SYBASE®

PowerBuilder Native Interface Programmer's Guide and Reference

PowerBuilder®

10.5

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Contents

About This Book

Audience

This book is for C++ programmers who will use the PowerBuilder Native Interface (PBNI) to build PowerBuilder® extensions. The book assumes that you are familar with the C++ language and a C++ development tool.

Related documents

This book contains information about building PowerBuilder extensions. The *PowerBuilder Extension Reference* contains information about using extensions that are provided with PowerBuilder.

Other sources of information

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The formatting conventions used in this manual are:

Formatting example	To indicate
Retrieve and Update	When used in descriptive text, this font indicates: • Command, function, and method names • Keywords such as true, false, and null • Datatypes such as integer and char • Database column names such as emp_id and f_name • User-defined objects such as dw_emp or w_main
variable or *file name*	When used in descriptive text and syntax descriptions, oblique font indicates: • Variables, such as *myCounter* • Parts of input text that must be substituted, such as *pblname*`.pbd` • File and path names
File>Save	Menu names and menu items are displayed in plain text. The greater than symbol (>) shows you how to navigate menu selections. For example, File>Save indicates “select Save from the File menu.”
`dw_1.Update()`	Monospace font indicates: • Information that you enter in a dialog box or on a command line • Sample script fragments • Sample output fragments

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PART 1

Programmer’s Guide

This part provides an introduction to the PowerBuilder Native Interface and a guide to creating PowerBuilder extensions and interacting with PowerBuilder.

CHAPTER 1

Introduction to PBNI

About this chapter

This chapter provides a brief introduction to the PowerBuilder Native Interface.

Contents

About PBNI

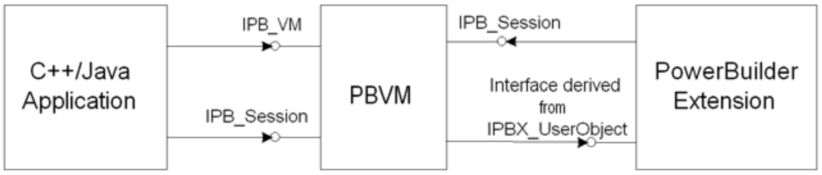
PBNI is a standard programming interface that enables developers to extend the functionality of PowerBuilder. Using PBNI, you can create extensions to PowerBuilder—nonvisual, visual, and marshaler extensions—and embed the PowerBuilder virtual machine (PBVM) into C++ applications. Through the Java Native Interface (JNI) and PBNI, Java applications can also communicate with the PBVM.

Code samples
This documentation contains two complete but very simple examples that illustrate some basic principles of using the PowerBuilder Native Interface (PBNI): "Nonvisual extension example" on page 11 and "Creating a PowerBuilder object to be called from C++" on page 64. For more real-world examples, see the PBNI section of the PowerBuilder CodeXchange Web site at http://powerbuilder.codeXchange.sybase.com/.

The following diagram illustrates the two-way communication, with both PowerBuilder extensions and external applications, that PBNI provides for the PBVM. As the diagram shows, a PowerBuilder extension communicates with the PBVM through the IPB_Session interface, and the PBVM communicates with the extension through an interface derived from IPBX_UserObject.

C++ and Java extensions communicate with the PBVM through the IPB_VM and IPB_Session interfaces.

Figure 1-1: Interaction between the PBVM and external applications and extensions



Understanding PowerBuilder extensions

A PowerBuilder extension is just what its name suggests: an extension to PowerBuilder functionality provided by you, by a third party, or by Sybase. All PowerBuilder extensions communicate with the PBVM through an interface called IPB_Session. This interface and other PBNI objects and interfaces are described in "The elements of PBNI" on page 6.

PowerBuilder provides its own extensions, including a PBDOM XML parser and classes that support SOAP clients for Web services. In future releases, Sybase might develop more new features as PBNI extensions instead of embedding them in the PowerBuilder VM (PBVM), so that the size of the PBVM can be minimized. Extensions are also available from third party contributors; for the latest samples and utilities, see the PBNI section of the PowerBuilder CodeXchange Web site at http://powerbuilder.codeXchange.sybase.com/.

Nonvisual extensions

The most frequently used type of PowerBuilder extension is a nonvisual extension. Nonvisual extensions provide a way to call C and C++ functions from PowerBuilder with more flexibility than the previous solution of declaring a function in a script. They also allow you to use object-oriented techniques when working with external objects.

A nonvisual extension is a DLL, written in C++, that exposes one or more native classes and/or global functions. Classes are used in a PowerBuilder application as though they were class user objects created in PowerBuilder—a native class is simply a PowerScript class that is implemented in C++. Global functions in an extension are used like global functions declared in the Function painter.

Nonvisual extensions allow you to use datatypes in C++ that map to standard PowerBuilder datatypes. PBNI provides predefined datatypes that map to PowerBuilder datatypes, so that you can use PowerBuilder datatypes when you invoke the methods of the native class, and the native class can use predefined types to call back into PowerBuilder. For more information about predefined types, see Chapter 6, "PBNI Types and Return Values."

You can use native classes to call back into the PBVM from the C++ code and trigger PowerBuilder events and invoke functions. You can also call external functions that require callback functions. For example, if your PowerBuilder application uses an extension that is a SAX XML parser, the SAX parser can send information back to the PowerBuilder application about the items it has encountered in the XML document that it is parsing. In response, the PowerBuilder application can send back instructions on how to handle those items.

Possible uses for a nonvisual extension include:

- A wrapper for a Component Object Model (COM) component that references a user-defined COM interface that cannot be mapped to a PowerBuilder datatype
- A PowerBuilder interface for database backups and administration using the Adaptive Server Anywhere dbtools (which require callback functions)
- Wrappers for any open source C++ libraries that provide standard utilities

PowerBuilder extensions run faster than standard PowerBuilder user objects because they are compiled in native machine code instead of PowerBuilder pseudocode (Pcode). PBNI complies with the C++ specification, so well-programmed code is portable at the source code level.

Visual extensions

Visual extensions can be used as if they were PowerBuilder visual user objects—you can place them in windows or on other visual controls. Visual extensions allow you to create a subclass of the Windows procedure (winproc) of a visual component so that you can use the latest "look and feel" for your applications.

Marshaler extensions

Marshaler extensions act as bridges between PowerBuilder and other components, such as Enterprise JavaBeans (EJB) components, Java classes, Web services, and CORBA components. PowerBuilder provides a marshaler extension for creating clients for EJB components running in any J2EE-compliant application server. Other techniques for calling EJBs from PowerBuilder do not provide a standard way to marshal PowerBuilder requests to other components and unmarshal the result back to PowerBuilder.

Embedding the PBVM in a C++ application

Many PowerBuilder users have developed sophisticated custom class user objects that handle intensive database operations or other functionality. Such objects can already be used in external applications. For example, you can create COM components or automation servers in the Project painter. However, these techniques have limitations on the use of some datatypes and of overloaded functions, as well as other coding restrictions.

To have direct access to a custom class user object running in the PBVM, and to take advantage of PBNI functions for data access and exchange, you can load the PBVM in the C++ application, create a session, and invoke the custom class user object's functions from the external application.

Communication between the PBVM and a C++ application is based primarily on two interfaces: IPB_VM and IPB_Session.

Interacting with Java

To call Java classes from PowerBuilder, you can build a marshaler extension that invokes Java methods through JNI, as described in Chapter 3, "Creating Marshaler Extensions." You can also use JNI to allow Java to call into PowerBuilder through C or C++. For an example, see the PowerBuilder CodeXchange Web site at http://powerbuilder.codexchange.sybase.com.

The elements of PBNI

To enable the features described in the previous section, PBNI provides interfaces, structures, global functions, and helper classes. These elements are described in more detail in the reference section of this guide. See Chapter 7, "PBNI Interfaces, Structures, and Methods." This section provides an overview.

Interfaces

The IPB_VM interface is used to load PowerBuilder applications in third-party applications and interoperate with the PowerBuilder virtual machine (PBVM).

IPB_Session is an abstract interface that defines methods for performing various actions such as accessing PowerScript data, creating PowerBuilder objects, and calling PowerScript functions.

The IPB_Value and IPB_Arguments interfaces enable you to pass values between the PowerBuilder VM and PowerBuilder extension modules.

The IPB_Value interface represents a PowerBuilder value, which could be one of the PowerBuilder standard datatypes such as integer, long, string, and so forth. It provides information about each variable, including its type, null flag, access privileges, array or simple type, and reference type.

The IPB_Arguments interface represents the arguments passed to a PowerScript function and is used to access the data.

The IPB_ResultSetAccessor and IPB_RSItemData interfaces enable you to access data in a DataWindow or DataStore.

All PowerBuilder native classes inherit from the IPBX_NonVisualObject interface or the IPBX_VisualObject interface, which in turn inherit from the IPBX_UserObject interface. You must implement the Invoke method in the inherited class to enable PowerBuilder to invoke methods in the native class.

Marshaler extensions contain a class that inherits from the IPBX_Marshaler interface. You must implement the InvokeRemoteMethod method in the inherited class to enable PowerBuilder to invoke methods on remote objects represented by a proxy.

Structures

The PBCallInfo structure holds arguments and return type information for function calls between PBNI and PowerBuilder. To access the information in PBCallInfo, use the IPB_Arguments interface.

The PBArrayInfo structure stores information about arrays.

The PB_DateData, PB_TimeData, and PB_DateTimeData structures are used to pass DataWindow and DataStore data.

Global functions

Every PowerBuilder extension object must export global functions that enable the PowerBuilder VM to create instances of the object and use its methods. The PBX_GetDescription function describes the classes and functions in the extension. The PBX_CreateNonVisualObject function enables the PBVM to create instances of the nonvisual classes in an extension, and the PBX_CreateVisualObject function does the same for visual classes.

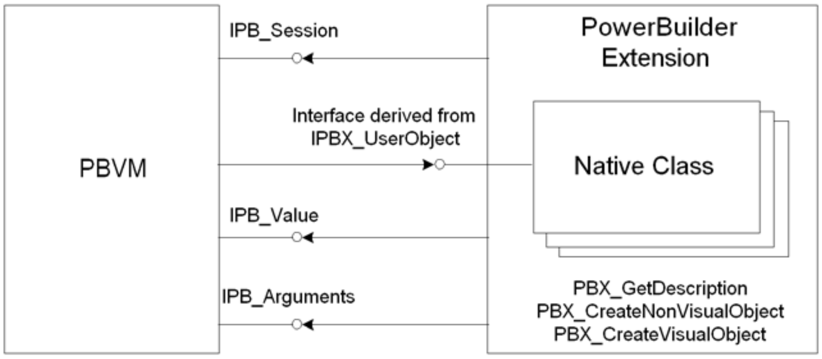
Helper classes

Several helper classes, such as PBObjectCreator, PBArrayAccessor, and PBEventTrigger, make it easier to program with PBNI.

Interaction between an extension and the PBVM

The following diagram summarizes how an extension interacts with the PBVM.

Figure 1-2: Interaction between an extension and the PowerBuilder VM



The PBNI SDK

When you install PowerBuilder, the Software Development Kit (SDK) for PBNI is installed in the *PowerBuilder 10.5\SDK\PBNI* directory. The SDK tools, pbsig105 and pbx2pbd105, are also installed in the *Shared\PowerBuilder* directory so that they are available in your path.

The SDK contains the components shown in the following table.

Table 1-1: Contents of the PBNI SDK

Component	Description
pbx2pbd105.exe	A tool that generates a PBD file from a PowerBuilder extension file. The extension file is a DLL file that must export a set of PBNI functions. The DLL is usually called a PBX and can be given the suffix *.pbx*.
pbsig105.exe	A tool that generates a set of strings representing the return type and arguments of each function in a PBL. Use these strings to call PowerBuilder functions from external modules.
include\pbni.h	A header file that defines the structures and interfaces used to build PowerBuilder extensions.

Component	Description
include\pbarray.h	A header file that contains helper classes that make it easier to create arrays and access data in them.
include\pbfield.h	A header file that contains helper classes that make it easier to access data in fields.
include\pbtraits.h	A header file used by *pbarray.h* and *pbfield.h* that provides specializations for the pbvalue_*type* enumerated types.
include\pbext.h	A header file that defines the functions that PowerBuilder extension functions must export.
include\pbevtid.h	A header file that maps the PowerBuilder event IDs to event names for use in visual extensions.
include\pbnimd.h	A header file that defines machine-dependent datatypes used in *pbni.h*.
include\pbrsa.h	A header file that defines interfaces and structures used to access DataWindow and DataStore data.
src\pbarray.cpp	A source file that must be added to your project if you want to use the following helper classes defined in *pbarray.h*: PBArrayAccessor PBObjectArrayAccessor PBBoundedArrayCreator PBBoundedObjectArrayCreator PBUnboundedArrayCreator PBUnboundedObjectArrayCreator
src\pbfuninv.cpp	A source file that must be added to your project if you want to use the following helper classes defined in *pbni.h*: PBGlobalFunctionInvoker PBObjectFunctionInvoker PBEventTrigger
src\pbobject.cpp	A source file that must be added to your project if you want to use the following helper class defined in *pbni.h*: PBObjectCreator.
wizards\VCProjects 7.1	A Microsoft Visual Studio .NET 2003 wizard that makes it easier for you to create PBNI projects.
wizards\VCProjects 7.0	A Microsoft Visual Studio .NET 2002 wizard that makes it easier for you to create PBNI projects.
wizards\VCWizards	Files required by the Visual Studio .NET wizards.
pbni105.hlp, pbni105.cnt	Help files for PBNI.

Comparing PBNI and JNI

If you have used the Java Native Interface (JNI), which allows Java applications and C and C++ modules to interoperate, you might find it helpful to be aware of the similarities in the two interfaces and the differences between them.

The IPB_VM interface in PBNI is analogous to the JavaVM type, and the IPB_Session interface in PBNI is analogous to JNIEnv. For JNI, you use the javap command to obtain a string that encodes the signature of each method in a native class. For PBNI, the pbsig105 tool performs the same function.

The major difference between the two interfaces is in how a native function or class is declared.

In JNI, you must use the native keyword to declare that a function is native, but you cannot simply declare a class as native. You must define your classes in Java source code, use the javah tool to generate a C header file that defines a C prototype for each native method, then implement the individual C or C++ functions, using `#include` to include the generated header file.

PBNI provides an object-oriented approach—you declare a class as native in the C++ code by inheriting from the IPBX_NonVisualObject or IPBX_VisualObject struct.

CHAPTER 2

Building PowerBuilder Extensions

About this chapter

This chapter describes how to build a PowerBuilder extension. It begins with a sample application that uses a simple nonvisual extension.

Contents

Nonvisual extension example

To illustrate the principles involved in building and using an extension, this chapter starts with a sample application that uses a PowerBuilder extension to perform a simple arithmetic operation. Ordinarily, this is not a task that needs PBNI, but it is used here to make the basic process clear. The rest of this chapter describes building extensions in more detail.

PBX file suffix
PowerBuilder extensions are DLL files but typically use the file extension *.pbx* instead of *.dll*. Your extension is compiled into a PBX file by default if you use the wizard described in the Appendix, “Using the Visual Studio .NET Wizard.”

For more realistic examples, see the PowerBuilder CodeXchange Web site at http://powerbuilder.codexchange.sybase.com.

The following sample application has two main steps:

- Building the pbadd PowerBuilder extension
- Using the extension in PowerBuilder

Building the pbadd PowerBuilder extension

In this example, the C++ code is in three files:

- The class declaration is in a header file, *pbadd.h*
- The standard functions that every PowerBuilder extension must expose are in *main.cpp*
- The implementation of the class is in *pbadd.cpp*.

❖ **To implement the pbadd extension:**

1 Create the *pbadd.h* header file.

The *pbadd.h* header file declares the pbadd class. The file includes *pbext.h*, which must be included in all PowerBuilder extensions because it declares the ancestor classes for native classes and the standard functions that the extension must expose. Here is the code for *pbadd.h*:

```
#include "pbext.h"
class pbadd: public IPBX_NonVisualObject
{
public:
   pbadd();
   virtual ~pbadd();
   PBXRESULT Invoke(
      IPB_Session   *session,
      pbobject      obj,
      pbmethodID    mid,
      PBCallInfo    *ci);

   int f_add(IPB_Session*, pbint, pbint);

// Enum used to provide entry points for each
// method in the class - the only one in this case
// is mAdd
   enum MethodIDs
   {
      mAdd = 0
   };
private:
   virtual void Destroy();
};
```

2 Create the *main.cpp* file, which includes *pbadd.h* and implements the standard functions, PBX_GetDescription and PBX_CreateNonvisualObject:.

