusters, and key server subsystems such as the message service, the component dispatcher, and network listeners.

For more information on this feature, see Chapter 13, “Using Systems Management,” in the *EAServer System Administration Guide*.

Support for legacy Open Server applications

You can easily convert existing applications that are coded for Sybase Open Server to run in EAServer. You can recompile and link your existing event handler code into a DLL or shared library, then install it into EAServer. After you define an Open Server listener, your existing clients can connect to the listener’s port. No client changes are required, aside from the possible requirement that you change the address to which the client connects.

EAServer allows you to run your Open Server application on multiprocessor machines, and simplifies server administration. See Appendix B, “Migrating Open Server Applications to EAServer,” in the *EAServer Programmer’s Guide* for more information.

CHAPTER 2

Developing an EAServer Application

This chapter explains some of the basic concepts and terminology associated with developing component-based EAServer applications in a three-tier environment.

Introductory concepts

An EAServer application consists of one or more packages and a client application or applet. Packages consist of components, and components are made up of one or more methods.

- EAServer can host, manage, and execute components such as ActiveX programmable objects, JavaBeans, or CORBA-compliant components. In EAServer, a **component** is simply an **application object** that consists of one or more methods. EAServer components typically execute business logic, access data sources, and return results to the client. Clients (applets) create an instance of a component and execute methods associated with that component. Components run only within EAServer.
- A **package** is a collection of components that work together to provide a service or some aspect of your application's business logic. A package defines a **boundary of trust** within which components can easily communicate. Each package acts as a unit of distribution, grouping together application resources for ease of deployment and management.

  EAServer supports the following types of components:

  - EJB

  - Java
  - CORBA C++
  - PowerBuilder NVO
  - ActiveX
  - C
- A **stub** is a Java class or a C++ stub generated by EAServer Manager and acts as a **proxy object** for an EAServer component. A stub is compiled and linked with your Java applets or client application. A stub communicates with EAServer to instantiate and invoke a method on a component in the middle tier. Stubs make a remote EAServer component appear local to the client.
- A **skeleton** acts as the interface between the EAServer runtime environment and the user code that implements the method. Skeletons are compiled and linked with each of the components, and at runtime they enable EAServer to locate and invoke an appropriate method.
- EAServer transparently maintains a **session** between a client application and EAServer. Unlike a typical HTTP scenario, where a new connection is created for each request and response, sessions allow a browser to maintain a connection with the server across a multiple request-response cycle.
- A **Web application** is a collection of static HTML pages, Java servlets, and JavaServer Pages. You can develop Web applications to provide a browser-based user interface as an alternative to standalone clients or Java applet clients.

You can develop and distribute an EAServer application across the network. EAServer implements a **three-tier** or **multitier** distributed computing architecture. In this model, three distinct elements work together to give users access to data:

- Client-side applet or application
- Middle-tier components
- The back-end database

Java applets are downloaded to clients, which instantiate components on the server. Client applications are installed on client machines, from which they also instantiate components on the server.

An applet, standalone application, or Web application manages presentation and interaction with an end user. Middle-tier components, which run in EAServer, handle much of the application processing. Finally, the database stores, manages, and processes data.

If the client is an applet, users find and launch applications from traditional HTML pages. Instead of simply loading a static page, EAServer downloads an executable applet to the individual's browser. If the client is an already-installed application, the user launches the application from his or her machine. Clients communicate directly with an application component running in the middle tier. Server components access data from one or more databases, apply business logic, and return results to the client applet for display.

When a proxy object is created on the client applet, it instantiates a corresponding component registered with EAServer. On the server side, a component is instantiated in response to a request from the proxy object running in the client environment. A method on a component is executed when it is invoked by a proxy object on the client applet.

Web applications can call EAServer components using the same proxies as used by standalone Java clients and applet clients.

Developing an EAServer application

There are three basic steps involved in creating and deploying an EAServer application that employs a Java applet as a client. For information on other types of EAServer clients, see the *EAServer Programmer's Guide*.

v **Creating and deploying an EAServer application**

1 Use EAServer Manager to define packages, components, and methods. EAServer Manager generates:

   - Client-side stub files – contain interface information used by the client to invoke EAServer component methods.
   - Server-side skeleton files – provide the interface information of each component method.

2 Once you have generated the stubs and skeletons, write the user interface logic for the client model that you have chosen.

Develop the server-side components that link with the skeletons to form the business logic of your servlet. EAServer supports many of the integrated development environment (IDE) tools available today.

3 Deploy the application. You can register components on any EAServer installation. Because EAServer is also a Web server, you can write an HTML page for your applet and install it on EAServer.

EAServer runtime environment

A typical EAServer application has an applet or HTML page associated with it. Once you build and deploy such an application, it runs in the following fashion:

1 EAServer receives an HTTP request and downloads the requested HTML page or applet. Included with the applet are the Java stubs, which through a proxy, instantiate components and invoke the methods on those components.

2 The client establishes a session with EAServer. The session, unlike an HTTP connection, allows the client and EAServer to maintain a connection throughout the transaction.

3 The client creates a component instance through a client-side proxy. The proxy used depends on the type of component being instantiated. EAServer validates the user against the component's access list. If the user is validated, the dispatcher checks the location and status of the component and creates an instance.

4 The client invokes the component's business logic by executing its methods.

5 The component may interact with remote databases. If it does:

- The component obtains a connection to the database using EAServer's connection caching feature.
- EAServer checks the component's transaction property. If the component is marked as transactional, EAServer ensures that remote database commands execute as part of a larger transaction.

6 EAServer returns the results from the database to the client.

7 The client indicates that it has completed the operation. EAServer destroys the component instance or returns it to a pool for future client instantiations. The client disconnects from EAServer.

CHAPTER 3

EAServer Components

This chapter discusses the component models that EAServer supports.