- PBX_GetDescription is used to pass the descriptions of classes in the extension to PowerBuilder.
- The PBX_CreateNonVisualObject method creates the object instance. The PowerScript CREATE statement maps to this PBNI method.

The following is the code for *main.cpp*:

```
#include "pbadd.h"
// initialize the PBX
BOOL APIENTRY DllMain(HANDLE hModule,
                DWORD ul_reason_for_all,
                 LPVOID lpReserved
              )
{
   switch(ul_reason_for_all)
   {
      case DLL_PROCESS_ATTACH:
      case DLL_THREAD_ATTACH:
      case DLL_THREAD_DETACH:
      case DLL_PROCESS_DETACH:
         break;
   }
   return TRUE;
}


// describe the pbadd class
PBXEXPORT LPCTSTR PBXCALL PBX_GetDescription()
{
   static const TCHAR desc[]={
      "class pbadd from nonvisualobject \n" \
      "function int f_add(int a,int b)\n" \
      "end class \n"
   };
return desc;
}
```

```
// export the required PBX_CreateNonVisualObject
// function so that the PBVM can
// create an instance of the class
PBXEXPORT PBXRESULT PBXCALL
PBX_CreateNonVisualObject
(
   IPB_Session*    pbSession,
   pbobject        pbobj,
   LPCSTR          xtraName,
   IPBX_NonVisualObject   **obj
)
{
   // if the calling function requests the pbadd
   // class, create an instance
   if (strcmp(xtraName,"pbadd")==0)
      {
         *obj=new pbadd;
   }
   return 0;
};
```

3 Create the *pbadd.cpp* file, which includes *pbadd.h* and contains the implementation of the pbadd class and its single method, f_add.

```
#include "pbadd.h"

// Implement the required Invoke method
PBXRESULT pbadd:: Invoke(IPB_Session *Session,
   pbobject obj, pbmethodID mid, PBCallInfo *ci)
{
   // if the method to call is f_add
   if (mid == mAdd)
   {
      int sum = f_add(Session, ci->pArgs->GetAt(0)->
         GetInt(), ci->pArgs->GetAt(1)->GetInt());
      ci->returnValue->SetInt(sum);
   }
   return PBX_OK;
}

// constructor and destructor
pbadd:: pbadd()
{
}
pbadd:: ~pbadd()
{
}
```

```
// implement the class's f_add method
int pbadd:: f_add(IPB_Session* session, pbint arg1,
   pbint arg2)
{
   return arg1+arg2;
}

// Implement the required Destroy method
void pbadd::Destroy()
{
   delete this;
}
```

❖ **To compile and link the PBX:**

- In your C++ development tool or on the command line, compile and link the PBX.

  Make sure the *include* directory in *PowerBuilder 10.5\SDK\PBNI* is in your include path. For this example, the generated DLL is called *pbadd.pbx*.

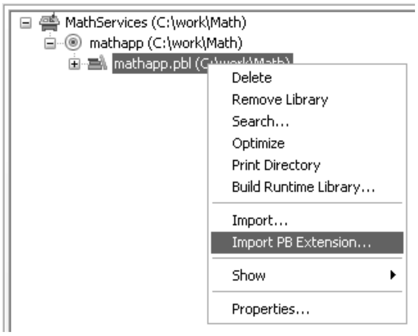
Using the extension in PowerBuilder

To use the PowerBuilder native class in a PowerBuilder application, import the object descriptions in the PBX file into a library in your application.

❖ **To import the extension into an application:**

1. Copy the PBX (or DLL) file to a directory on your application's path.
2. In PowerBuilder, create a new workspace.
3. On the Target page of the New dialog box, select the Application icon to create a new target, library, and application object.

4 In the System Tree, expand the new target, right-click the library, and select Import PB Extension from the pop-up menu.



5 Navigate to the location of the *pbadd.pbx* file and click Open.

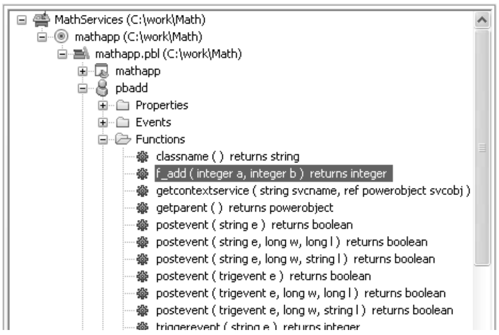
❖ **To invoke the f_add function in PowerBuilder:**

1 Create a new window called w_add, and add three single-line edit boxes and a command button to it.

2 Declare an instance variable called *mypbadd* for the pbadd native class, and then add this script to the button's Clicked event:

```
TRY
   mypbadd = CREATE pbadd
   sle_3.text = string (mypbadd.f_add( &
      integer(sle_1.text), integer(sle_2.text)))
CATCH (runtimeerror re)
   MessageBox("Error", &
      "pbadd native class could not be created: " + &
      re.getmessage() )
END TRY
```

The pbadd class displays in the System Tree. As shown in the following screen shot, you can expand its function list:


MathServices (C:\work\Math)
mathapp (C:\work\Math)
mathapp.pbl (C:\work\Math)
mathapp
pbadd
Properties
Events
Functions
classname ( ) returns string
f_add (integer a, integer b) returns integer
getcontextservice (string svcname, ref powerobject svcobj)
getparent ( ) returns powerobject
postevent (string e) returns boolean
postevent (string e, long w, long l) returns boolean
postevent (string e, long w, string l) returns boolean
postevent (trigevent e) returns boolean
postevent (trigevent e, long w, long l) returns boolean
postevent (trigevent e, long w, string l) returns boolean
triggerevent (string e) returns integer

3. Add `open(w_add)` to the application's Open event.
4. Run the application.

   The application runs just as it would if you had created a custom class user object in PowerBuilder with an f_add function. If PowerBuilder cannot find *pbadd.pbx*, the runtime error in the Clicked event script will be triggered and caught. Put *pbadd.pbx* in the same directory as the executable or the PowerBuilder runtime DLLs to make sure it can be found.

Creating a PowerBuilder extension

To build a PowerBuilder extension, follow these steps:

Step 1: Decide on a feature to implement.

Step 2: Define the classes and functions in the extension.

Step 3: Declare native classes and global functions.

Step 4: Implement native classes and global functions.

Step 5: Export methods to create class instances.

Step 6: Build a PBX.

These steps apply whether you are building a nonvisual or a visual extension. The differences between building nonvisual and visual extensions are described in "Creating and using a visual extension" on page 27. This section focuses primarily on nonvisual extensions.

Required methods

All PowerBuilder nonvisual extensions must export two methods: PBX_GetDescription and PBX_CreateNonVisualObject. The use of these methods is described in "Step 2: Define the classes and functions in the extension" on page 18 and "Step 5: Export methods to create class instances" on page 24.

PowerBuilder visual extensions must export PBX_GetDescription and PBX_CreateVisualObject. See "Creating and using a visual extension" on page 27.

If the extension declares global functions, it must also export the PBX_InvokeGlobalFunction method.

For every native class, you must implement two PBNI methods, Invoke and Destroy, in addition to the methods the class will provide. The use of these PBNI methods is described in “Step 4: Implement native classes and global functions” on page 22.

Step 1: Decide on a feature to implement

The first step in building a PowerBuilder extension is to identify a problem that an extension can solve. This might be a feature that can be coded more efficiently and easily in C++ than in PowerScript, or that requires the use of callback functions or nonstandard datatypes. You might also have access to existing C++ classes that perform the tasks you want to add to a PowerBuilder application, or you might want to create a wrapper for existing standard utilities written in C++.

For possible uses of PowerBuilder extensions, see “Understanding PowerBuilder extensions” on page 4.

For examples of PowerBuilder extensions, see the PowerBuilder CodeXchange Web site at http://powerbuilder.codexchange.sybase.com.

Step 2: Define the classes and functions in the extension

Your C++ code must expose two standard methods that enable PowerBuilder to recognize each native class and create instances of the class. One of these methods is PBX_GetDescription.

Use PBX_GetDescription to pass the descriptions of classes and global functions in the PowerBuilder extension to PowerBuilder. Every extension must export this method. Importing the PBX or DLL file into a PBL converts the description of the extension into PowerScript and adds it to the PBL as source code. The keyword native in the source code indicates that the PowerBuilder type was defined in an extension.

All the classes or global functions in an extension module are passed in a single description. The examples that follow illustrate how you define classes and functions in a description. For the full syntax, see PBX_GetDescription on page 233.

Describing nonvisual classes

Nonvisual classes can inherit from the NonVisualObject PowerBuilder system class or any of its descendants. While a native class can inherit from a user-defined user object, Sybase recommends that you use only system classes. Each native class can provide several functions, subroutines, and events.

The following example shows how you use the PBX_GetDescription method in the C++ code for an extension that includes three nonvisual classes. *ClassName1* inherits from NonVisualObject, *ClassName2* inherits from Exception, and *ClassName3* inherits from Transaction. All three classes must be in a single description passed by PBX_GetDescription:

```
PBXEXPORT LPCTSTR PBXCALL PBX_GetDescription()
{
  static const TCHAR desc[] = {
   // Description begins here
   "class ClassName1 from NonVisualObject\n"
    "function integer objectFunction(integer a[])\n"
    "subroutine objectSubroutine(integer ai_ref)\n"
    "event integer eventName(integer b)\n"
    "end class\n"

    "class ClassName2 from Exception\n"
    "function integer objectFunction(readonly
       integer ai)\n"
    "subroutine objectSubroutine(integer arg)\n"
    "event integer eventName(integer arg)\n"
    "end class\n"

    "class ClassName3 from Transaction\n"
    "function integer objectFunction(integer arg)\n"
    "subroutine objectSubroutine(integer arg)\n"
    "event integer eventName(integer arg)\n"
    "end class\n"
    // Description ends here
  };
  return desc;
}
```

Describing visual classes

Visual native classes can inherit only from the UserObject PowerBuilder system class. The PowerBuilder VM considers any class that inherits from UserObject to be a visual class. All other native classes are considered to be nonvisual classes. For more information about how to describe visual classes, see “Creating and using a visual extension” on page 27.

Describing global functions

An extension can include global functions as well as classes. This example shows a description for two global functions:

```
"globalfunctions \n" \
"function int g_1(int a, int b)\n" \
"function long g_2(long a, long b)\n" \
"end globalfunctions\n"
```

The syntax and usage of global functions defined in an extension are the same as for global functions defined in the Function painter in PowerBuilder.

Global functions cannot be overloaded
Like global functions in PowerScript, global functions in a PowerBuilder extension cannot be overloaded.

Using forward declarations

PowerBuilder extensions can provide multiple classes. A class can reference any class that is defined *earlier* in the description, but if it references a class defined *later* in the description, you must provide a forward declaration. This example shows a description that includes forward declarations for two classes, nativeclass_1 and nativeclass_2, that reference each other. This example also demonstrates that a single description can include global functions as well as classes:

```
"forward\n" \
"class nativeclass_1 from nonvisualobject\n"\
"class nativeclass_2 from nonvisualobject\n"\
"end forward\n" \

"class nativeclass_1 from nonvisualobject \n" \
"function int add(nativeclass_2 a, int b)\n" \
"function int sub(int a, int b)\n" \
"end class \n" \

"class nativeclass_2 from nonvisualobject \n" \
"function int add(nativeclass_1 a, int b)\n" \
"function int sub(int a, int b)\n" \
"end class \n"

"globalfunctions \n" \
"function int g_1(int a, int b)\n" \
"function long g_2(long a, long b)\n" \
"end globalfunctions\n"
```

Step 3: Declare native classes and global functions

For each native class that the nonvisual extension supports, declare an ANSI C++ class that inherits from IPBX_NonVisualObject, which is the ancestor class for all nonvisual PowerBuilder native classes.

The declaration of the class can be placed in a header file, and it must include Invoke and Destroy methods. This is a simple prototype for a nonvisual class:

```
#include "pbext.h"

class CMyClass : public IPBX_NonVisualObject
{
enum MethodIDs
{
   mFunca = 0,
   mFuncb = 1
};
public:
   // constructor, destructor
   CMyClass()
   virtual ~CMyClass()

   // member methods
   PBXRESULT Invoke(
      IPB_Session   *session,
      pbobject   obj,
      pbmethodID   mid,
      PBCallInfo   *ci
   );
   void Destroy();

private:
   void funcA(IPB_Session* session, pbobject obj,
       PBCallInfo* ci);
   void funcB(IPB_Session* session, pbobject obj,
       PBCallInfo* ci);
};
```

If you declare global functions in your extension, the extension must export the PBX_InvokeGlobalFunction method. The following PBX_GetDescription call declares three global functions: bitAnd, bitOr, and bitXor:

```
PBXEXPORT LPCTSTR PBXCALL PBX_GetDescription()
{
   static const TCHAR desc[] = {
      "globalfunctions\n"
      "function int bitAnd(int a, int b)\n"
```

```
         "function int bitOr(int a, int b)\n"
         "function int bitXor(int a, int b)\n"
         "end globalfunctions\n"
      };

   return desc;
}
```

Step 4: Implement native classes and global functions

The implementation of each class must include the implementation of the Invoke and Destroy methods, as well as all the methods declared for the class. Invoke and Destroy are methods of the IPBX_UserObject interface.

When the PowerBuilder application calls a method on the native class, the PBVM calls the Invoke method, which dispatches the call based on the method ID or method name. The method name is used when the method is called dynamically.

The Invoke method must be coded to invoke each method in the class. The example that follows shows a switch-case statement that invokes either funcA or funcB, depending on the value of the method ID. When the PowerBuilder application has finished using an instance of a native class, the PBVM calls the Destroy method.

This example does not show the implementation of the methods of the class itself:

```
PBXRESULT MyClass::Invoke(IPB_Session *session,
pbobject obj, pbmethodID mid, PBCallInfo *ci)
{
   PBXRESULT result = PBX_OK;

   switch (mid)
   {
   case mFunca:
      result = funcA(session, obj, ci);
      break;

   case mFuncb:
      result = funcB(session, obj, ci);
      break;

   default:
      result = PBX_E_INVOKE_FAILURE;
```

```
         break;
      }

      return result;
   }
   // Implementation of funcA and funcB not shown
   void Destroy()
      {
         delete this;
   }
```

The following PBX_InvokeGlobalFunction contains the implementation of the three global functions included in the description shown in "Step 3: Declare native classes and global functions" on page 21:

```
PBXEXPORT PBXRESULT PBXCALL PBX_InvokeGlobalFunction
(
   IPB_Session*   pbsession,
   LPCTSTR        functionName,
   PBCallInfo*    ci
   )
{

  PBXRESULT pbrResult = PBX_OK;

  int arg1 = ci->pArgs->GetAt(0)->GetInt();
  int arg2 = ci->pArgs->GetAt(1)->GetInt();

  if (stricmp(functionName, "bitand") == 0)
  {
     ci->returnValue->SetInt(arg1 & arg2);
  }else if (strcmp(functionName, "bitor") == 0)
  {
     ci->returnValue->SetInt(arg1 | arg2);
  }else if (strcmp(functionName, "bitxor") == 0)
  {
     ci->returnValue->SetInt(arg1 ^ arg2);
  }else
  {
     return PBX_FAIL;
  }

  return pbrResult;
}
```

Step 5: Export methods to create class instances

PowerBuilder creates nonvisual and visual class instances differently:

- For visual classes, the instance is created when the window or visual control in which the class is used is opened. See “Creating visual class instances” on page 29.
- For nonvisual classes, the instance is created when the PowerBuilder CREATE statement is used. This is described next.

When the PowerBuilder application creates an instance of a nonvisual class using the PowerScript CREATE statement, the PBVM calls the PBX_CreateNonVisualObject method in the extension. Every extension that contains nonvisual native classes must export this method.

In the same way that multiple classes are included in a single description passed by PBX_GetDescription, PBX_CreateNonVisualObject can be used to create multiple classes.

In this example, the extension has three classes. An IF statement compares the name of the class passed in from the PowerBuilder CREATE statement to the name of each of the classes in the extension in turn and creates an instance of the first class with a matching name. You could also use a CASE statement. The class name in the string comparison must be all lowercase:

```
PBXEXPORT PBXRESULT PBXCALL PBX_CreateNonVisualObject(
   IPB_Session * session,
   pbobject obj,
   LPCSTR className,
   IPBX_NonVisualObject **nvobj
)
{
   PBXRESULT result = PBX_OK;
   // The class name must not contain uppercase
   if ( strcmp( className, "classone" ) == 0 )
      *nvobj = new ClassOne;
   else if ( strcmp( className, "classtwo" ) == 0 )
      *nvobj = new ClassTwo( session );
   else if ( strcmp( className, "classthree" ) == 0 )
      *nvobj = new ClassThree;
   else
   {
      *nvobj = NULL;
      result = PBX_E_NO_SUCH_CLASS;
   }
   return PBX_OK;
};
```

Step 6: Build a PBX

Using your C++ development tool or the command line, build a PBX from your C++ classes.

When you compile and link the C++ code, verify the following:

- The *include* directory for the PBNI SDK, typically *PowerBuilder 10.5\SDK\PBNI\include*, must be in your include path.
- If you use any helper classes, make sure the source file that contains them is added to your project. For a list of classes, see the table in "The PBNI SDK" on page 8.

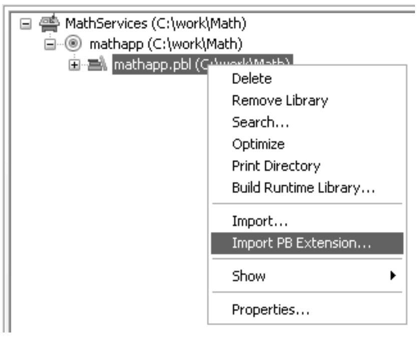
Now you are ready to use the extension in a PowerBuilder application.

Adding an extension to a PowerBuilder target

The simplest way to add a PowerBuilder native class to a PowerBuilder target is to import the object descriptions in the PBX file into a library in the PowerBuilder System Tree. You can also use a command-line tool to create a PBD file from a PBX file and add it to the target's library search path. See `pbx2pbd105` on page 244.

❖ **To import the descriptions in an extension into a library:**

1. Copy the PBX file into a directory on the application's path.
2. In the System Tree, expand the target in which you want to use the extension, right-click a library, and select Import PB Extension from the pop-up menu.



3. Navigate to the location of the PBX file and click Open.

Each class in the PBX displays in the System Tree so that you can expand it, view its properties, events, and methods, and drag and drop to add them to your scripts.

Using the extension

Using nonvisual classes

In PowerScript, use the classes in a nonvisual extension just as you would a custom class user object: Declare an instance of the object, use the CREATE statement to create the instance, invoke the object's functions, and destroy the instance when you have finished with it. You can inherit from the native classes if you want to add functions or events to the class.

At runtime, instances of the native class are created as normal PowerBuilder objects.

In this example, the extension module contains two nonvisual native classes: fontcallback and fontenumerator. A PowerBuilder custom class user object, nvo_font, inherits from the fontcallback class. These statements create instances of both classes:

```
fontenumerator fe
nvo_font uf
fe = create fontenumerator
uf = create nvo_font
```

After an instance of a native class has been created, the PowerBuilder application can call methods on the object. Each native class must implement an Invoke method that the PowerBuilder VM calls when the PowerBuilder application calls one of the native class's methods. Then, the Invoke method dispatches the method call based on the method ID or method name. The method name is used when a native method is called dynamically.

Using the previous example, this statement invokes the enumprinterfonts method of the instance of the fontenumerator class:

```
fe.enumprinterfonts(uf)
```

Destroying the PBNI object instance

When the PowerBuilder application no longer needs an instance of a nonvisual class and a DESTROY statement is issued, by either the user or the garbage collector, or when the window or visual control that contains a visual class is closed, the PowerBuilder VM destroys the instance by calling the native class's Destroy method.

Creating and using a visual extension

In general, you follow the same steps to create and use a visual extension that you do to create a nonvisual extension:

Step 1: Decide on a feature to implement.

Step 2: Define the classes and functions in the extension.

Step 3: Declare visual classes and global functions.

Step 4: Implement native classes.

Step 5: Export methods to create class instances.

Step 6: Build and use a PBX.

Step 7: Use the visual extension in an application.

Using PowerBuilder visual objects in C++
For information about using PowerBuilder visual objects from a C++ application, see "Processing PowerBuilder messages in C++" on page 71.

Step 1: Decide on a feature to implement

You can choose to use visual extensions to implement controls with a specific purpose or that use a custom look and feel. For some examples of visual extensions, see the PowerBuilder CodeXchange Web site at http://powerbuilder.codexchange.sybase.com.

Step 2: Define the classes and functions in the extension

The description for a visual class follows the same rules as for a nonvisual class, but it must inherit from the UserObject system class:

```
PBXEXPORT LPCTSTR PBXCALL PBX_GetDescription()
{
   static const TCHAR desc[] = {
      "class myvisualext from userobject\n"
      "subroutine func_1(int arg1, int arg2)\n"
      "subroutine func_2(string arga)\n"
      "end class\n"
   };
   return desc;
   }
```

There are no events in the preceding example, but a typical visual extension makes use of events such as mouse clicks. There are two ways to declare and handle events. See “Event processing in visual extensions” on page 32.

Step 3: Declare visual classes and global functions

You declare native visual classes in the same way as nonvisual classes, except that you declare an ANSI C++ class that inherits from IPBX_VisualObject, which is the ancestor class for all nonvisual PowerBuilder native classes, instead of from IPBX_NonVisualObject. You can also declare global functions in a visual extension. See “Step 3: Declare native classes and global functions” on page 21.

Step 4: Implement native classes

You implement Invoke and Destroy methods and any class or global functions the same way for visual extensions as for nonvisual extensions. See “Step 4: Implement native classes and global functions” on page 22.

Step 5: Export methods to create class instances

The major difference between visual and nonvisual extensions is in how instances of the class are created. See “Creating visual class instances” on page 29.

Step 6: Build and use a PBX

As for nonvisual extensions, you must build a PBX, import it into the application, and put the PBX in the execution path. See “Step 6: Build a PBX” on page 25 and “Adding an extension to a PowerBuilder target” on page 25.

Step 7: Use the visual extension in an application

You do not need to declare an instance of a visual class or use the CREATE statement to create an instance. The PBVM creates an instance when the window or visual control in which the visual class resides is opened, as described in "Creating visual class instances" on page 29. You can invoke the object's functions the same way that you invoke a nonvisual object's functions.

❖ **To use a visual extension:**

1 Select File>Inherit from the PowerBuilder menu and select the PBD in the Libraries list in the Inherit from Object dialog box.

2 Select the visual class and click OK.

3 In the User Object painter, size the visual object and make any other changes you need.

4 Save the object.

   You can now drag the new user object from the System Tree directly onto a window or onto another visual control, such as a tab control, and use it like any other visual user object.

Code samples
The code fragments in the rest of this section are based on complete sample applications that you can find on the PowerBuilder CodeXchange Web site at http://powerbuilder.codexchange.sybase.com.

Creating visual class instances

When the window or other visual control in which a visual native class resides is created in a PowerBuilder application, the PBVM calls the PBX_CreateVisualObject method in the extension automatically—the PowerBuilder application developer does not need to write a CREATE statement in a script. The PBVM also calls the IPBX_VisualObject's CreateControl method. Every extension that contains visual native classes must export PBX_CreateVisualObject and implement CreateControl.

The following is sample code for PBX_CreateVisualObject:

```
PBXEXPORT PBXRESULT PBXCALL PBX_CreateVisualObject
(
   IPB_Session*         pbsession,
   pbobject            pbobj,
   LPCTSTR               className,
   IPBX_VisualObject   **obj
)
{
   PBXRESULT result = PBX_OK;

   string cn(className);
   if (cn.compare("visualext") == 0)
   {
      *obj = new CVisualExt(pbsession, pbobj);
   }
   else
   {
      *obj = NULL;
      result = PBX_FAIL;
   }

   return PBX_OK;
};
```

Registering the window class

Before CreateControl can be called, the window class must be registered. This code uses the Windows RegisterClass method to register the window class with the class name s_className:

```
void CVisualExt::RegisterClass()
{
   WNDCLASS wndclass;

   wndclass.style = CS_GLOBALCLASS | CS_DBLCLKS;
   wndclass.lpfnWndProc = WindowProc;
   wndclass.cbClsExtra = 0;
   wndclass.cbWndExtra = 0;
   wndclass.hInstance = g_dll_hModule;
   wndclass.hIcon = NULL;
   wndclass.hCursor = LoadCursor (NULL, IDC_ARROW);
   wndclass.hbrBackground =(HBRUSH) (COLOR_WINDOW + 1);
   wndclass.lpszMenuName = NULL;
   wndclass.lpszClassName = s_className;

   ::RegisterClass (&wndclass);
}
```

You must also implement the Windows UnregisterClass method to unregister the class when the window is closed:

```
void CVisualExt::UnregisterClass()
{
   ::UnregisterClass(s_className, g_dll_hModule);
}
```

The RegisterClass and UnregisterClass methods are called in the initialization code for the PBX. This is the Visual C++ DllMain method:

```
BOOL APIENTRY DllMain( HANDLE hModule,
                       DWORD  reasonForCall,
                       LPVOID lpReserved
                     )
{
   g_dll_hModule = (HMODULE)hModule;

   switch (reasonForCall)
   {
      case DLL_PROCESS_ATTACH:
         CVisualExt::RegisterClass();
          break;

      case DLL_THREAD_ATTACH:
      case DLL_THREAD_DETACH:
         break;

      case DLL_PROCESS_DETACH:
         CVisualExt::UnregisterClass();
         break;
   }
   return TRUE;
}
```

Implementing CreateControl

Every visual native class must implement the IPBX_VisualObject CreateControl method. After getting the class name with the IPBX_VisualObject GetClassName method, CreateControl passes the class name to the Windows CreateWindowEx method to create the window, then returns the window handle to the PBVM:

```
TCHAR CVisualExt::s_className[] = "PBVisualExt";

LPCTSTR CVisualExt::GetWindowClassName()
{
   return s_className;
}
```

```
HWND CVisualExt::CreateControl
(
   DWORD dwExStyle,      // extended window style
   LPCTSTR lpWindowName, // window name
   DWORD dwStyle,        // window style
   int x,             // horizontal position of window
   int y,                // vertical position of window
   int nWidth,           // window width
   int nHeight,          // window height
   HWND hWndParent,      // handle to parent or
                         // owner window
   HINSTANCE hInstance   // handle to application
                         // instance
)
{
   d_hwnd = CreateWindowEx(dwExStyle, s_className,
      lpWindowName, dwStyle, x, y, nWidth, nHeight,
      hWndParent, NULL, hInstance, NULL);

   ::SetWindowLong(d_hwnd, GWL_USERDATA, (LONG)this);
   return d_hwnd;
}
```

Event processing in visual extensions

A visual extension can have a window procedure that can process any Windows message or user-defined message. The PBVM passes all such messages to the visual extension, which can intercept messages and either process or ignore them.

WindowProc is an application-defined callback function that processes messages sent to a window. In the example in this section, a WM_PAINT message is sent to the extension when an action in the PowerBuilder application causes the window to be redrawn. When the extension receives the message, it repaints an area in the window using the current values for text and color set by the user of the application.

The following example also captures mouse clicks and double clicks, and triggers the Onclick and Ondoubleclick event scripts in the PowerBuilder application. You can use two different syntaxes for describing events:

event *returnType eventName*(*args_desc*) newline

event *eventName pbevent_token* newline

Using an event name with return type and arguments

The following description uses the first syntax. The class has two events, onclick and ondoubleclick:

```
PBXEXPORT LPCTSTR PBXCALL PBX_GetDescription()
{
   static const TCHAR desc[] = {
      "class visualext from userobject\n"
      "event int onclick()\n"
      "event int ondoubleclick()\n"
      "subroutine setcolor(int r, int g, int b)\n"
      "subroutine settext(string txt)\n"
      "end class\n"
   };
return desc;
}
```

Capturing messages and mouse clicks

The code in the extension captures the Windows messages that cause the window to be drawn, as well as mouse clicks and double clicks:

```
LRESULT CALLBACK CVisualExt::WindowProc(
                                   HWND hwnd,
                                   UINT uMsg,
                                   WPARAM wParam,
                                   LPARAM lParam
                                   )
{
   CVisualExt* ext = (CVisualExt*)::GetWindowLong(hwnd,
      GWL_USERDATA);
   switch(uMsg) {

   case WM_CREATE:
      return 0;

   case WM_SIZE:
      return 0;

   case WM_COMMAND:
      return 0;

   case WM_PAINT: {
      PAINTSTRUCT ps;
      HDC hdc = BeginPaint(hwnd, &ps);
      RECT rc;
      GetClientRect(hwnd, &rc);
      LOGBRUSH lb;
      lb.lbStyle = BS_SOLID;
// Get color using the visual class's GetColor method
      lb.lbColor = ext->GetColor();
      HBRUSH hbrush = CreateBrushIndirect(&lb);
      HBRUSH hbrOld = (HBRUSH)SelectObject(hdc,
         hbrush);
      Rectangle(hdc, rc.left, rc.top, rc.right-rc.left,
         rc.bottom-rc.top);
      SelectObject(hdc, hbrOld);
      DeleteObject(hbrush);


// Get text using the visual class's GetText method
      DrawText(hdc, ext->GetText(),
         ext->GetTextLength(), &rc,
      DT_CENTER|DT_VCENTER|DT_SINGLELINE);
      EndPaint(hwnd, &ps);
      }
      return 0;

// Trigger event scripts in the PowerBuilder application
   case WM_LBUTTONUP:
      ext->TriggerEvent("onclick");
      break;

   case WM_LBUTTONDBLCLK:
      ext->TriggerEvent("ondoubleclick");
      break;
   }
   return DefWindowProc(hwnd, uMsg, wParam, lParam);
}
```

Triggering click events

The following is the TriggerEvent method that triggers the Onclick and Ondoubleclick events:

```
void CVisualExt::TriggerEvent(LPCTSTR eventName)
{
   pbclass clz = d_session->GetClass(d_pbobj);
   pbmethodID mid = d_session->GetMethodID(clz,
      eventName, PBRT_EVENT, "I");

   PBCallInfo ci;
   d_session->InitCallInfo(clz, mid, &ci);
   d_session->TriggerEvent(d_pbobj, mid, &ci);
   d_session->FreeCallInfo(&ci);
}
```

Using an event name with a PowerBuilder event ID

A simpler way to trigger events in a visual extension uses direct mapping of Windows messages to PowerBuilder events. The following class description contains the same two events, but in this case they use the alternative syntax that maps the event name to a PowerBuilder token name:

```
PBXEXPORT LPCTSTR PBXCALL PBX_GetDescription()
{
   static const TCHAR desc[] = {
      "class visualext from userobject\n"
      "event onclick pbm_lbuttonup\n"
      "event ondoubleclick pbm_lbuttondblclk\n"
      "subroutine setcolor(int r, int g, int b)\n"
      "subroutine settext(string txt)\n"
      "end class\n"
   };
return desc;
}
```

Generating event syntax automatically

Importing the extension generates the Onclick and Ondoubleclick events with the appropriate arguments automatically, and at runtime, the PBVM fires the events. You do not need to capture the Windows messages WM_LBUTTONUP and WM_LBUTTONDBLCLK in the extension.

In the following description, *onclick* is the event name and *pbm_lbuttonup* is the event token name. Notice that the event name is not followed by empty parentheses as it is when you use the return type and arguments technique for describing the event:

```
"event onclick pbm_lbuttonup\n"
```

About the token name

The token name is a string that maps to an internal PowerBuilder event ID defined in the header file *pbevtid.h*. The first ID in this file is PB_NULL. For all other IDs in the file, there is a fixed relationship between the name that you use in the description and the event ID in *pbevtid.h*. The name is the same as the ID with the letter *m* appended to the *pb* prefix. You must use lowercase in the description.