Overview

EAServer components contain the methods that execute business logic and access data sources. EAServer's server-side component support and client-side stub or proxy support are independent. Any EAServer client can execute any type of component. A component of any model can execute components of another model using intercomponent calls without the use of additional gateway software.

Server-side component support

EAServer provides support for several major component models, including:

- **Enterprise JavaBeans** EAServer supports Java components that follow the Java Software Enterprise JavaBean (EJB) specification, versions 1.0, 1.1, and 2.0. An Enterprise JavaBean is a nonvisual, transactional component that is implemented in Java. For more information, see "Enterprise JavaBeans components" on page 33, and Chapter 7, "Creating Enterprise JavaBeans Components," in the *EAServer Programmer's Guide*.

A message-driven bean (MDB) is a type of EJB specifically designed as a Java Message Service consumer. Chapter 31, "Using the Message Service," in the *EAServer Programmer's Guide* describes how to create MDBs.

- **CORBA-Java** CORBA-Java components follow the CORBA component model and use standard CORBA interfaces for transaction management. Almost any Java class with nonvisual behavior can be adapted to run as an EAServer component. Chapter 11, "Creating CORBA Java Components," in the *EAServer Programmer's Guide* describes EAServer's Java component support in detail.
- **PowerBuilder NVO components** Using PowerBuilder 7.0 or later, you can create nonvisual objects (NVOs) that run natively in EAServer as EAServer components. You can also create NVO proxies for EAServer components, then use the proxies in PowerBuilder client applications. For more information, see the *Application Techniques* manual included in the PowerBuilder documentation.
- **CORBA-C++ components** EAServer C++ components are C++ classes that contain methods with similar prototypes to the EAServer component interface; the exact interface mapping complies with the CORBA specification for IDL/C++ language bindings.

  Chapter 14, "Creating CORBA C++ Components," in the *EAServer Programmer's Guide* describes C++ component support in detail.
- **ActiveX** You can install any nonvisual ActiveX component as an EAServer component (though you may need to define an "adaptor," or wrapper class to handle methods that use unsupported parameter datatypes). EAServer uses the Component Object Model (COM) and ActiveX automation support to execute ActiveX component methods. Consequently, all EAServer ActiveX components must support COM's automation interface (the IDispatch interface). Many application development tools, such as Microsoft Visual Basic, can be used to create ActiveX components that are compatible with EAServer.

  Chapter 19, "Creating ActiveX Components," in the *EAServer Programmer's Guide* describes EAServer's ActiveX support in detail.

  EAServer currently implements subsets of the Microsoft Transaction Server (MTS) ActiveX interface with the goal of providing full compatibility in the future.

- **C components** EAServer provides a C "pseudo" component model that can be used to adapt existing C procedural applications as EAServer components. C components are dynamic link libraries (DLLs) or UNIX shared libraries that contain C or C++ methods and method skeletons. Method skeletons contain C functions that retrieve the RPC's parameters and invoke C component methods.

  Appendix C, "Creating C Components," in the *EAServer Programmer's Guide* describes support for this component model.

C++ classes can be run as C++ components Developers using EAServer version 1.1 may have adapted C++ classes to run as EAServer C components. In version 2.0 and later, these classes can be run directly as C++ components.

Client stub and proxy support

Applications invoke an EAServer component using a stub or proxy object. The stub or proxy acts as a local surrogate for the remote component; it provides the same method signatures as the component and hides the details of remote server communication. Stubs and proxies are available for:

- **Java (CORBA and EJB)** Any component can be invoked via a Java stub class. EAServer Manager generates source code for Java stubs. At runtime, your client program instantiates the stub. When you call methods on the stub class, the stub transparently invokes the component method on EAServer. You can also create Java servlets or JavaServer pages that run in EAServer and call components. Using this model, you can create "zero-install" applications. With EAServer's built-in HTTP support, these applications have no client-machine installation requirements other than the presence of a Web browser. You can add additional interactive functionality to browser-based clients using Java applets that run in the browser.

  EAServer supports three Java client models:

  - **EJB** Your program uses the EJB (javax.ejb) classes and EAServer's EJB stubs to call EAServer component methods. This client model follows the EJB 2.0 Specification and is backward compatible with the EJB 1.1 and 1.0 specifications. Chapter 8, "Creating Enterprise JavaBeans Clients," in the *EAServer Programmer's Guide* describes how to implement EJB clients.

- **CORBA-Java** Your program uses EAServer's CORBA-compliant Java ORB or any other CORBA-compliant Java ORB to instantiate stubs. Stub method signatures are mapped from the component's interface definition, based on the CORBA specification of IDL-Java language bindings. Chapter 12, "Creating CORBA Java Clients," in the *EAServer Programmer's Guide* describes how to implement CORBA-Java clients.

- **PowerBuilder** PowerBuilder 7.0 or later allows you to generate NVOs that act as proxies for EAServer components. Using a proxy, you can call component methods as if they were implemented as local NVO methods. See the *Application Techniques* manual included in the PowerBuilder documentation for more information.

- **C++ (CORBA)** Your program uses EAServer's CORBA-compliant C++ ORB or any other CORBA-compliant C++ ORB to instantiate stubs. Stub method signatures are mapped from the component's interface definition, based on the CORBA specification of IDL-C++ language bindings. Chapter 15, "Creating CORBA C++ Clients," in the *EAServer Programmer's Guide* describes how to implement C++ clients.

- **ActiveX** Your program invokes EAServer components using EAServer's ActiveX proxy. The ActiveX proxy allows you to invoke EAServer components from ActiveX-enabled visual builder tools such as Microsoft Visual Basic. Used on the server, the ActiveX proxy allows you to invoke any EAServer component from an ActiveX component. EAServer Manager generates the type-library information that is required to register the component interface with your development tool. The ActiveX proxy uses the EAServer C++ client ORB to communicate with EAServer. Chapter 20, "Creating ActiveX Clients," in the *EAServer Programmer's Guide* describes how to use the ActiveX proxy.