For example, the event ID *PB_ACTIVATE* in *pbevtid.h* maps to the token name *pbm_activate*. In the description provided with PBX_GetDescription, you must use the name *pbm_activate*. If the event name you provide does not exist, importing the extension generates an error message. See the *pbevtid.h* file for a complete list of mapped IDs.

Processing events sent to the parent of the window

Some Windows messages, such as WM_COMMAND and WM_NOTIFY, are sent to the parent of an object and not to the object itself. Such messages cannot be caught in the visual extension's window procedure. The PBVM calls the GetEventID method to process these messages, as follows:

- If the message is mapped to a PowerBuilder event, GetEventID returns the event's identifier, for example PB_BNCLICKED, and the event is fired automatically.
- If the message is not mapped to an event, GetEventID returns the value PB_NULL and the message is discarded.

In the following example, the GetEventID function returns the identifier PB_BNCLICKED if a WM_COMMAND message with the notification code BN_CLICKED was sent. It returns the identifier PB_ENCHANGE if a WM_NOTIFY message was sent. Otherwise, it returns PB_NULL.

```
TCHAR CVisualExt::s_className[] = "PBVisualExt";

LPCTSTR CVisualExt::GetWindowClassName()
{
  return s_className;
}

HWND CVisualExt::CreateControl
(
  DWORD dwExStyle,      // extended window style
  LPCTSTR lpWindowName, // window name
  DWORD dwStyle,        // window style
  int x,               // horizontal position of window
  int y,            // vertical position of window
  int nWidth,       // window width
  int nHeight,      // window height
  HWND hWndParent,  // handle of parent or owner window
  HINSTANCE hInstance // handle of application instance
)
{
  d_hwnd = CreateWindowEx(dwExStyle, s_className,
    lpWindowName, dwStyle, x, y, nWidth, nHeight,
    hWndParent, NULL, hInstance, NULL);

  ::SetWindowLong(d_hwnd, GWL_USERDATA, (LONG)this);

  return d_hwnd;
}
```

```
int CVisualExt::GetEventID(
   HWND    hWnd,     /* Handle of parent window */
   UINT    iMsg,     /* Message sent to parent window*/
   WPARAM  wParam,   /* Word parameter of message*/
   LPARAM  lParam    /* Long parameter of message*/
  )
{
  if (iMsg == WM_COMMAND)
  {
    if ((HWND)lParam == d_hwnd)
    {
      switch(HIWORD(wParam))
      {
      case BN_CLICKED:
        return PB_BNCLICKED;
        break;
      }
    }
  }

  if (iMsg == WM_NOTIFY)
  {
    return PB_ENCHANGE;
  }
  return PB_NULL;
}
```

Calling PowerScript from an extension

You can call PowerBuilder system functions through IPB_Session. The InitCallInfo method simplifies the process of setting up the call information. You need to provide the arguments to the InitCallInfo method, including an identifier for the PowerBuilder function you want to call.

The identifier can be returned from the GetMethodID or FindMatchingFunction method.

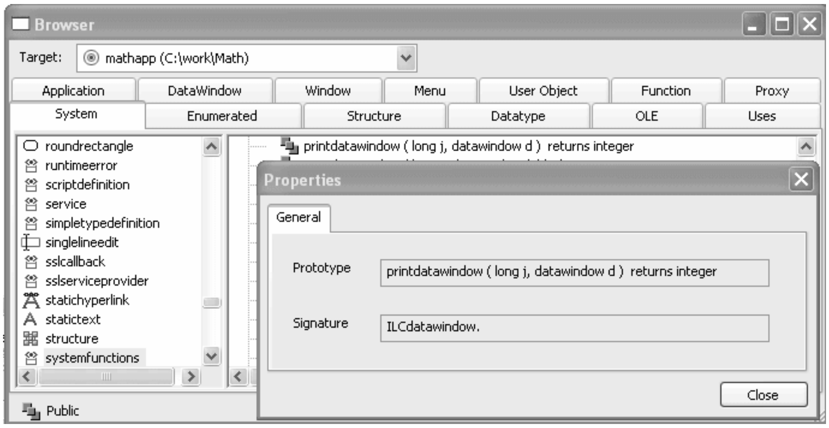
Using GetMethodID

To get the function's ID using the GetMethodID method, you need the function's signature:

PbmethodID GetMethodID(pbclass *cls*, LPCTSTR
  methodName, PBRoutineType *rt*, LPCTSTR *signature*);

The *signature* argument in this method call is a string representing the method's return type and arguments. You can obtain this string in the Browser.

For example, to obtain the signature of a system function, select systemfunctions from the left pane of the System page, right-click the function in the right pane, and select Properties from its pop-up menu:



Target: mathapp (C:\work\Math)

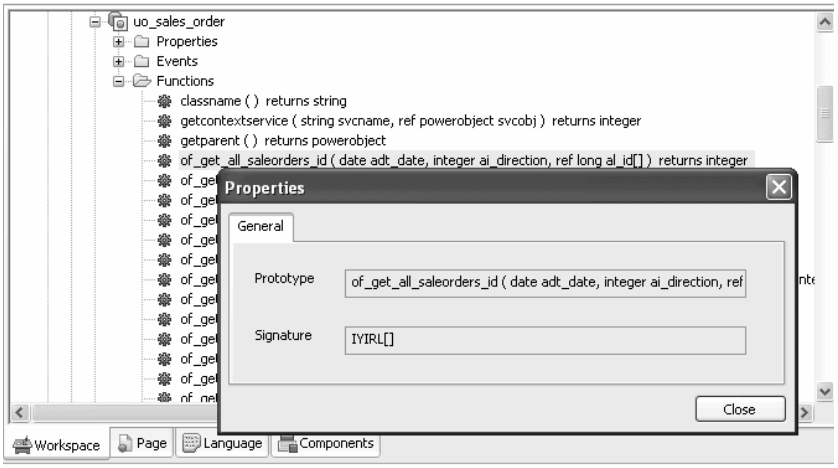
roundrectangle
runtimeerror
scriptdefinition
service
simpletypedefinition
singlelineedit
sslcallback
sslserviceprovider
statichyperlink
statictext
structure
systemfunctions

printdatawindow (long j, datawindow d) returns integer

Prototype: printdatawindow (long j, datawindow d) returns integer

Signature: ILCdatawindow.

For methods in your application, you can expand the object that contains it in the System Tree, select the function or event, and select Properties from its pop-up menu:



uo_sales_order
Properties
Events
Functions
classname ( ) returns string
getcontextservice (string svcname, ref powerobject svcobj) returns integer
getparent ( ) returns powerobject
of_get_all_saleorders_id (date adt_date, integer ai_direction, ref long al_id[]) returns integer

Prototype: of_get_all_saleorders_id (date adt_date, integer ai_direction, ref

Signature: IYIRL[]

Consider this function:

```
of_get_trans ( ref transaction atr_trans ) returns
(none)
```

The signature for this function is `QRCtransaction`. `Q` indicates that the function does not return a value, `R` that the argument is passed by reference, and `Ctransaction` that the argument is a PowerBuilder system object of type transaction.

You can use the pbsig105 command-line tool to obtain a function's signature. However, the pbsig105 tool does not report the signature of functions that are inherited from an ancestor object unless they are extended in the descendant, and it does not report event signatures.

For more information about using pbsig105, and an explanation of all the formats used in the signature, see pbsig105 on page 241.

Using FindMatchingFunction

Instead of the string that GetMethodID uses, the FindMatchingFunction function provides another way to get the method ID. Some short signatures can be difficult to parse, and signatures that include PowerBuilder system objects or Java classes can be much longer.

FindMatchingFunction uses a "readable signature" instead of the string used by GetMethodID:

FindMatchingFunction(pbclass *cls*, LPCTSTR *methodName*, PBRoutineType *rt*, LPCTSTR *readableSignature*)

The *readableSignature* argument is a comma-separated list of the arguments of the function. Unlike the string used by GetMethodID, it does not include the return type. For example, for a function called uf_test that takes two arguments, an int by value and a double by reference, the call to FindMatchingFunction looks like this:

```
mid = Session -> FindMatchingFunction(cls, "uf_test",
   PBRT_FUNCTION, "int, double");
```

Invoking PowerBuilder functions

The following methods are those you use most frequently to invoke PowerBuilder functions. For descriptions of each method, see IPB_Session interface on page 94.

PbmethodID GetMethodID(pbclass *cls*, LPCTSTR *methodName*, PBRoutineType *rt*, LPCTSTR *signature*, pbboolean *publiconly*)

PBXRESULT InitCallInfo(pbclass *cls*, pbmethodID *mid*, PBCallInfo **ci*)

void FreeCallInfo(PBCallInfo **ci*)

PBXRESULT Add<*Type*>Argument(PBCallInfo *ci, PBType v);

PBXRESULT InvokeClassFunction(pbclass *cls*, pbmethodID *mid*, PBCallInfo **ci*)

PBXRESULT InvokeObjectFunction(pbobject *obj*, pbmethodID *mid*, PBCallInfo **ci*)

PBXRESULT TriggerEvent(pbobject *obj*, pbmethodID *mid*,
  PBCallInfo **ci*)

Example: Calling PowerBuilder functions

In this code fragment, the class and method ID returned by calls to the IPB_Session GetClass and GetMethodID methods are used to initialize a PBCallInfo structure, called ci, using the IPB_Session InitCallInfo method.

After a new *pbstring* variable is created, the value of that string is set to the value of the first argument in the PBCallInfo structure.

```
BOOL CALLBACK CFontEnumerator::EnumFontProc
(
   LPLOGFONT lplf,
   LPNEWTEXTMETRIC lpntm,
   DWORD FontType,
   LPVOID userData
)
{
   UserData* ud = (UserData*)userData;
   pbclass clz = ud->session->GetClass(ud->object);
   pbmethodID mid = ud->session->GetMethodID
      (clz, "onnewfont", PBRT_EVENT, "IS");

   PBCallInfo ci;
   ud->session->InitCallInfo(clz, mid, &ci);

// create a new string variable and set its value
// to the value in the first argument in the
// PBCallInfo structure
   pbstring str = ud->session->NewString
      (lplf->lfFaceName);
   ci.pArgs->GetAt(0)->SetString(str);

   ud->session->TriggerEvent(ud->object, mid, &ci);
   pbint ret = ci.returnValue->GetInt();

   ud->session->FreeCallInfo(&ci);
   return ret == 1 ? TRUE : FALSE;
}
```

Exception handling and debugging

To handle errors, you use the error codes returned from PBNI methods. Some functions of the IPB_Session interface return detailed error codes that make debugging easier.

Native methods, such as the IPBX_UserObject Invoke method, return either PBX_OK or PBX_FAIL if the extension encounters a serious problem from which it cannot recover.

Whenever the PowerBuilder VM gets PBX_FAIL from a native method, it throws a PBXRuntimeError in the PowerBuilder application. PBXRuntimeError inherits from the PowerBuilder RuntimeError system object and can be caught and handled in a script in the same way as any exception in PowerBuilder.

To catch these errors, wrap your PowerScript call in a try-catch block as follows:

```
TRY
   n_cpp_pbniobj    obj
   obj = CREATE n_cpp_pbniobj
   obj.of_test( arg1 )
CATCH ( PBXRuntimeError re )
   MessageBox( "Caught error", re.getMessage() )
END TRY
```

The IPB_Session interface provides a set of methods to handle exceptions that occur in native code. Use HasExceptionThrown to determine whether an exception occurred. If it did, use GetException to get the current exception object so that it can be handled. If necessary, you can throw exceptions to PowerBuilder with ThrowException. When an exception has been handled, use ClearException to clear it.

Debugging

You cannot edit a native class in the PowerBuilder development environment, and you cannot enter native methods in the PowerBuilder debugger because the methods are C++ methods. You must use a C/C++ debugger to debug an extension module.

CHAPTER 3 Creating Marshaler Extensions

About this chapter

This chapter describes how to create marshaler extensions.

Contents

About marshaler extensions

Marshaler extensions can act as bridges between PowerBuilder and other components, such as EJB components, Java classes, and Web services, as long as those components can be called from C++.

To create a marshaler extension, build a PBX that contains at least one class that implements the IPBX_Marshaler interface, as well as one or more native classes. The extension must contain code that associates the marshaler with a proxy for the component you want to call.

If you build a marshaler extension, you should also provide a tool that generates proxies so the components can be called from PowerBuilder. For example, PowerBuilder provides a marshaler extension for calling EJB components from PowerBuilder, and it provides a tool for generating proxies for EJB components.

This chapter provides an overview based on the Java Marshaler sample application, which can be downloaded from the PowerBuilder CodeXchange Web site at http://powerbuilder.codexchange.sybase.com, and shows some extracts from the sample.

This chapter describes the major tasks involved in:

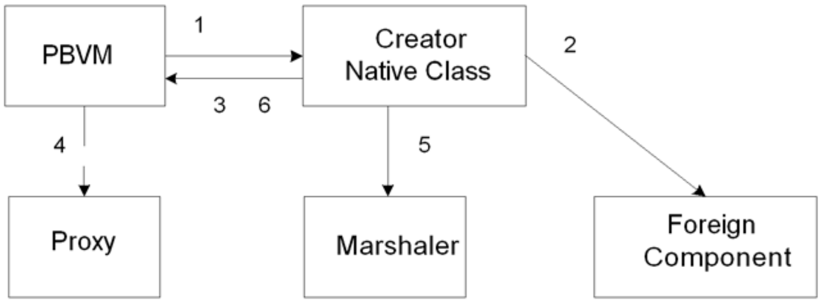
- Developing the PowerBuilder extension
- Generating proxies for Java classes
- Calling the Java class from PowerBuilder

This chapter does not show detailed code samples, and the fragments shown simplify the coding involved. For a more complete understanding of the process of building a marshaler extension, download the sample available on the Web site.

Developing the PowerBuilder extension

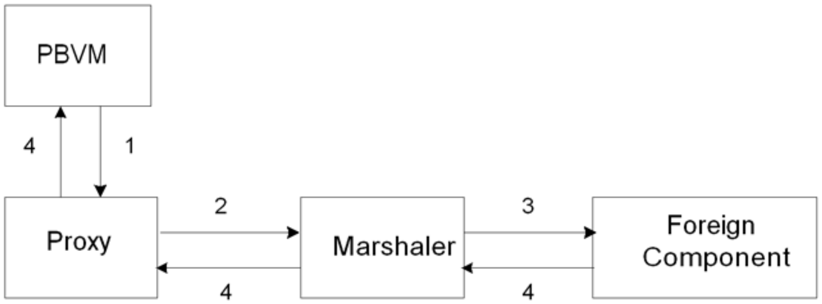
A PowerBuilder marshaler extension usually provides a native class that acts as a creator. This class defines a function that creates an instance of the foreign component that is specified in the parameters passed into the function (1). If it succeeds in creating an instance of the foreign component (2), it creates a proxy for it using the PBVM (3, 4), creates a marshaler object (5), and associates the marshaler with the proxy (6).

Figure 3-1: Creating a foreign component, proxy, and marshaler



When a function of the proxy object is called in PowerScript, the PBVM calls the InvokeRemoteMethod function on the marshaler object through the proxy (1, 2). The marshaler object translates PowerBuilder function calls into requests that the foreign component understands, sends the requests (3), waits for a response, and send the results back to PowerBuilder (4).

Figure 3-2: Invoking a remote method



To develop the extension, you need to:

Step 1: Describe the extension

Step 2: Implement the creator class

Step 3: Implement the marshaler class

Step 1: Describe the extension

The class that implements the creator, called CJavaVM in the following example, must export the PBX_GetDescription function. It inherits from NonVisualObject and has two functions, CreateJavaObject and CreateJavaVM:

```
PBXEXPORT LPCTSTR PBXCALL PBX_GetDescription()
{
  static const TCHAR desc[] = {
    "class javavm from nonvisualobject\n"
    "function long createjavavm(string classpath,
       string properties[])\n"
    "function long createjavaobject(ref powerobject
       proxyobject, readonly string javaclassname,
       readonly string proxyname)\n"
    "end class\n"
  };
  return desc;
}
```

Step 2: Implement the creator class

Like any nonvisual native class, the CJavaVM class must implement the Invoke and Destroy functions in addition to the class functions CreateJavaObject and CreateJavaVM.

The CreateJavaVm function of CjavaVM gets the classpath and properties from the PBCallInfo structure. Then it loads the Java VM by calling the loadJavaVM function of a wrapper class called JavaVMWrapper. The JavaVMWrapper class encapsulates the JavaVM interface provided by JNI.

The CreateJavaObject function creates an instance of a Java class based on the given class name, creates a PowerBuilder proxy object for the Java object, creates a JavaMarshaler object, and associates the marshaler object with the proxy object.

The following is the CreateJavaObject function:

```
PBXRESULT CJavaVM::CreateJavaObject
  (
  IPB_Session  *session,
  pbobject     obj,
  PBCallInfo   *ci
  )
{
  enum
  {
    kSuccessful = 0,
    kInvalidJavaClassName = -1,
    kFailedToCreateJavaClass = -2,
    kInvalidProxyName = -3,
    kFailToCreateProxy = -4
  };

  // Get java class name.
  string jclassName;

  {
    pbstring jcn = ci->pArgs->GetAt(1)->GetPBString();
    if (jcn == NULL)
    {
      ci->returnValue->SetLong(kInvalidJavaClassName);
      return PBX_OK;
    }
  else
  {
    jclassName = session->GetString(jcn);
  }
}

// Create java object
JavaVMWrapper*  jvm = JavaVMWrapper::instance();
JNIEnv*         env = jvm->getEnv();

jclass jcls = env->FindClass(jclassName.c_str());
jobject jobj = NULL;

if (jcls != NULL)
{
  JLocalRef  lrClz(env, jcls);

  jmethodID mid = env->GetMethodID(jcls, "<init>",
    "()V");
  if (mid != NULL)
  {
    jobj = env->NewObject(jcls, mid);
  }
}

// Get PowerBuilder proxy name
string proxyName;

{
  pbstring pn = ci->pArgs->GetAt(2)->GetPBString();

  if (pn == NULL)
  {
    ci->returnValue->SetLong(kInvalidProxyName);
    return PBX_OK;
  }
  else
  {
    proxyName = session->GetString(pn);
  }
}
```

```
  // Find proxy class
  pbgroup group = session->FindGroup(proxyName.c_str(),
    pbgroup_proxy);
  if (group == NULL)
  {
    ci->returnValue->SetLong(kInvalidProxyName);
    return PBX_OK;
  }

  pbclass cls = session->FindClass(group,
proxyName.c_str());
  if (cls == NULL)
  {
    ci->returnValue->SetLong(kInvalidProxyName);
    return PBX_OK;
  }

  // Create PowerBuilder proxy object.
  pbproxyObject proxy = session->NewProxyObject(cls);
  if (proxy == NULL)
  {
    ci->returnValue->SetLong(kFailToCreateProxy);
    return PBX_OK;
  }

  // Create JavaMarshaler
  JavaMarshaler* marshaler = new JavaMarshaler(env,
    proxy, jobj);

  // Associate the JavaMarshaler with the proxy
  session->SetMarshaler(proxy, marshaler);

  ci->pArgs->GetAt(0)->SetObject(proxy);

  ci->returnValue->SetLong(kSuccessful);

  return PBX_OK;
}
```

Step 3: Implement the marshaler class

The marshaler class must implement the InvokeRemoteMethod function. It also needs to provide a Destroy function and get the handle of the module. This is the declaration:

```
#include <jni.h>
#include <pbext.h>

class JavaMarshaler : public IPBX_Marshaler
{
  jobject      d_jobject;
  pbproxyObject  d_pbobject;

public:
  JavaMarshaler(JNIEnv* env, pbproxyObject pbobj,
jobject ejbobj);
  ~JavaMarshaler();

  virtual PBXRESULT InvokeRemoteMethod
    (
    IPB_Session*  session,
    pbproxyObject  obj,
    LPCSTR      method_name,
    PBCallInfo*    ci
    );

  virtual pbulong  GetModuleHandle();

  virtual void Destroy();
};
```

The InvokeRemoteMethod function calls Java functions through JNI. This is the implementation in *JavaMarshaler.cpp*:

```
#include "JavaMarshaler.h"
#include "JMethod.h"
#include "JavaVMWrapper.h"

extern pbulong g_dll_hModule;

pbulong  JavaMarshaler::GetModuleHandle()
{
  return g_dll_hModule;
}
```

```
//*************************************************
//  JavaMarshaler
//*************************************************
JavaMarshaler::JavaMarshaler
(
  JNIEnv*      env,
  pbproxyObject  pbobj,
  jobject      ejbobj
)
:  d_jobject(env->NewGlobalRef(ejbobj)),
     d_pbobject(pbobj)
{
}

JavaMarshaler::~JavaMarshaler()
{
  JNIEnv* env = JavaVMWrapper::instance()->getEnv();

  if (d_jobject != NULL && env != NULL)
    env->DeleteGlobalRef(d_jobject);
}

PBXRESULT JavaMarshaler::InvokeRemoteMethod
(
  IPB_Session*   session,
  pbproxyObject  obj,
  LPCSTR         szMethodDesc,
  PBCallInfo*    ci
)
{
  static char* eFailedToInvokeJavaMethod  =
    "Failed to invoke the Java method.";

  JNIEnv* env = JavaVMWrapper::instance()->getEnv();
  JMethod method(this, szMethodDesc);

  try
  {
    if (d_jobject != NULL)
    {
      method.invoke(session, env, d_jobject, ci);
      if (env->ExceptionCheck() == JNI_TRUE)
      {
        string error(eFailedToInvokeJavaMethod);
        error += "\n";
        // Throw exception here
```

```
            return PBX_E_INVALID_ARGUMENT;
          }
        }
      }
      catch(...)
      {
      }

      return PBX_OK;
    }

    void JavaMarshaler::Destroy()
    {
      delete this;
    }
```

Generating proxies for Java classes

You need to develop PowerBuilder proxies for the Java classes you want to invoke from PowerBuilder. You can develop proxies using Java reflection, from Java source code directly, or using the javap tool. For example, suppose you want to invoke this Java class:

```
public class Converter
{
public double dollarToYen(double dollar);
public double yenToEuro(double yen);
}
```

The PowerBuilder proxy for this Java class could be stored in a file called *converter.srx* that looks like this:

```
$PBExportHeader$converter.srx
$PBExportComments$Proxy generated for Java class

global type Converter from nonvisualobject
end type
global Converter Converter

forward prototypes
  public:
function  double dollarToYen(double ad_1) alias
   for "dollarToYen,(D)D"
```

```
function  double yenToEuro(double ad_1) alias
   for "yenToEuro,(D)D"
end prototypes
```

Notice that both PowerBuilder proxy methods have an alias containing the Java method name and method signature. This is necessary because Java is case sensitive, but PowerBuilder is not. The extension uses the alias information is used by the extension to find the corresponding Java methods.

To add the proxy to a PowerScript target, select the library where the proxy will be stored in the System Tree, select Import from the pop-up menu, and browse to select *converter.srx*.

Calling the Java class from PowerBuilder

In the open event of a window, create a Java VM:

```
// instance variable: javavm i_jvm
string properties[]
i_jvm = create javavm
string classpath
i_jvm.createjavavm(classpath, properties)
```

In the clicked event of a button on the window, create an instance of the Converter class using the CreateJavaObject method of the JavaVM instance, and call the conv method on the Converter class:

```
converter conv
double yen
i_jvm.createjavaobject(conv, "Converter", "converter")
yen = conv.dollarToYen(100.0)
messagebox("Yen", string(yen))
```

When the CreateJavaObject method is called in PowerScript, the PBVM calls the corresponding C++ method in the extension. The C++ method creates a Java Converter object through JNI. If it is successful, the method creates an instance of the PowerBuilder Converter proxy and a JavaMarshaler object, and associates the JavaMarshaler object with the PowerBuilder proxy.

When `conv.dollarToYen(100.0)` is called in PowerScript, the PowerBuilder VM calls the InvokeRemoteMethod method on the JavaMarshaler object, which delegates the call to the Java Converter object though JNI and returns the result to PowerBuilder.

CHAPTER 4 Exchanging Data with PowerBuilder

About this chapter

This chapter describes how PBNI extensions exchange data with PowerBuilder.

Contents

About exchanging data with PowerBuilder

You can use the IPB_Session interface or the IPB_Value and IPB_Arguments interfaces to exchange data between PowerBuilder and PBNI. The IPB_Session interface contains many virtual functions that enable the C++ code in an extension to interact with the PBVM. The IPB_Value and IPB_Arguments interfaces contain methods that you can use to pass values between PowerBuilder and extensions.

Passing values between extensions and the PBVM

PBNI uses two interfaces, IPB_Value and IPB_Arguments, to pass PowerBuilder values between the PBVM and extension PBXs. The PBNICallInfo structure holds the data.

PBCallInfo structure

The PBCallInfo structure is used to hold data and return type information for calls between extensions and the PBVM. It has three public members:

```
IPB_Arguments*   pArgs;
IPB_Value*       returnValue;
pbclass          returnClass;
```

The following code initializes a PBCallInfo structure using the IPB_Session InitCallInfo method. After allocating a PBCallInfo structure called *ci*, the IPB_Session GetClass and GetMethodID methods are used to get the class and method ID of the current method. Then, these parameters are used to initialize the *ci* structure:

```
pbclass cls;
pbmethodID mid;
PBCallInfo* ci = new PBCallInfo;

cls = Session -> GetClass(myobj);
mid = Session -> GetMethodID(cls, "myfunc",
   PBRT_FUNCTION, "II");

Session -> InitCallInfo(cls, mid, ci);
```

When you have finished using a PBCallInfo structure, you must call FreeCallInfo to release the allocated memory:

```
Session -> FreeCallInfo(ci);
delete ci;
```

The IPB_Arguments and IPB_Value interfaces have methods that enable you to pass values between the PBVM and PowerBuilder extension modules using PBCallInfo to hold the data.

IPB_Arguments interface

The IPB_Arguments interface has two methods:

- GetCount obtains the number of arguments in a method call.
- GetAt obtains the value at a specific index of the pArgs member of the PBCallInfo structure. For each argument, GetAt returns a pointer to the IPB_Value interface.

The following code fragment uses GetCount and GetAt in a FOR loop to process different argument types. The `ci-> pArgs -> GetCount()` statement gets the number of arguments, and `ci -> pArgs -> GetAt(i)` gets the value at the index *i*. This value is a pointer to the IPB_Value interface on which IPB_Value methods, such as IsArray and GetArray, can be called (see "IPB_Value interface" next) :

```
int i;
for (i=0; i < ci-> pArgs -> GetCount();i++)
{
   pbuint ArgsType;
   if( ci -> pArgs -> GetAt(i) -> IsArray())
      pArguments[i].array_val =
         ci -> pArgs -> GetAt(i) -> GetArray();
      continue;
   }

   if( ci -> pArgs -> GetAt(i) -> IsObject())
   {
      if (ci -> pArgs -> GetAt(i) -> IsNull())
         pArguments[i].obj_val=0;
      else
         pArguments[i].obj_val =
            ci -> pArgs -> GetAt(i) -> GetObject();
      continue;
   }
   ...
```

IPB_Value interface

IPB_Value has three sets of methods: helper methods, set methods, and get methods.

Helper methods

The IPB_Value interface helper methods provide access to information about variables and arguments, including the value's class and type, whether it is an array or simple type, whether it is set by reference, and whether the null flag is set. There is also a method that sets the value to null:

```
virtual pbclass        GetClass() const = 0;
virtual pbint          GetType() const = 0;
virtual pbboolean      IsArray() const = 0;
virtual pbboolean      IsObject() const = 0;
virtual pbboolean      IsByRef() const = 0;
virtual pbboolean      IsNull() const = 0;
virtual PBXRESULT      SetToNull() = 0;
```

The example shown in the previous section, "IPB_Arguments interface" on page 54, shows how you can use three of these methods: IsArray, IsObject, and IsNull.

This example shows how you can use the SetToNull method to set the returnValue member of the PBCallInfo structure to null:

```
if ( ci->pArgs->GetAt(0)->IsNull() ||
   ci->pArgs->GetAt(1)->IsNull() )
   {
// if either of the passed arguments is null,
// return the null value
ci->returnValue->SetToNull();
```

Set methods

The IPB_Value set methods set values in the PBCallInfo structure. There is a set method for each PowerBuilder datatype: SetInt, SetUint, SetLong, SetUlong, and so on. These methods automatically set the value represented by IPB_Value to not null. The syntax is:

virtual PBXRESULT Set<*type*>(<*pbtype*> *arg*);

For example, the SetLong method takes an argument of type pblong.

In this example, the method has two integer arguments, set to *int_val1* and *int_val2*:

```
ci-> pArgs -> GetAt(0) -> SetInt(int_val1);
ci-> pArgs -> GetAt(1) -> SetInt(int_val2);
```

The IPB_Value set methods set the datatype of the value represented by IPB_Value to a specific type. If the original type of the value is any, you can set it to any other type. Then, because the value now has a specific type, setting it to another type later returns the error PBX_E_MISMATCHED_DATA_TYPE. If the argument is readonly, the error PBX_E_READONLY_ARGS is returned.

Get methods

The IPB_Value get methods obtain values from the PBCallInfo structure. There is a get method for each PowerBuilder datatype: GetInt, GetUint, GetLong, GetUlong, and so on.The syntax is:

virtual <*pbtype*> Get<*type*>( );

For example, the GetString method returns a value of type pbstring.

The following example uses the IPB_Value GetAt method to assign the value at the first index of the pArgs member of the PBCallInfo structure to a variable of type IPB_Value* called *pArg*. If *pArg* is not null, the GetLong method sets the variable *longval* to the value in *pArg*:

```
PBCallInfo   *ci
...
```

```
pblong longval = NULL;
IPB_Value* pArg = ci-> pArgs-> GetAt(0);

if (!pArg->IsNull())
   longval = pArg -> GetLong();
```

If the value is null, or if you use a get method that is expected to return one datatype when the value is a different datatype (such as using GetLong when the datatype is pbarray), the result returned is undetermined.

The get methods can also be used with the *returnValue* member of PBCallInfo:

```
ret_val = ci.returnValue->GetInt();
return ret_val;
```

Using the IPB_Session interface

The IPB_Session interface is an abstract interface that enables the PBVM to interact with PowerBuilder extensions and with external applications. It defines hundreds of methods for accessing PowerScript variables, calling PowerScript methods, handling exceptions, and setting a marshaler to convert PowerBuilder data formats to the user's communication protocol.

The IPB_Session interface includes several categories of methods:

- Class accessor methods are used to find PowerBuilder classes, call PowerBuilder methods and events, and get and set instance variables of PowerBuilder objects.
- Exception-handling methods communicate with the PowerBuilder exception handling mechanism.
- Array accessor methods create and access PowerBuilder bounded and unbounded arrays.
- Result set accessor methods work with result sets in DataStores and DataWindow controls.
- Typed data access methods create and access data of the PowerBuilder types string, double, decimal, blob, date, time, datetime, and so forth.
- Proxy access methods provide an interface for the implementation of new protocols.
- The Release method releases the IPB_Session object itself.

For a complete list of methods, see IPB_Session interface on page 94.

You use IPB_Session methods in conjunction with IPB_Value and IPB_Arguments methods.

The following code fragment shows the body of a method that tests whether a date passed to a PBNI function is handled correctly by a PowerBuilder function. It uses the IPB_Value SetToNull, SetDate, and IsNull methods to set and test the date values in the PBCallInfo structure, as well as the IPB_Session SplitDate, SetDate, and NewDate methods.

```
// boolean isNull[], pbobject myobj,
// and pbdate* d_date arguments passed in
pbclass cls;
pbmethodID mid;
PBCallInfo* ci = new PBCallInfo;
pbdate ret_date;
pbint yy,mm,dd;

cls = Session-> GetClass(myobj);
mid = Session-> GetMethodID(cls,"uf_getdate_byref",
      PBRT_FUNCTION,"YR");
Session-> InitCallInfo(cls, mid, ci);

if (isNull[0])
   ci -> pArgs -> GetAt(0)->SetToNull();
else
   ci-> pArgs -> GetAt(0) ->SetDate(*d_date);

Session->InvokeObjectFunction(myobj, mid, ci);

Session->SplitDate(ci->pArgs->GetAt(0)->GetDate(),
   &yy,&mm,&dd);
Session->SetDate(*d_date, yy, mm, dd);

if (ci-> returnValue ->IsNull())
{
   ret_date = Session-> NewDate();
   Session-> SetDate(ret_val, 1900, 1, 1);
}
else
{
   ret_date = Session-> NewDate();
   Session -> SplitDate(ci-> returnValue -> GetDate(),
      &yy,&mm,&dd);
   Session -> SetDate(ret_val,yy,mm,dd);
}
```

```
Session -> FreeCallInfo(ci);
delete ci;
return ret_date;
```

Saving data from IPB_Value to a local variable

To avoid memory leaks, you must call FreeCallInfo to free the values stored in the PBCallInfo structure after using the structure. However, after making a function call, you might want to save the return value or a by reference argument value into a local variable you can use later.