- **Methods As Stored Procedures (MASP)** EAServer provides a built-in interface that allows you to execute component methods as if they were stored procedures in an Adaptive Server Enterprise database. You can use this interface to call EAServer components from scripting and user-interface-builder tools that are database-aware but that do not support ActiveX. Appendix A, "Executing Methods As Stored Procedures," in the *EAServer Programmer's Guide* describes how to use this client interface.

CORBA

CORBA is a distributed component architecture defined by the Object Management Group (OMG). EAServer supports the CORBA IIOP.

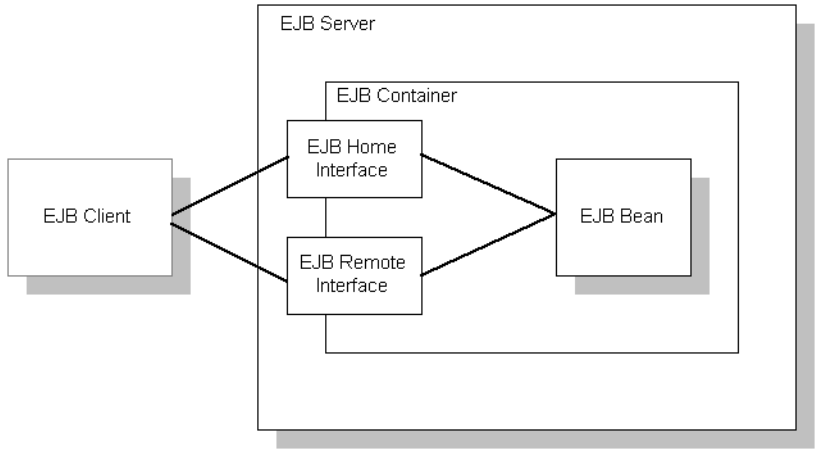
For information on the CORBA architecture, see the specifications available at the OMG Web site at http://www.omg.org.

Enterprise JavaBeans components

The Enterprise JavaBeans (EJB) technology defines a model for the development and deployment of reusable Java server components, called **EJB components**.

An EJB component is a nonvisual server component with methods that typically provide business logic in distributed applications. A remote client, called an EJB client, can invoke these methods, which typically results in database updates. Since EAServer uses CORBA as the basis for the EJB component support, EJB components running in EAServer can be called by any other type of EAServer client or component, and even CORBA clients using ORBs from other vendors that are compatible with CORBA 2.3.

The EJB architecture looks like this:



EJB server The EJB server contains the EJB container, which provides the services required by the EJB component. EAServer is an EJB server.

EJB client An EJB client usually provides the user-interface logic on a client machine. The EJB client makes calls to remote EJB components on a server and needs to know how to find the EJB server and how to interact with the EJB components. An EJB component can act as an EJB client by calling methods in another EJB component.

An EJB client does not communicate directly with an EJB component. The container provides proxy objects that implement the components home and remote interfaces. The component's **remote interface** defines the business methods that can be called by the client. The client calls the **home interface** methods to create and destroy proxies for the remote interface.

EJB container The EJB specification defines a container as the environment in which one or more EJB components execute. The container provides the infrastructure required to run distributed components, allowing client and component developers to focus on programming business logic, and not system-level code. In EAServer, the container encapsulates:

- The client runtime and generated stub classes, which allow clients to execute components on a remote server as if they were local objects.
- The naming service, which allows clients to instantiate components by name, and components to obtain resources such as database connections by name.
- The EAServer component dispatcher, which executes the component's implementation class and provides services such as transaction management, database connection pooling, and instance lifecycle management.

EJB component implementation The Java class that runs in the server implements the bean's business logic. The class must implement the remote interface methods and additional methods for lifecycle management.

EJB component types

You can implement three types of EJB components, each for a different purpose:

- Stateful session beans
- Stateless session beans
- Entity beans

Stateful session beans

A stateful session bean manages complex processes or tasks that require the accumulation of data, such as adding items to a Web catalog's shopping cart. Stateful session beans have the following characteristics:

- They manage tasks that require more than one method call to complete, but are relatively short-lived. For example, a session bean might manage the process of making an airline reservation.

- They typically store session state information in class instance data, and do not survive server crashes unless they are run in a cluster that has persistent storage enabled for the component.
- There is an affinity between each instance and one client from the time the client creates the instance until it is destroyed by the client or by the server in response to an expired instance timeout limit.

For example, if you create a session bean on a Web server that tracks a user's path through the site, the session bean is destroyed when the user leaves the site or idles beyond a specified time

Stateless session beans

A stateless session bean manages tasks that do not require the keeping of client session data between method calls. Stateless session beans have the following characteristics:

- Method invocations do not depend on data stored by previous method invocations.
- There is no affinity between a component instance and a particular client. Each call to a client's proxy can invoke a different instance.
- From the client's perspective, different instances of the same component are identical.

Unlike stateful session beans, stateless session beans can be pooled by the server, improving overall application performance.

Entity beans

An entity bean models a business concept that is a real-world object. For example, an entity bean might represent a scheduled airplane flight, a seat on the airplane, or a passenger's frequent-flyer account. Entity beans have the following characteristics:

- Each instance represents a row in a persistent database relation, such as a table, view, or the results of a complex query.
- The bean has a primary key that corresponds to the database relation's key, and is represented by a Java datatype or class.

EJB transaction attribute values

Each EJB component has a transaction attribute that determines how instances of the component participate in transactions. In EAServer, you set the transaction attribute in the Transaction tab of the Component Properties dialog box.

When you design an EJB component, you must decide how the bean will manage transaction demarcation: either programmatically in the business methods, or by the container, based on the value of the transaction attribute in the deployment descriptor.

A session bean can use either bean-managed transaction demarcation or container-managed transaction demarcation; you cannot create a session bean where some methods use container-managed demarcation and others use bean-managed demarcation. An entity bean must use container-managed transaction demarcation.

EJB container services

The EJB container provides services to EJB components. The services include transaction and persistence support.

Transaction support An EJB container must support transactions. EJB specifications provide an approach to transaction management called declarative transaction management. In declarative transaction management, you specify the type of transaction support required by your EJB component. When the bean is deployed, the container provides the necessary transaction support.

Persistence support An EJB container can provide support for persistence of EJB components. An EJB component is persistent if it is capable of saving and retrieving its state. A persistent EJB component saves its state to some type of persistent storage (usually a file or a database). With persistence, an EJB component does not have to be re-created with each use.

An EJB component can manage its own persistence (by means of the logic you provide in the bean) or delegate persistence services to the EJB container. Container-managed persistence means that the data appears as member data and the container performs all data retrieval and storage operations for the EJB component. See Chapter 27, “Creating Entity Components,” in the *EAServer Programmer’s Guide* for more information.

Java components

EAServer can load and execute a Java class file as a component. The class can be a stand-alone class or part of a JavaBeans component that does not display any graphics or text, that is, a nonvisual JavaBeans component.

Defining the component's interfaces

The definition of a Java component specifies the interfaces that the component implements as well as its other properties.

All component interfaces for EAServer components are defined in CORBA IDL modules that are stored in EAServer's IDL repository. Chapter 5, "Defining Component Interfaces," in the *EAServer Programmer's Guide* describes how to define IDL interfaces.

Java component developers typically use one of the following to define the interface or interfaces that their component implements:

- **Implement a Java source file and import the methods from it** As an alternative to IDL, you can define a Java class or interface, then use EAServer Manager to import the method definitions from the compiled Java byte code file. EAServer creates a new component definition and an IDL interface that matches the methods defined in the Java file. For more information on this feature, see "Importing interfaces from compiled Java files" in "Defining Component Interfaces" in the *EAServer Programmer's Guide*.
- **Use existing interfaces from EAServer's IDL repository** In some cases, client and server component developers may have agreed upon an existing interface or several interfaces that a component must implement. In this case, it is up to the component developer to implement the specified interface. EAServer stores HTML documentation for all interfaces in the IDL repository in the *html/ir* subdirectory of your EAServer installation.
- **Define one or more new IDL interfaces** If you are defining the interface yourself, you can use EAServer Manager's IDL editor to create a new interface for the component. "Defining modules, interfaces, and types in IDL" in "Defining Component Interfaces" in the *EAServer Programmer's Guide* describes how.

CORBA-C++ components

EAServer provides a CORBA-compatible C++ client-side interface. This allows you to create CORBA EAServer C++ applications. C++ components and clients are also interoperable with clients and components using other technologies.

The dynamic invocation interface (DII) is not supported.

Defining components

You use EAServer Manager to define basic information (such as the component name and methods) about a C++ component, and generate files that are required to write the component's class implementation and to compile the class into a dynamic link library (on Windows) or shared library (on UNIX).

You write your component as a C++ class; the generated files include a class implementation template in which you can write your method logic. In addition, EAServer supplies an application programming interface that contains classes and methods that you can use to perform EAServer-specific tasks. You can use the EAServer API to write code to handle errors, cache connections to third-tier database servers, return result sets, manage transactions, share data between instances of the same component, retrieve a client's SSL certificate information, and make intercomponent calls.

PowerBuilder components

Using PowerBuilder 7.0 or later, you can create nonvisual objects (NVOs) that run natively in EAServer as EAServer components. You can also create NVO proxies for EAServer components, then use the proxies in PowerBuilder client applications. Inside EAServer, PowerBuilder components run in the PowerBuilder Virtual Machine (PBVM), which allows the EAServer component dispatcher to call the methods in your NVO component.

The PowerBuilder integrated development environment (IDE) includes wizards to create and deploy components, and generate proxies for use in PowerBuilder based client applications. For details, see the *Application Techniques* manual included in the PowerBuilder documentation.

The PowerBuilder IDE runs on Windows platforms, but you can deploy PowerBuilder components to EAServer on any platform for which a compatible PBVM is available, including most UNIX platforms. For more information, see the EAServer *Release Bulletin* for your platform.

ActiveX components

ActiveX/COM is a Microsoft component technology. Many IDE tools such as Visual Basic allow you to create ActiveX components and write code to call methods in registered ActiveX components.

Any nonvisual ActiveX component can be installed as an EAServer component (though you may need to define an "adaptor," or wrapper class to handle methods that use unsupported parameter datatypes). EAServer uses COM and ActiveX automation support to execute ActiveX component methods. Consequently, all EAServer ActiveX components must support COM's automation interface (the IDispatch interface). Many application development tools can be used to create ActiveX components that are compatible with EAServer. Once installed in EAServer, ActiveX components can be called by clients of any type.

To support ActiveX clients, EAServer provides an ActiveX automation server that interacts with the server using the C++ CORBA ORB and standard CORBA IIOP. Because ActiveX clients use IIOP rather than the DCOM network protocol, they can call EAServer components of any type and interact with servers running on platforms that do not support ActiveX.

No client managed transactions This version of EAServer does not provide an ActiveX client interface to manage transactions. Consequently, ActiveX clients cannot call component methods that have the Mandatory transaction attribute.

C components

C components provide a quasi-object model for the execution of a group of related C functions. Unlike a C++ object, separate instances of a C component lack a private data space. However, you can implement create and destroy methods to associate data with an instance of a C component.