There are techniques for saving values so they are still available after the call to FreeCallInfo. How you save your result into a local variable depends on whether you want to save a simple value, a pointer value, or an object value.

Saving simple values

Saving simple values is straightforward. When you call one of the IPB_Value Get<*type*> methods for a simple value, such as GetInt or GetReal, the actual data is returned. As a result, you can simply save the values of any of the following datatypes:

pbvalue_byte
pbvalue_int
pbvalue_uint
pbvalue_long
pbvalue_ulong
pbvalue_real
pbvalue_double
pbvalue_longlong
pbvalue_boolean
pbvalue_char

Saving pointer values

A pointer value does not contain data. It contains a pointer to a memory location where the data is stored. When you call one of the IPB_Value Get<*type*> methods for a pointer value, such as GetBlob or GetTime, it returns a pointer to memory that is also pointed to by IPB_Value.

When you call FreeCallInfo, the memory to which IPB_Value points is released and the data is deleted. Because this is the same data pointed to by the pointer returned by the Get<*type*> method, that pointer can no longer be used to represent the data.

This applies to the following pointer value datatypes, as well as to the pbarray datatype:

pbvalue_dec
pbvalue_string
pbvalue_blob
pbvalue_date
pbvalue_time
pbvalue_datetime

If you want to save the data in a pointer value, you can use the AcquireValue, AcquireArrayItemValue, and ReleaseValue methods to acquire and release the data.These methods clone a new IPB_Value that is not freed until you call ReleaseValue and reset the existing IPB_Value pointer.

Can be used for other datatypes
You can use AcquireValue and AcquireArrayItemValue to acquire values of any datatype.

Like the Get<*type*> methods, AcquireValue and AcquireArrayItemValue return a pointer to the memory where the data is stored, but they also reset the IPB_Value pointer so that IPB_Value no longer points to the actual data. When you call FreeCallInfo, the data pointed to by the value acquired using AcquireValue and AcquireArrayItemValue is unaffected.

The original value is reset to zero or null, so it can no longer be used. Attempts to get or acquire the original value return zero or null until another IPB_Value is set to the value.

If the IPB_Value acquired using AcquireValue is an array, the entire array is acquired. To acquire only an element of the array, use AcquireArrayItemValue. When you have finished using the data, you must free the memory using the ReleaseValue method.

The processing that the AcquireArrayItemValue and ReleaseValue methods perform results in poor performance when handling large arrays. It is more efficient to get the type of the array and handle each type with appropriate type-specific functions.

Caution
You *must* call the ReleaseValue method to free the data. If you do not do so, a memory leak will occur. You *must not* call ReleaseValue to release a pointer that was not acquired using AcquireValue and AcquireArrayItemValue. Doing so might cause the PBVM to crash.

Saving object values

Strictly speaking, object values are also pointer values, but the PBVM handles them differently. You use the IPB_Session AddLocalRef and AddGlobalRef methods to add a reference to the object. If there is a reference to an object, it is not deleted when FreeCallInfo is called.

When you no longer need the object, call RemoveLocalRef or RemoveGlobalRef to decrease the reference count for the object. If the reference count is decreased to zero, the object is deleted automatically.

There is an important difference between AddLocalRef and AddGlobalRef. A reference added by AddLocalRef can be deleted automatically when the local frame is popped up. The local frame can be popped by calling PopLocalFrame or when the current function returns. However, a reference added by AddGlobalRef is deleted only when RemoveGlobalRef is called or the session ends.

You must use these methods in pairs; that is, use RemoveLocalRef to remove references created with AddLocalRef, and use RemoveGlobalRef to remove references created with AddGlobalRef.

Using variables throughout a session

The SetProp function enables you to use a variable value throughout an IPB session without using a global variable, which is susceptible to namespace conflicts with other sessions. SetProp is one of a set of three functions:

- Use SetProp to register a new variable with the session or to change the value of an existing variable.
- Use GetProp to access the variable.
- Use RemoveProp to remove the variable from the list of variables associated with the session when it is no longer needed.

This set of functions is particularly useful for working with multiple threads of execution in EAServer.

Suppose you want to throw an exception from within a PBNI extension and the exception itself is also defined by the PBNI extension. You call the IPB_Session NewObject function to create an instance of the exception, causing the PBX_CreateNonVisualObject function to be called.

One way to set the value of the fields of the exception before the function returns in a thread-safe manner is to create a new object or structure to hold the exception information before calling NewObject. You can call SetProp to store the structure or the object in the current IPB_Session. When PBX_CreateNonVisualObject is called, you can call GetProp to get the structure or object to obtain the exception information, then call RemoveProp to remove the data you stored in the current session.

You can also use these functions when initializing and uninitializing a session. If the extension exports the PBX_NOTIFY function, the PBVM calls PBX_Notify immediately after an extension PBX is loaded and just before the PBX is unloaded. You can use this function to initialize and uninitialize a session. For example, you could create a session manager object, and store it in the IPB session using the SetProp function. Later, you could use GetProp to obtain the session object.

Handling enumerated types

The GetEnumItemValue and GetEnumItemName functions allow you to convert the name of an enumerated value to an integer value, and to convert an integer value to the name of an enumerated value.

This example gets the numeric value for the boolean! enumerated value, then uses it to return the string value:

```
pblong lType = session->GetEnumItemValue("object",
   boolean" ); // returns 138
LPCTSTR szEnum = session->GetEnumItemName( "object",
   lType ); // returns "boolean"
```

Notice that the second argument in the GetEnumItemValue call, the enumerated value, must *not* have an appended exclamation mark (!).

To return an enumerated value from an extension to PowerScript, use the SetLong function to set the value of the enumerated variable into IPB_Value (you cannot use SetInt or SetShort).

To obtain an enumerated variable’s value, you can use GetInt or GetShort as well as GetLong, as long as the value is in the appropriate range. For example, if you attempt to use GetInt to obtain a value that is more than 32767, the returned value is truncated.

CHAPTER 5 Calling PowerBuilder from C++

About this chapter

A third-party application or server written in C++ can load the PowerBuilder VM, use PowerBuilder nonvisual objects, and use PowerBuilder visual controls. This chapter uses some simple examples to illustrate the process.

Contents

About calling PowerScript from C++ applications

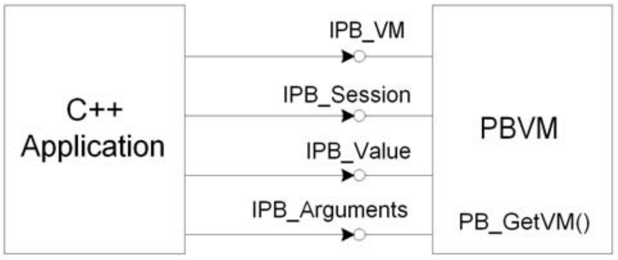
If you have a PowerBuilder custom class user object that performs intensive programming that would be useful to an application that you need to write in C++, you can access the object directly from the C++ application using PBNI. You do not need to make the user object into a COM component or automation server.

To call functions on a PowerBuilder object, you can embed the PBVM in the C++ application. The C++ application must load the PBVM by loading *pbvm105.dll* with the Windows LoadLibrary function, get a pointer to the IPB_VM interface by calling the PB_GetVM function exported by *pbvm105.dll*, and create a session by calling the IPB_VM CreateSession function.

The application can then create an instance of the PowerBuilder class and invoke its functions through the IPB_Session interface.

The following figure illustrates the relationship between the C++ application and the interfaces provided by the PBVM.

Figure 5-1: Embedding the PBVM in a C++ application



Calling PowerBuilder objects from C++

This section presents a simple example that illustrates how to call a function on a PowerBuilder custom class user object from a C++ application:

- Creating a PowerBuilder object to be called from C++
- Getting the signature of a function
- Creating the C++ application
- Running the C++ application

Creating a PowerBuilder object to be called from C++

To keep the code for this example simple, create an application with one custom class user object that has one function. The function returns the product of two integers:

1. In PowerBuilder, create a new workspace.
2. Select the Application icon from the Target page of the New dialog box and name the application `loadpbvm`.
3. Select the Custom Class icon from the PB Object page of the New dialog box.

4 In the Function prototype window, create a function with this signature:

```
f_mult ( integer arg1, integer arg2 )  returns
integer
```

5 Save the user object as nvo_mult and close the User Object painter.

Getting the signature of a function

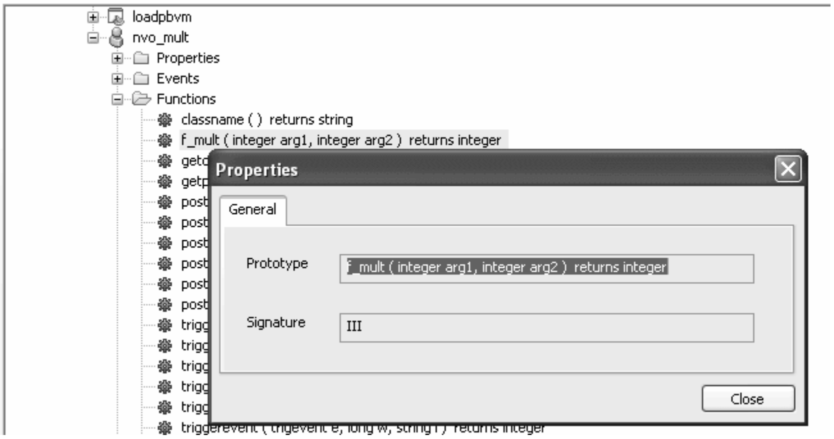
To write the C++ code that invokes the f_mult function, you need to obtain its method ID. The method ID is used to initialize the PBCallInfo structure and to invoke the function. There are two IPB_Session functions that return a method ID: GetMethodID, which takes a signature, and FindMatchingFunction, which takes a comma-separated list of arguments. You use the same functions when you call PowerScript from the code in your extension; see “Calling PowerScript from an extension” on page 37.

If you want to use GetMethodID, you need a signature. This function is simple enough that you do not need a tool to obtain a signature—the signature is the string `III`, which indicates that the function returns an integer and takes two integers as arguments.

For more complicated functions, you can get the signature from the System Tree or with the pbsig105 tool.

Getting a signature from the System Tree

To get the signature of f_mult in the System Tree, expand nvo_mult, right-click on the f_mult function, and select Properties from the pop-up menu. The signature displays in the Properties dialog box in the Signature text box:


loadpbvm
nvo_mult
Properties
Events
Functions
classname ( ) returns string
f_mult (integer arg1, integer arg2) returns integer
Properties
General
Close

Prototype: f_mult (integer arg1, integer arg2) returns integer

Signature: III

Getting a signature using *pbsig105*

To get the signature of f_mult with pbsig105, type the following at a command prompt:

```
pbsig105 d:\pbls\loadpbvm.pbl
```

In the output of pbsig105, the comment on the last line contains the signature to be passed as the method ID argument to GetMethodID:

```
PB Object Name: loadpbvm

PB Object Name: nvo_mult
   public function integer f_mult (integer arg1,
      integer arg2)
      /*  III  */
```

For more information about the pbsig105 tool and the format of method signatures, see pbsig105 on page 241.

Creating the C++ application

To create the C++ application, follow these steps:

1. Load the PowerBuilder VM
2. Call PB_GetVM to get a pointer to the IPB_VM interface
3. Create an IPB_Session object within IPB_VM
4. Create an instance of the PowerBuilder object
5. Initialize the PBCallInfo structure
6. Call the PowerBuilder function
7. Write cleanup code

Load the PowerBuilder VM

In your C++ development tool, create a new console application project. The *include* directory for the PBNI SDK, typically *PowerBuilder 10.5\SDK\PBNI\include*, must be in your include path. If you use any helper classes, the source file that contains them must be added to your project. For a list of files and helper classes, see the table in “The PBNI SDK” on page 8.

The code for the C++ application creates an IPB_VM object using the PB_GetVM function and loads the PowerBuilder VM:

```
#include "pbext.h"
#include "stdio.h"

typedef PBXEXPORT PBXRESULT (*P_PB_GetVM)(IPB_VM** vm);

int main(int argc, char *argv[])
{
   IPB_Session* session;
   IPB_VM* pbvm = NULL;

   //Load the PowerBuilder VM module
   HINSTANCE hinst = LoadLibrary("pbvm105.dll");
   if ( hinst== NULL) return 0;
   fprintf(stderr, "Loaded PBVM successfully\n");
```

Call PB_GetVM to get a pointer to the IPB_VM interface

The next step is to call the PB_GetVM function to get a pointer to the IPB_VM interface:

```
P_PB_GetVM getvm = (P_PB_GetVM)GetProcAddress
   (hinst,"PB_GetVM");
if (getvm == NULL) return 0;

getvm(&pbvm);
if (pbvm == NULL) return 0;
```

Create an IPB_Session object within IPB_VM

Next create an IPB_Session object within IPB_VM, using the PowerBuilder application's name and library list as arguments:

```
// loadpbvm.pbl must contain an application object
// named loadpbvm and it must be on the search path
// for the executable file
LPCTSTR LibList[] = {"loadpbvm.pbl"};
if ( pbvm->CreateSession("loadpbvm", LibList, 1,
   &session) != PBX_OK )
{
   fprintf(stderr, "Error in CreateSession\n");
   return 1;
}
fprintf(stderr, "Created session successfully\n");
```

Create an instance of the PowerBuilder object

After the session has been created, the C++ application can create PowerBuilder objects and call PowerBuilder functions in that session.

You use the FindGroup function to locate the group that contains the user object you want to use. FindGroup takes the name of the object as its first argument, and an enumerated type as its second argument. You are looking for a user object, so the second argument is pbgroup_userobject.

You pass the group returned from FindGroup to the FindClass function to get a class that you can pass to the NewObject function:

```
// Create the PowerBuilder object contained
// in loadpbvm.pbl.
// First find the group that contains the
// user object nvo_mult
pbgroup group = session->FindGroup("nvo_mult",
   pbgroup_userobject);
if (group == NULL) return 0;

// Now find the class nvo_mult in the group
pbclass cls = session->FindClass(group,"nvo_mult");
if (cls == NULL) return 0;

// Create an instance of the PowerBuilder object
pbobject pbobj = session->NewObject(cls);
```

Initialize the PBCallInfo structure

Next, get the method ID for the function you want to call and initialize a PBCallInfo structure. You pass the signature obtained in "Getting the signature of a function" on page 65 to the GetMethodID function:

```
// PBCallInfo contains arguments and return value
PBCallInfo ci;

// To call the class member function f_mult,
// pass its signature as the last argument
// to GetMethodID
pbmethodID mid = session->GetMethodID(cls, "f_mult",
   PBRT_FUNCTION, "III");

// Initialize call info structure based on method ID
session->InitCallInfo(cls, mid, &ci);
```

You could use FindMatchingFunction instead of GetMethodID to get the method ID. The call would look like this, because f_mult takes two integer arguments:

```
pbmethodID mid = session->FindMatchingFunction(cls,
   "f_mult", PBRT_FUNCTION, "int, int");
```

Call the PowerBuilder function

Before you call the function, you must supply the integers to be multiplied. For the sake of simplicity, the following code sets them directly in the PBCallInfo structure.

```
// Set IN arguments. The prototype of the function is
// integer f_mult(integer arg1, integer arg2)
ci.pArgs-> GetAt(0)->SetInt(123);
ci.pArgs-> GetAt(1)->SetInt(45);
```

Finally call the function, wrapping it in a try-catch statement to handle any runtime errors:

```
// Call the function
try
{
   session->InvokeObjectFunction(pbobj, mid, &ci);

   // Was PB exception thrown?
   if (session->HasExceptionThrown())
   {
      // Handle PB exception
      session->ClearException();
   }
}
catch (...)
{
   // Handle C++ exception
}

// Get the return value and print it to the console
pbint ret = ci.returnValue->GetInt();
fprintf(stderr, "The product of 123 and 45 is %i\n",
   ret);
```

Write cleanup code

When you have finished with the PBCallInfo structure, call FreeCallInfo to release the memory allocated to it, then delete the structure, release the session, and free the library:

```
      // Release Call Info
      session->FreeCallInfo(&ci);
      delete &ci;

      // Release session
      session->Release();
      return 0;
      FreeLibrary(hinst);
   }
```

Running the C++ application

When you run the compiled executable file at the command prompt, if the PowerBuilder VM is loaded and the session is created successfully, the following output displays in the command window:

```
Loaded PBVM successfully
Created session successfully
The product of 123 and 45 is 5535
```

Accessing result sets

You can use the IPB_ResultSetAccessor interface to access result sets in PowerBuilder. Use the IPB_Session GetResultSetAccessor method to create an instance of the interface using a result set returned from PowerBuilder as the method's argument. You can then use the IPB_ResultSetAccessor's getColumnCount, GetRowCount, GetItemData, and GetColumnMetaData methods to obtain information from the result set.

GetItemData uses the IPB_RSItemData interface to handle the data in each cell in the result set. If the data has a date, time, or datetime datatype, it is stored in a PB_DateData, PB_TimeData, or PB_DateTimeData structure.

To create a result set that can be passed to PowerBuilder, use the IPB_Session CreateResultSet method. See CreateResultSet on page 105 for an example.

Processing PowerBuilder messages in C++

You can open a PowerBuilder window from a C++ application or from an extension, but to make sure that events triggered in the window or control are processed, you need to make sure that the C++ application processes PowerBuilder messages. The IPB_Session ProcessPBMessage function lets you do this.

Each time the ProcessPBMessage function is called, it attempts to retrieve a message from the PowerBuilder message queue and process it. The function is similar to the PowerBuilder Yield function, which yields control to other graphic objects and pulls messages from PowerBuilder objects and other graphic objects from the queue. However, ProcessPBMessage processes only one message at a time, and it processes only PowerBuilder messages.

Messages are added to the PowerBuilder message queue when you call the PostEvent function.

ProcessPBMessage must be called repeatedly

You need to make sure that the ProcessPBMessage function is called repeatedly. For most C++ applications, you can provide a message loop in the main function and insert the IPB_Session ProcessPBMessage function in the message loop. This is shown in the example that follows.

If you use Microsoft Foundation Classes (MFC), you cannot modify the built-in message loop. To ensure that the ProcessPBMessage function is called repeatedly, you can overload the CWnd::WindowProc function and insert ProcessPBMessage into the overloaded function:

```
LRESULT CCallPBVCtrl::WindowProc(UINT message,
   WPARAM wParam, LPARAM lParam)
{
   d_session->ProcessPBMessage();
   return CDialog::WindowProc(message, wParam, lParam);
}
```

Example

The following code fragments are from a C++ program that opens a window. The window has a menu item that invokes the Open event of a PowerBuilder application.

Calling *ProcessPBMessage*

The call to ProcessPBMessage is in a loop in the WinMain function:

```
int __stdcall WinMain(HINSTANCE hInstance,
                      HINSTANCE hPrevInstance,
                      LPSTR lpCmdLine,
                      int nCmdShow)
{
   MSG msg;

   WNDCLASSEX wcex;

// initialization code omitted
   ...
   RegisterClassEx(&wcex);

   HWND hWnd = CreateWindow(szWndClsName,
      "OpenPBWindow", WS_OVERLAPPEDWINDOW,
      CW_USEDEFAULT, 0, CW_USEDEFAULT, 0, NULL, NULL,
      hInstance, NULL);

   if (!hWnd)
   {
     return FALSE;
   }

   ShowWindow(hWnd, nCmdShow);
   UpdateWindow(hWnd);

   try
   {
       while (GetMessage(&msg, NULL, 0, 0))
       {
          TranslateMessage(&msg);
          DispatchMessage(&msg);

          // Call to ProcessPBMessage
          if (session)
             session->ProcessPBMessage();
      }
   }
   catch(...)
      {
          MessageBox(NULL, "Exception occurs",
            "Exception", MB_OK);
      }
   return msg.wParam;
}
```

Loading the PBVM and triggering an event

In the WndProc function, when the WM_CREATE message is passed, the PBVM is loaded and the library list, containing *openwin.pbl*, is passed to CreateSession. When the user selects the menu item that opens the PowerBuilder window, the FindGroup, FindClass, and GetMethodID functions obtain the information needed to create a new application object, initialize the PBCallInfo structure, and trigger the application object's Open event:

```
LRESULT CALLBACK WndProc(HWND hWnd, UINT message,
   WPARAM wParam, LPARAM lParam)
{
  int wmId, wmEvent;
  PAINTSTRUCT ps;
  HDC hdc;

  switch (message)
  {
    case WM_CREATE:
      {
       // Load the PBVM
       hPBVMInst = ::LoadLibrary("pbvm105.dll");
       P_PB_GetVM getvm = (P_PB_GetVM)
           GetProcAddress(hPBVMInst,"PB_GetVM");
       IPB_VM* vm = NULL;
       getvm(&vm);

       // Define the library list and create the session
       static const char *liblist[] = {"openwin.pbl"};
       vm-> CreateSession("openwin", liblist, 1,
          &session);
       break;
      }

    case WM_COMMAND:
       wmId    = LOWORD(wParam);
       wmEvent = HIWORD(wParam);
       // Parse the menu selections:
       switch (wmId)
       {
         case ID_PB_VISUAL:
         {
           // Initialize PBCallInfo and trigger the
           // application open event
           try
           {
               pbgroup group = session->FindGroup
                  ("openwin", pbgroup_application);
               pbclass cls = session->FindClass(group,
                   "openwin");
               pbmethodID mid = session->GetMethodID
                   (cls, "open", PBRT_EVENT, "QS");
               pbobject obj = session->NewObject(cls);

               PBCallInfo ci;
               session->InitCallInfo(cls, mid, &ci);
               session->TriggerEvent(obj, mid, &ci);
               session->FreeCallInfo(&ci);
           }
           catch(...)
           {
              MessageBox(NULL, "Exception occurs",
                 "Exception", MB_OK);
           }
          break;
         }
         default:
            return DefWindowProc(hWnd, message, wParam,
               lParam);
         }
         break;
      case WM_PAINT:
         hdc = BeginPaint(hWnd, &ps);
         RECT rt;
         GetClientRect(hWnd, &rt);
         EndPaint(hWnd, &ps);
         break;
      case WM_DESTROY:
         session->Release();
         session = NULL;
         FreeLibrary(hPBVMInst);
         PostQuitMessage(0);
         break;
      default:
         return DefWindowProc(hWnd, message, wParam,
            lParam);
   }
   return 0;
}
```

Testing ProcessPBMessage

You can test the ProcessPBMessage function with a simple PowerBuilder application like this one:

1. Create a PowerBuilder application called openwin in *openwin.pbl*.
2. Create a main window, w_main, with three buttons.
3. Insert a window-level function, of_setcolor, that takes three integers as arguments and has this script:

    ```
    this.backcolor = rgb(red,green,blue)
    ```

4. Insert a window-level user event, ue_test, with this script:

    ```
    MessageBox("ue_test", "This is a user event")
    ```

5. Provide the following scripts for the clicked events of the buttons:

    ```
    //cb_1:
    MessageBox("Button 1", "Clicked")
    parent.of_setcolor(255, 255, 0)

    //cb_2:
    MessageBox("Button 2", "Clicked")
    parent.PostEvent("ue_event") // not fired
    parent.of_setcolor(255, 0, 0)

    //cb_3:
    MessageBox("Button 3", "Clicked")
    cb_1.PostEvent(Clicked!) // not fired
    ```

6. Script the application's Open event:

    ```
    open (w_main)
    ```

When the ProcessPBMessage function is included in the C++ application, the application runs from C++ as it does in PowerBuilder. The posted events in cb_2 and cb_3 are processed.

Now try commenting out these lines in the C++ application, recompiling, and running the application again:

```
if (session)
session->ProcessPBMessage();
```

The message boxes still display (response windows have their own message loop) and the of_setcolor function is called, but the posted events do not fire.

More PBNI possibilities

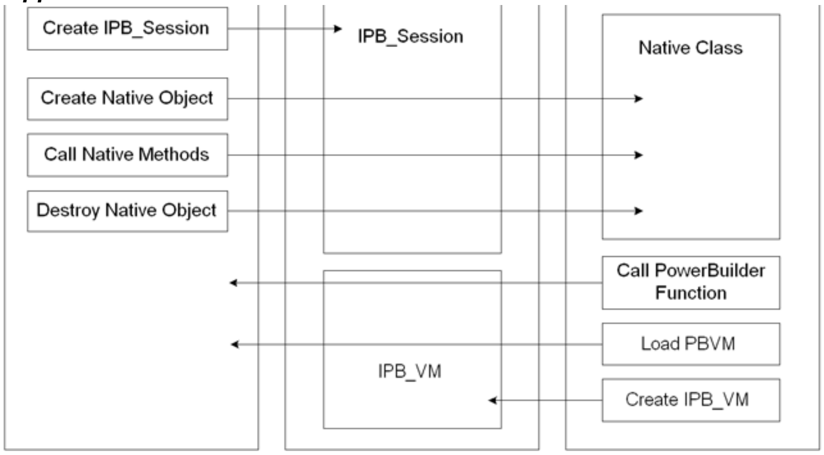
The ability to create visual, nonvisual, and marshaler extensions, and to call PowerBuilder objects from external C++ applications, opens up numerous opportunities to combine these capabilities to develop more complex applications.

Writing an extension that loads the PBVM

Most of the examples in this book and on the PowerBuilder CodeXchange Web site at http://powerbuilder.codexchange.sybase.com show you how to create an extension in C++ and use it in PowerBuilder, or how to write a C++ application that loads the PowerBuilder VM.

You could also write an extension that loads the PowerBuilder VM and uses a custom class user object, using the techniques described in this chapter. The following figure depicts the interaction between the PBVM and an external application that uses an extension.

Figure 5-2: Interaction between PBNI, the PBVM, and external applications



Calling PowerBuilder from Java

You can combine the ability to call PowerBuilder classes from C++, as described in this chapter, with the ability to create marshaler extensions, as described in Chapter 3, “Creating Marshaler Extensions,” to call PowerBuilder from Java.

One way to do this is to create a Java proxy class that declares static native methods that can be called to load the PBVM, create PowerBuilder sessions, create PowerBuilder objects, and invoke PowerScript functions. These native methods can call into the PBVM through PBNI. Additional Java classes that represent the PBVM, PowerBuilder sessions, and PowerBuilder objects can be based on the proxy class.

The Java classes call the Java native methods through JNI, whereas the Java native methods call PowerBuilder through PBNI.

There is a sample that illustrates these techniques on the PowerBuilder CodeXchange Web site at http://powerbuilder.codexchange.sybase.com.

PART 2

Reference

This part contains reference information for PBNI datatypes, interfaces, and tools.

CHAPTER 6

PBNI Types and Return Values

About this chapter

This chapter contains information about the datatypes, enumerated types, and error return values used by the PowerBuilder Native Interface.

Contents

PowerBuilder to PBNI datatype mappings

The following table maps PowerBuilder datatypes to predefined datatypes used in PBNI C++ modules.

Table 6-1: Predefined datatype mappings

PowerBuilder datatype	Predefined datatype
Int	pbint
Uint	pbuint
Byte	pbbyte
Long	pblong
Longlong	pblonglong
Ulong	pbulong
Boolean	pbboolean
Real	pbreal
Double	pbdouble
Decimal	pbdec
Date	pbdate
Time	pbtime
DateTime	pbdatetime
Char	pbchar
Blob	pbblob

PowerBuilder datatype	Predefined datatype
String	pbstring
Powerobject	pbobject

Types for access to PowerBuilder data

The types in the following table enable access to PowerBuilder data.

Table 6-2: Types for access to PowerBuilder data

Datatype	Description
pbgroup	Used to access PowerBuilder group information. A group is a container of PowerBuilder classes.
pbclass	Used to access PowerBuilder class definition information.
pbmethodID	Used to access the method ID of a PowerBuilder global or member function.
pbfieldID	Used to access an instance variable.
pbarray	Used to access array information and data items.

PBNI enumerated types

Enumerated types for PowerBuilder groups

The pbgroup_*type* enumerated types are used in IPB_Session FindGroup calls to identify the type of group required.

Table 6-3: Enumerated types for PowerBuilder groups

Value	PowerBuilder object
pbgroup_application	Application
pbgroup_datawindow	DataWindow definition
pbgroup_function	Global function
pbgroup_menu	Menu
pbgroup_proxy	Proxy definition for a remote object
pbgroup_structure	PowerBuilder structure type
pbgroup_userobject	PowerBuilder user object
pbgroup_window	Window
pbgroup_unknown	Unknown group

Enumerated types for PowerBuilder values

The pbvalue_*type* enumerated types are used in methods such as the IPB_Value GetType method and the IPB_Session NewUnboundedSimpleArray method to identify the type of PowerBuilder data.

Table 6-4: Enumerated types for PowerBuilder values

Value	PowerBuilder datatype
pbvalue_notype	Undetermined datatype.
pbvalue_int	Int
pbvalue_uint	Uint
pbvalue_byte	Byte
pbvalue_long	Long
pbvalue_longlong	Longlong
pbvalue_ulong	Ulong
pbvalue_real	Real
pbvalue_double	Double
pbvalue_dec	Decimal
pbvalue_string	String
pbvalue_boolean	Boolean
pbvalue_any	Any (changed to another datatype when set explicitly)
pbvalue_blob	Blob
pbvalue_date	Date
pbvalue_time	Time
pbvalue_datetime	DateTime
pbvalue_char	Char

Enumerated types for PowerBuilder routines

The pbrt_*type* enumerated types are used in IPB_Session GetMethodID calls to identify the type of routine required.

Table 6-5: Enumerated types for PowerBuilder routines

Value	Routine type
PBRT_FUNCTION	Function
PBRT_EVENT	Event

Error return values

The following table shows the PBXRESULT return values and error codes returned from PBNI methods.

Table 6-6: PBXResult return values

Value of PBXResult	Error code
PBX_OK	0
PBX_SUCCESS	0
PBX_FAIL	-1
PBX_E_NO_REGISTER_FUNCTION	-1
PBX_E_REGISTRATION_FAILED	-2
PBX_E_BUILD_GROUP_FAILED	-3
PBX_E_INVALID_ARGUMENT	-4
PBX_E_INVOKE_METHOD_INACCESSABLE	-5
PBX_E_INVOKE_WRONG_NUM_ARGS	-6
PBX_E_INVOKE_REFARG_ERROR	-7
PBX_E_INVOKE_METHOD_AMBIGUOUS	-8
PBX_E_INVOKE_FAILURE	-9
PBX_E_MISMATCHED_DATA_TYPE	-10
PBX_E_OUTOF_MEMORY	-11
PBX_E_GET_PBVM_FAILED	-12
PBX_E_NO_SUCH_CLASS	-13
PBX_E_CAN_NOT_LOCATE_APPLICATION	-14
PBX_E_INVALID_METHOD_ID	-15
PBX_E_READONLY_ARGS	-16
PBX_E_ARRAY_INDEX_OUTOF_BOUNDS	-100

CHAPTER 7

PBNI Interfaces, Structures, and Methods

About this chapter

This chapter contains reference information about the classes, structures, and methods of the PowerBuilder Native Interface.

Contents

Header file contents

PBNI classes and interfaces are defined in a set of header files.

pbni.h

The classes, structures, and methods defined in the header file *pbni.h* allow PowerBuilder extension modules to interact with PowerBuilder. This file also includes the *pbarray.h*, *pbfield.h*, and *pbnimd.h* header files.

pbarray.h, pbfield.h, pbtraits.h, and pbnimd.h

pbarray.h contains helper classes that make it easier to create arrays and access data in them. *pbfield.h* contains a helper class that makes it easier to access fields. Both header files rely on *pbtraits.h*, which provides specializations for the Value enumerated types. *pbnimd.h* contains machine-specific datatype definitions. These files should not be included directly in your code.

pbext.h

The classes, structures, and methods defined in the header file *pbext.h* must be implemented in PowerBuilder extension modules to allow PowerBuilder applications to use the extension modules. *pbext.h* includes *pbni.h* and *pbevtid.h*.

pbevtid.h

pbevtid.h contains mappings from PowerBuilder event strings to internal event identifiers. These mappings allow the PBVM to automatically fire events that you include in the description of an extension. For more information, see “Event processing in visual extensions” on page 32.

pbrsa.h

pbrsa.h contains structures and interfaces used to access data in DataStores and DataWindow controls.