CHAPTER 4

Web Applications

A Web application allows you to deploy interrelated Web content, JavaServer Pages (JSPs), and Java servlets as a cohesive unit, and configure the Web server properties required by the servlets and JSPs.

This chapter presents an overview of Web applications. For detailed information on developing Web applications, see Chapter 21, “Creating Web Applications,” in the *EAServer Programmer’s Guide*.

What is a Web application?

A Web application is a unit of deployment for interrelated Web content, JavaServer Pages (JSPs), and Java servlets. The Web application contains static files, servlet and JSP implementation classes, and a deployment descriptor that describes how the files, servlets, and JSPs are configured on the host server. The deployment descriptor also allows you to configure application-specific HTTP properties, such as MIME types and per-file security constraints. To tie it all together, a Web application provides an abstract naming convention for the JNDI names of database connections and EJBs.

A Web application represents a subset of the files available on a Web server. Each Web application has a **root request path** that forms a prefix for URLs that access the JSPs, servlets, and static pages. For example, http://myhost/Finance. Each Web application also has a **context root**, which is a directory in the server’s file system where the Web application’s files are deployed. In EAServer, the context root for Web application *wapp* is this directory in your EAServer installation:

```
$JAGUAR/Repository/WebApplication/wapp
```

Contents of a Web application

Web applications contain several types of components.

Servlet files

Servlets are Java classes that create HTML pages with dynamic content and respond to requests from client applications that are implemented as HTML forms. Servlets also allow you to execute business logic from a Web browser or any other client application that connects using the Hypertext Transfer Protocol (HTTP). For more information, see Chapter 22, "Creating Java Servlets," in the *EAServer Programmer's Guide*.

Web clients invoke your Web application's servlets by prepending the Web application's root request path to an alias that is mapped to the servlet. For example, the following URL invokes a servlet mapped to the alias "Account" in the application with root request path "Finance":

```
http://myhost/Finance/Account?type=add
```

JSP files and tag libraries

JavaServer Pages (JSPs) allow you to embed snippets of Java code into HTML pages to create dynamic content. JSP tag libraries allow you to extend the standard HTML markup tags with custom tags backed by Java classes. See Chapter 24, "Creating JavaServer Pages," in the *EAServer Programmer's Guide* for more information on creating JSPs. If you have the PowerBuilder IDE, you can deploy JSP-based Web applications from PowerBuilder to EAServer. For more information, see *Working with Web and JSP Targets* in your PowerBuilder documentation.

Static files

You can include files that provide static content for the site in the Web site, including HTML, images, sounds, and so forth. You can also include Java applet files. You can configure the application's deployment descriptor to specify security constraints for static files and any unique MIME types required by your content.

You must deploy static files to the following subdirectory in your EAServer installation directory:

```
Repository/WebApplication/web-app
```

Where *web-app* is the name of the Web application. You can include subdirectories, which are reflected in your application's URL namespace.

If you import a Web archive (WAR) file, the importer expands the application's static files to this location.

Java classes

A Web application's Java classes include the implementation class for each servlet and JSP, and any server-side utility classes used by the servlets and JSPs.

EAServer uses a custom class loader to run a Web application's servlets and classes referenced by servlet and JSP code. This feature allows hot refresh of servlets and JSPs. The custom class loader also allows each Web application to run with its own effective Java class path.

EAServer also supports class sharing among components and servlets. You can configure custom class lists for components, Web applications, J2EE applications, or a server process. The custom list allows you to support hot refresh of the implementation and limit the number of copies of shared classes that are loaded into server memory. For example, if a Web application calls an EJB component, you can configure the component and the Web application to share instances of the component stub classes and common utility classes. See the Chapter 30, "Configuring Custom Java Class Lists," in the *EAServer Programmer's Guide* for more information.

Deployment descriptor

The application's deployment descriptor catalogs the servlets, JSPs, and files contained in the application, as well as the properties of each. The descriptor must be formatted in XML, using the DTD specified in the *Java Servlet Specification Version 2.3*. You can create a descriptor using EAServer Manager or another J2EE-compliant development tool.

CHAPTER 5

Using PowerDynamo with EAServer

This chapter looks at how you can use PowerDynamo and EAServer together to serve up applications that require dynamic Web pages as well as the ability to access components (Java/Enterprise JavaBeans, ActiveX, and C/C++) that run in EAServer.

The examples in this chapter use the components of the Sybase Virtual University (SVU) sample that comes with EAServer.

Do not use PowerDynamo for new application development
Sybase recommends that you do not use PowerDynamo for new application development. Instead, use the J2EE-standard Java servlet and JSP technologies. Support for PowerDynamo will be removed from later versions of EAServer.

PowerDynamo on UNIX platforms
Some UNIX versions of EAServer do not include PowerDynamo. See your release notes and install documentation for a list of products included with your EAServer software.

Converting PowerDynamo scripts to JavaServer Pages

EAServer 5.0 includes the Dyn2JSP utility to convert PowerDynamo™ Web sites into JSP-based J2EE Web applications. Sybase recommends that you migrate your PowerDynamo Web sites to the J2EE model. Support for PowerDynamo will be removed from later versions of EAServer. For information on using the Dyn2JSP utility, see the HTML documentation included in the *PDynamo2JSP* directory of the installation.

Sybase recommends that you do not use PowerDynamo for new application development. Instead, use the J2EE-standard Java servlet and JSP technologies. Support for PowerDynamo will be removed from later versions of EAServer.

The remainder of this chapter provides information that may be useful for maintenance of existing PowerDynamo applications.

PowerDynamo overview

You can use PowerDynamo to implement thin-client Web applications for an Internet or intranet site that can support millions of hits per day. Dynamo provides the tools necessary to build and manage a thin-client Web application containing both static HTML and dynamic, data-driven content.

Not only does Dynamo leverage a powerful object-oriented scripting language called DynaScript, but Dynamo applications can be extended to call any component supported by EAServer. The Dynamo application server acts as an intermediary between the Web server and the database management system. The application server processes templates, which are HTML pages with embedded SQL or COMPONENT statements and DynaScript scripts, and serves the resulting output, together with static HTML, to the Web server. Dynamo's unique use of the database as a Web repository allows for entire applications to be distributed using existing database replication facilities.

With Dynamo, you can:

- Build templates, SQL statements, and scripts for Web pages by using a collection of powerful, customizable wizards.
- Modify the source for your Web pages by using a syntax-highlighting editor.

- Write scripts in DynaScript, which is designed specifically for server-side scripting with the Dynamo application server. DynaScript is fully compatible with ECMAScript. ECMAScript is the standard for JavaScript and JScript-like languages.
- Store and execute the thin-client Web application in a database and manage it using Sybase Central, a graphical server administration tool.
- Use existing database replication technologies to distribute entire Web solutions (including both application and data) to wherever the application is needed. Web solutions can be distributed to multiple servers for load balancing, various offline workgroups, or even to laptops for mobile users.
- Use the PowerDynamo Personal Web Server to test Web sites locally and to provide offline access.
- Invoke EAServer components. PowerDynamo can access EAServer components through Java, ActiveX, SQL queries, or PowerDynamo tags. Access the EJB interfaces of the components.
- Integrate with other Web development tools, including PowerBuilder.
- Access Java classes from within Dynamo scripts. These classes may be stored within a database or a file system.
- Create and manipulate XML. The template wizard from Sybase Central can be used to create queries that generate output in either HTML or XML. The XML Document Object Model may be used to manipulate XML documents. Dynamo tags and built-in functions are also available for the creation and manipulation of XML documents.
- Send, receive, and manipulate mail from within a PowerDynamo Web site.
- Enable FTP functions in PowerDynamo Web sites.

Dynamo provides the following additional services:

- Database connection pooling to allow for reuse of database connections and eliminate the time-consuming and resource-intensive process of constantly creating new database connections.
- End user session management to maintain client state information.
- Page caching the HTML output of frequently accessed pages, improving retrieval time.
- Document generation scheduling to schedule the processing of specific templates or scripts, whose content generation may be lengthy.

Dynamo is available on AIX with NSAPI, CGI, and the Personal Web Server. CGI and the Personal Web Server are available on Solaris (NSAPI is supported from earlier versions of Dynamo.)

For more information

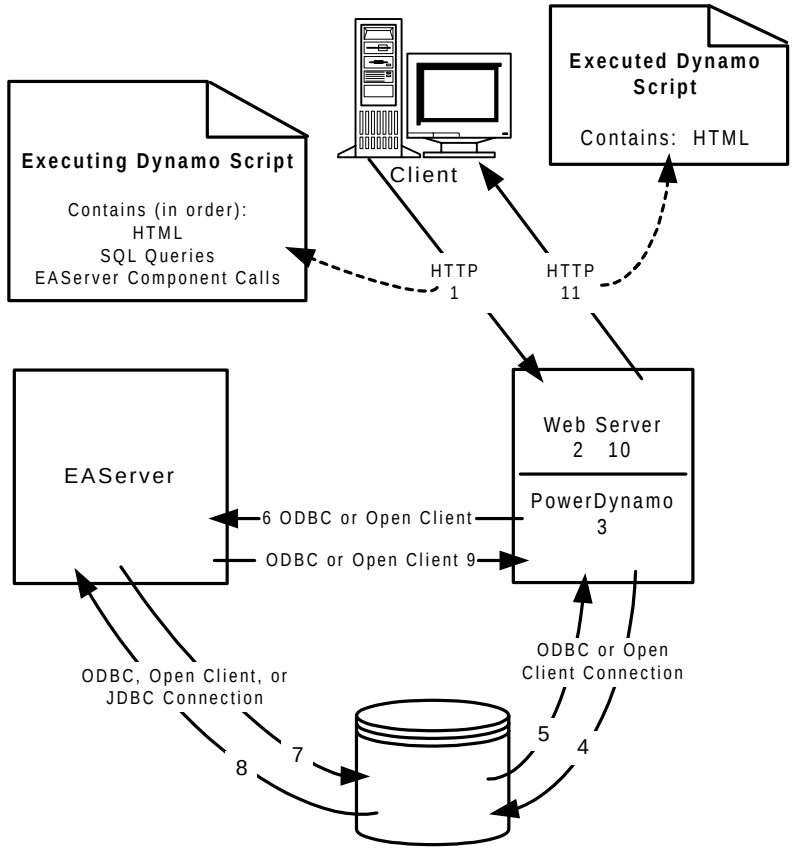
For more information, see the PowerDynamo documentation, which includes these books:

- *User's Guide*
- *Reference Manual*

EAServer and PowerDynamo architecture

Figure 5-1 demonstrates one scenario in which a Dynamo client connects to EAServer to process a Dynamo script, which contains a Methods As Stored Procedures (MASP) call to an EAServer component.

Figure 5-1: EAServer and Dynamo



These steps correspond to the numbers in the diagram:

1 A browser requests a Web page. The Web page is a Dynamo script that contains HTML, SQL queries and a MASP call to an EAServer component in that order.

2 The Web server passes the request to Dynamo.

3 The script is retrieved from the Web site (not shown in the diagram). Processing of the script begins. The HTML and SQL queries within the Dynamo script are processed.

4 An ODBC or Open Client connection is made to a database to retrieve the necessary information for the SQL query.

5 The data is returned to Dynamo. Processing of the script continues until the EAServer component call is encountered.

6 Because a MASP call is being made, an ODBC or Open Client connection is made to access the EAServer component and the called method.

7 The component method is executed. If the method requires database access, a connection is made to a database to retrieve the appropriate data.

8 The data is returned to EAServer through an ODBC, Open Client, or JDBC connection.

9 The results from the EAServer function are returned to Dynamo through an ODBC or Open Client connection.

10 Dynamo passes the results, in HTML format, back to the Web server.

11 The results are passed back to the client through an HTTP connection.

Notes

- EAServer and Dynamo can access several different databases; this diagram displays only one database.
- EAServer components can access data from many different types of databases; you do not need a Sybase database to store data.
- The client, Dynamo, and EAServer can all reside on either one machine or on separate machines.

A Web author can embed calls to EAServer components within a Dynamo script or template. The Dynamo script executes in the regular manner until it encounters the call to the EAServer component. At this point, a connection (through Dynamo) is made to EAServer, the appropriate method is executed, and the results are returned to Dynamo. Dynamo processes the information and returns HTML to the client.

Benefits of using EAServer components with PowerDynamo

You can call EAServer components from within a Dynamo script as though they were stored procedures, Java objects, or ActiveX objects. As long as the client has been set up properly to access the component, you can write Dynamo scripts to use EAServer components as though a stored procedure was being called (referred to as the MASP feature in EAServer), or by creating an instance of a Java or ActiveX object.

The three main benefits to using EAServer components in Dynamo scripts are:

- Business logic stored in one EAServer component becomes available to many clients.
- EAServer makes powerful native code components such as C and C++ available for execution by Dynamo scripts that would otherwise not have access to methods written in C and C++. This extends Dynamo's capabilities to an even greater extent, as there are few limitations being put on the languages that Dynamo scripts may make use of.
- You can update components in one location. Without EAServer, changes to a component or a stored procedure would be required at each client.

The way in which EAServer components are independently accessible by clients such as Dynamo is advantageous because no restrictions have been put on the way in which the client can manipulate the component results. The component results are wholly controlled by the client which, in the case of Dynamo, is by HTML pages.

The ability to access these components at one central repository is appealing from a setup point of view. Setting up Dynamo to access EAServer components can be as simple as creating a connection to EAServer or installing the ActiveX proxy automation server. For detailed information on setting up clients that require EAServer access, see the *EAServer Programmer's Guide*.

Calling EAServer components from Dynamo scripts

You can call EAServer components from within a Dynamo script by using:

- The Dynamo SQL tag (must return a result set)
- The Dynamo COMPONENT tag (may return a result set)
- The connection.CreateQuery method (must return a result set)
- The connection.CreateComponent method (must return a result set)

- The java.CreateComponent method (no restriction on the return)
- An ActiveX object through the Dynamo CreateObject method (no restriction on the return)

The SQL tag, COMPONENT tag, and the connection.CreateQuery and connection.CreateComponent methods allow Dynamo to call EAServer components as though they were MASP. Each MASP invocation creates an instance of the component, invokes the method and then destroys the component instance. You can also use the COMPONENT tag to access ActiveX and Java objects—however, just as with MASP, each invocation creates an instance of the component, invokes the method, and then destroys the component instance. The Dynamo CreateObject method allows you to create an instance of an ActiveX object and access its methods and properties from within a script. The ActiveX object exists until it goes out of scope or until the ActiveX variable is assigned a new value. The Dynamo java.CreateComponent method allows you to create an instance of a Java object and access its methods and properties from within a script. The Java object exists until it goes out of scope.

Using MASP verses ActiveX and Java

Within an application, there are a few benefits to creating an instance of an ActiveX (using the CreateObject method) or Java object (using the java.CreateComponent method) against an EAServer component instead of making a MASP method call:

- ActiveX or Java objects exist until they go out of scope, whereas MASP calls create an instance of the component, execute it, and destroy it immediately.
- ActiveX or Java objects can give any type of return. MASP calls from Dynamo can return only a result set.
- Once ActiveX or Java objects are created, they are treated like normal DynaScript objects. MASP calls (except the connection.CreateComponent method) require that you enter a full string each time a call is made. For more information about DynaScript objects, see “Writing DynaScripts” in the PowerDynamo *User’s Guide*.

If a script requires repeated use of an EAServer component, the creation of an ActiveX object or Java stub is the preferred method of working with an EAServer component and its methods. ActiveX, however, is a Microsoft technology, which means that it is available only on Microsoft operating systems. Java, on the other hand, is platform-independent, which means that Java objects can run anywhere. For a detailed explanation of MASP, see the *EAServer Programmer's Guide*.

Setting up PowerDynamo as a client

For Dynamo to access EAServer as a client, the machine on which Dynamo is installed must be set up properly. This setup depends on whether you are using ActiveX, Java, or MASP calls from the Dynamo client to the EAServer components.

Setting up PowerDynamo to use ActiveX

To create ActiveX objects to access an EAServer component:

1. Ensure that EAServer Manager is installed on the Dynamo machine. If you do not install EAServer Manager on the Dynamo machine, you must copy and register the TLB/REG files for the package onto the Dynamo machine.
2. Install the ActiveX Proxy Automation Server on the Dynamo machine.
3. From EAServer Manager, connect to the server that contains the required components.
4. Generate TLB/REG files for the package, which generates ActiveX proxy objects that are used to create instances on the client and invoke methods on remote EAServer components.
5. Verify that the package has been registered.

Setting up PowerDynamo to use Java

To create Java objects to access an EAServer component:

1. Ensure that EAServer Manager is installed on the Dynamo machine.
2. From EAServer Manager, generate stubs for the desired package.
3. Ensure that the Java Code Base path is in your CLASSPATH.
4. Compile the generated Java files.
5. Ensure that the Sun Java VM has been set. This is the only VM that works with EAServer.
6. Ensure that Dynamo is configured for Java support.

7 Set your default EAServer settings.

Setting up PowerDynamo to use MASP

Setting up Dynamo as a client machine to use MASP calls requires only that a connection to EAServer exists. There are two types of connections that you can create:

- System 11 ODBC data source connection
- Open Client connection

For detailed information on setting up Java or ActiveX clients, or accessing EAServer MASP methods from a client, see the *EAServer Programmer's Guide*.

CHAPTER 6

Using Message Bridge for Java with EAServer

This chapter discusses Message Bridge and how you can use it with EAServer.

Message Bridge overview

Message Bridge is a powerful, easy-to-use tool you can use to build applications that generate and consume documents and messages. It generates Java classes that can be used as part of an EAServer component to assist in parsing and constructing XML documents that conform to a known schema. It includes:

- A GUI to access to all its features
- Importers that support different types of schemas
- Schema compilers to generate DataBeans
- DataBean runtime infrastructure
- Developer artifacts that support use of DataBeans

Message Bridge helps you build applications that make use of structured messages, such as XML documents or messages exchanged between enterprise systems or business partners through New Era adapters, using EAServer components. Message Bridge improves your productivity by modeling the schema of a document or message as Java classes. When used in an EAServer application, these classes provide an intuitive way to access and manipulate message content in memory, and to read and write messages to and from the network.

Message Bridge provides a schema compiler that binds a document or message schema into Java classes. Each class provides access to the data content of the corresponding schema component through accessor (get) and mutator (set) methods similar to those used in standard JavaBeans. Because these classes model the data content of a document or message instance, they are called **DataBeans**. In short, a DataBean is a Java binding of a particular schema.

Using Message Bridge

Using the Message Bridge GUI, you can import two types of schemas: DTDs and XML Schemas. Message Bridge converts the imported schemas into neutral representations that you can modify, enhance, and group into projects with other related schemas.

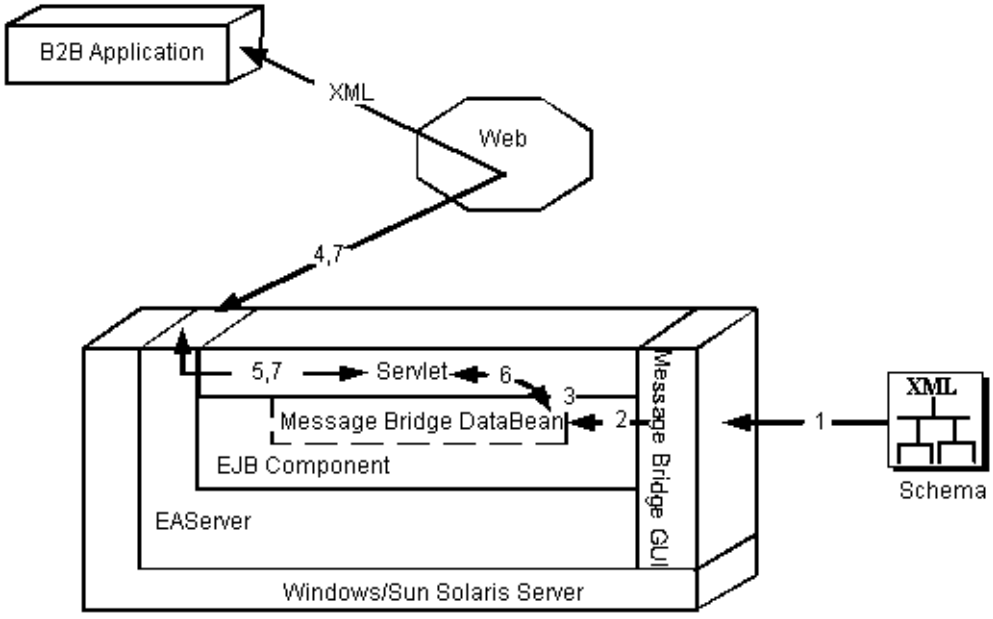
Then you can generate DataBeans for the individual schema definitions you select. These DataBean classes abstract the data contained in documents or messages. Each DataBean leverages shared runtime classes—the DataBean framework—to perform its functions: serializing and deserializing content from the data stream, validating content, and providing a read/write in-memory representation of message data.

During design, Message Bridge also generates artifacts to assist you in using DataBeans in your applications. These artifacts—XML DTDs, XML Schemas, and HTML documentation for DataBeans—facilitate development in various ways. For example, the XML DTD and Schema provide you with content model descriptions of each DataBean. By using these content models, you can use your own XML-based tools, easily modeling runtime systems based on XML data authoring, manipulation, and transmission. The HTML documentation provides Java developers with a detailed view of each particular DataBean's content model.

Message Bridge and EAServer architecture

Figure 6-1 demonstrates Message Bridge creating a DataBean from a schema. A developer uses the DataBean to parse and construct the XML documents.

Figure 6-1: EAServer and Message Bridge



These steps correspond with the numbers in Figure 6-1.

Steps 1 through 3 are performed at design time. Steps 4 through 7 are performed at runtime.

1 Import a schema into Message Bridge and define your message.

2 Generate a DataBean.

3 Write an EJB component with a method that accepts an XML document and uses the DataBean for parsing it. Write a servlet that accepts an XML document.

4 EAServer accepts an HTTP request that contains an XML document.

5 EAServer invokes the servlet.

6 The servlet calls the EJB component method. The EJB component uses the DataBean to parse the XML document and perform business logic. The EJB component uses another DataBean to build an XML reply document and return the XML to the servlet.

7 The servlet returns the XML document in an HTTP response to the caller.

For more information

For more information see the *Message Bridge for Java™ User's Guide.*

Also see the Message Bridge samples and tutorial in the *Messagebridge* subdirectory of your EAServer installation.

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