Class and interface summary

This table lists the classes and interfaces that make up PBNI. After the table, the classes and interfaces are listed in alphabetical order. The methods for each class are listed in alphabetical order after the class description.

Several additional helper classes that are defined in *pbni.h* are not listed in the table. These helper classes include:

- PBArrayInfoHolder and PBCallInfoHolder – used to hold a PBArrayInfo or PBCallInfo variable and release it when it is out of scope
- PBEventTrigger, PBObjectFunctionInvoker, and PBGlobalFunctionInvoker – used to trigger events and call object and global functions

Table 7-1: PBNI class and interface summary

Object	Description	Defined in
IPB_Arguments interface	Used to access the arguments of the PBCallInfo structure.	*pbni.h*
IPB_ResultSetAccessor interface	Used to access data in a DataWindow or DataStore.	*pbrsa.h*
IPB_RSItemData interface	Used to set data values in a result set from a DataWindow or DataStore.	*pbrsa.h*
IPB_Session interface	Used to interoperate with PowerBuilder. An abstract interface, it defines methods for accessing PowerScript data, calling PowerScript functions, catching and throwing PowerScript exceptions, and setting a marshaler to convert PowerBuilder data formats to the user's communication protocol.	*pbni.h*
IPB_Value interface	Used to hold PowerBuilder data, IPB_Value contains information about each variable, including its type, null flag, access privileges, array or simple type, and reference type.	*pbni.h*
IPB_VM interface	Used to load PowerBuilder applications in third-party applications and interoperate with the PowerBuilder virtual machine (PBVM).	*pbni.h*
PBArrayInfo structure	Used to hold information about arrays.	*pbni.h*
PBCallInfo structure	Used to hold arguments and return type information in function calls between PBNI and PowerBuilder.	*pbni.h*
PB_DateData structure	Used to pass data of type Date in the SetData function in the IPB_RSItemData interface.	*pbrsa.h*
PB_DateTimeData structure	Used to pass data of type DateTime in the SetData function in the IPB_RSItemData interface.	*pbrsa.h*
PB_TimeData structure	Used to pass data of type Time in the SetData function in the IPB_RSItemData interface.	*pbrsa.h*
PBX_DrawItemStruct structure	Used to hold the properties of an external visual control that you want to draw using the PBX_DrawVisualObject function.	*pbext.h*
PBArrayAccessor template class	Used to access items in an array.	*pbarray.h*
PBObjectArrayAccessor class	Used to access items in an object array.	*pbarray.h*
PBBoundedArrayCreator template class	Used to create bounded arrays.	*pbarray.h*
PBBoundedObjectArrayCreator class	Used to create bounded object arrays.	*pbarray.h*
PBBoundedObjectArrayCreator class	Used to create unbounded arrays.	*pbarray.h*
PBUnboundedObjectArrayCreator class	Used to create unbounded object arrays.	*pbarray.h*

Object	Description	Defined in
IPBX_Marshaler interface	Used to invoke remote methods and convert PowerBuilder data formats to the user's communication protocol. A marshaler extension is a PowerBuilder extension that acts as the bridge between PowerBuilder and other components, such as EJBs, Java classes, CORBA objects, Web services, and so on.	*pbext.h*
IPBX_NonVisualObject interface	Inherits from IPBX_UserObject and is the direct ancestor class of nonvisual PowerBuilder native classes.	*pbext.h*
IPBX_UserObject interface	The ancestor class of PowerBuilder native classes. It has two functions, Destroy and Invoke.	*pbext.h*
IPBX_VisualObject interface	Inherits from IPBX_UserObject and is the direct ancestor class of visual PowerBuilder native classes.	*pbext.h*
Exported methods	Some exported methods *must* be implemented in PowerBuilder extension modules.	*pbext.h*
Method exported by PowerBuilder VM	The PB_GetVM method is exported by the PowerBuilder VM and is used to pass the IPB_VM interface to the user.	*pbni.h*

IPB_Arguments interface

Description

The IPB_Arguments and IPB_Value interfaces are used to pass values between the PowerBuilder VM and PowerBuilder extension modules. Each argument is represented by a pointer to the IPB_Value interface.

Methods

The IPB_Arguments interface has two methods, GetAt and GetCount.

GetAt

Description

Returns a pointer to the IPB_Value interface representing an argument whose order in the list of arguments is indicated by a specified index.

Syntax

GetAt (pbint *index*)

Argument	Description
index	A valid index into the PBCallInfo structure

Return value

IPB_Value*.

Examples

In the following code fragment, GetAt obtains the first value in the PBCallInfo structure. The value has been passed in from the calling function.

```
PBCallInfo ci;
LPCSTR myPBNIObj = NULL;
IPB_Value* pArg0 = ci->pArgs->GetAt(0);
if (!pArg0->IsNull())
{
   pbstring t = pArg0->GetString();
   if (t != NULL)
      myPBNIObj = session->GetString(t);
}
```

See also GetCount

GetCount

Description Obtains the number of arguments in an instance of PBCallInfo.

Syntax GetCount ( )

Return value pbint.

Examples This example uses GetCount in a FOR loop used to process different argument types:

```
int i;
for (i=0; i < ci-> pArgs -> GetCount();i++)
{
   pbuint ArgsType;

   if( ci -> pArgs -> GetAt(i) -> IsArray())

      pArguments[i].array_val =
         ci -> pArgs -> GetAt(i) -> GetArray();
      continue;
   }

   if( ci -> pArgs -> GetAt(i) -> IsObject())
   {
      if (ci -> pArgs -> GetAt(i) -> IsNull())
         pArguments[i].obj_val=0;
      else
         pArguments[i].obj_val =
            ci -> pArgs -> GetAt(i) -> GetObject();
      continue;
   }
   ...
```

See also GetAt

IPB_ResultSetAccessor interface

Description

The IPB_ResultSetAccessor interface is used to access result sets in DataWindow and DataStore objects.

Methods

The IPB_ResultSetAccessor interface has six methods:

AddRef
GetColumnCount
GetColumnMetaData
GetItemData
GetRowCount
Release

AddRef

Description

When you call the CreateResultSet function of interface IPB_Session, you need to pass an argument of type IPB_ResultSetAccessor. The AddRef function is called on that argument and the Release function is called when the pbobject is destroyed.

Syntax

AddRef ( )

Return value

None.

See also

CreateResultSet
GetColumnCount

GetColumnCount

Description

Obtains the number of columns.

Syntax

GetColumnCount ( )

Return value

Unsigned long.

Examples

This statement stores the number of columns in *numCols:

```
*numCols = d_rsAccessor->GetColumnCount();
```

See also

CreateResultSet
GetRowCount

GetColumnMetaData

Description

Obtains a column's metadata. The column number of the first column is 1. Memory must be allocated for *columnName* before this function call. The pointer values can be null.

Syntax

GetColumnMetaData (unsigned long *columnNum*, LPTSTR *columnName*, pbvalue_type* *type*, unsigned long* *width*)

Argument	Description
columnNum	The number of the column for which you want to obtain metadata
columnName	The name of the specified column
type	A pointer to the type of the specified column
width	A pointer to the width of the specified column

Return value

None.

Examples

This example gets the number of columns in a result set and allocates an array to hold the types of each column:

```
CRsltSet::CRsltSet(IPB_ResultSetAccessor* rsAccessor)
   :m_lRefCount (0), d_rsAccessor(rsAccessor)
{
   rsAccessor->AddRef();
      // for each column
   ULONG nNumColumns = d_rsAccessor->GetColumnCount();
   d_arrColTypes = new USHORT[nNumColumns + 1];
   for (ULONG nColumn=1; nColumn <= nNumColumns;
      ++nColumn)
      {
         // get the column type into the array
         pbvalue_type type;
         d_rsAccessor->GetColumnMetaData (nColumn,
            NULL, &type, NULL);
         d_arrColTypes[nColumn] = (USHORT)type;
      }
}
```

See also

CreateResultSet
GetColumnCount
GetItemData
GetRowCount

GetItemData

Description

Accesses the data in a cell. The first row is 1 and the first column is 1.

Syntax

GetItemData(unsigned long *row*, unsigned long *col*, IPB_RSItemData* *data*)

Argument	Description
row	The row number of the cell
col	The column number of the cell
data	A pointer to an IPB_RSItemData structure

Return value

Boolean.

Examples

This example stores the data in the first row and column in the IPB_RSItemData structure sd:

```
d_rsAccessor->GetItemData(1, 1, &sd);
```

Usage

If the value of *data* is null, this function issues the callback `data->SetNull`. If the value is not null, it issues the callback `data->SetData`. For more information, examine the IPB_RSItemData interface.

See also

CreateResultSet
GetColumnCount
GetColumnMetaData
GetRowCount
IPB_RSItemData interface
SetData
SetNull

GetRowCount

Description

Obtains the number of rows.

Syntax

GetRowCount ( )

Return value

Unsigned long.

Examples

This statement stores the number of rows in *numRows:

```
*numRows = d_rsAccessor->GetRowCount();
```

See also

CreateResultSet
GetColumnCount
GetColumnMetaData
GetItemData

Release

Description

When you call the CreateResultSet function of interface IPB_Session, you need to pass an argument of type IPB_ResultSetAccessor. The AddRef function is called on that argument and the Release function is called when the pbobject is destroyed.

Syntax

Release ( )

Return value

None.

See also

AddRef
CreateResultSet

IPB_RSItemData interface

Description

The IPB_RSItemData interface is used as an argument to the GetItemData function of IPB_ResultSetAccessor.

Methods

The IPB_RSItemData interface has two methods: SetData and SetNull.

SetData

Description

Sets the data in an IPB_RSItemData structure when the GetItemData function of IPB_ResultSetAccessor is called and the data value is not null.

Syntax

SetData(unsigned long *len*, void* *data*)

Argument	Description
len	The length of the data
data	A void pointer to the address of the data

Return value

None.

Usage

If the cell datatype is:

- string and decimal, the address points to a string
- date, the address points to a PB_DateData structure
- time, the address points to a PB_TimeData structure
- datetime, the address points to a PB_DateTimeData structure
- another datatype, the address points to data of the corresponding type

See also

GetItemData
SetNull
PB_DateData structure
PB_DateTimeData structure
PB_TimeData structure

SetNull

Description

Sets the data in an IPB_RSItemData structure to null when the GetItemData function of IPB_ResultSetAccessor is called and the data value is not null.

Syntax

SetNull()

Return value

None.

See also

GetItemData
SetData

IPB_Session interface

Description

The IPB_Session interface is used to interoperate with PowerBuilder. An abstract interface, it defines methods for accessing PowerScript data, calling PowerScript functions, catching and throwing PowerScript exceptions, and setting a marshaler to convert PowerBuilder data formats to the user's communication protocol.

Methods

This table lists functions by category. Full descriptions in alphabetic order follow the table.

Table 7-2: IPB_Session methods by category

Purpose	Method	Description
Managing sessions	Release	Releases this IPB session. The IPB_Session object becomes invalid after the call.
Managing object references	AddGlobalRef	Adds a global reference to the specified PowerBuilder object.
	AddLocalRef	Adds a local reference to the specified PowerBuilder object.
	NewObject	Creates a new object of the specified type.
	PopLocalFrame	Pops the current local reference frame from the current native method stack frame.

Purpose	Method	Description
	PushLocalFrame	Pushes a local reference frame onto the current native method stack frame.
	RemoveGlobalRef	Removes a global reference to the specified PowerBuilder object.
	RemoveLocalRef	Removes a local reference to the specified PowerBuilder object.
Managing shared properties	GetProp	Retrieves a pointer to the data value of a variable that has been registered as a shared property for the current IPB session.
	RemoveProp	Removes the specified variable from the list of properties of the current IPB session.
	SetProp	Adds a new variable to the list of properties of the current session or changes the value of an existing variable.
Handling the PowerBuilder message queue	ProcessPBMessage	Checks the PowerBuilder message queue and, if there is a message in the queue, attempts to process it.
Handling exceptions	ClearException	Clears the current PowerBuilder exception object.
	GetException	Obtains the current thrown exception object.
	HasExceptionThrown	Checks for the existence of an exception that has been thrown but not cleared.
	ThrowException	Throws a PowerBuilder exception or inherited exception, replacing the existing exception if one exists.
Passing arguments	Add<type>Argument	Adds an argument in a variable argument PowerBuilder call.
	FreeCallInfo	Frees memory allocated by InitCallInfo.
	InitCallInfo	Initializes the PBCallInfo structure.
Finding PowerBuilder classes and objects	FindGroup	Searches for a group with a given name and group type in the current library list.
	FindClass	Searches for a class with a given name within a given group.
	FindClassByClassID	Searches for a class with a given name and a given ID.
	GetClass	Returns the class handle of a PowerBuilder object.
	GetClassName	Returns the name of a class in lowercase.
	GetCurrGroup	Returns the name of the current group.
	GetSuperClass	Returns the base class of a class, if any.

Purpose	Method	Description
	GetSystemClass	Returns the system class handle of a PowerBuilder object.
	GetSystemGroup	Returns the class that contains all the system global functions.
	IsAutoInstantiate	Returns true if the specified class is an autoinstantiated class; otherwise returns false.
Working with functions and events	FindMatchingFunction	Finds a function that has the specified argument list.
	GetMethodID	Returns the ID of the requested function.
	GetMethodIDByEventID	Returns the ID of the function that has a given predefined PowerBuilder event ID.
	InvokeClassFunction	Invokes system or user global functions.
	InvokeObjectFunction	Invokes a class member function.
	TriggerEvent	Triggers a PowerBuilder event.
Working with enumerated variables	GetEnumItemName	Obtains the name of an enumerated variable.
	GetEnumItemValue	Obtains the value of an enumerated variable.
Working with global variables	GetGlobalVarID	Returns the name of a global variable.
	GetGlobalVarType	Returns the datatype of a global variable.
	Get<type>GlobalVar	Returns the value of a global variable of a specific datatype.
	GetPBAnyGlobalVar	Obtains the value of a global variable of type Any.
	IsGlobalVarArray	Returns true if the global variable contains an array, otherwise returns false.
	IsGlobalVarNull	Returns true if the global variable contains a null value, otherwise returns false.
	IsGlobalVarObject	Returns true if the global variable contains a pbobject, otherwise returns false.
	Set<type>GlobalVar	Sets the value of a global variable of a specific datatype.
	SetGlobalVarToNull	Sets the value of a shared variable to null.
Working with shared variables	GetSharedVarID	Returns the name of a shared variable.
	GetSharedVarType	Returns the datatype of a shared variable.
	Get<type>SharedVar	Returns the value of a shared variable of a specific datatype.

Purpose	Method	Description
	GetPBAnySharedVar	Obtains the value of a shared variable of type Any.
	IsSharedVarArray	Returns true if the shared variable contains an array, otherwise returns false.
	IsSharedVarNull	Returns true if the shared variable contains a null value, otherwise returns false.
	IsSharedVarObject	Returns true if the shared variable contains a pbobject, otherwise returns false.
	Set<type>SharedVar	Sets the value of a shared variable of a specific datatype.
	SetSharedVarToNull	Sets the value of a shared variable to null.
Working with arrays	Get<type>ArrayItem	Returns the value of an array item of a specific datatype.
	GetArrayInfo	Obtains information about an array.
	GetArrayItemType	Obtains the datatype of an item in an array.
	GetArrayLength	Returns the length of an array.
	GetPBAnyArrayItem	Obtains the value of an array item of type Any.
	IsArrayItemNull	Returns true if the array item contains an array, otherwise returns false.
	NewBoundedSimpleArray	Creates a bounded simple data array.
	NewUnboundedSimpleArray	Creates an unbounded simple data array.
	NewBoundedObjectArray	Creates a bounded PowerBuilder object or structure array.
	NewUnboundedObjectArray	Creates an unbounded PowerBuilder object or structure data array.
	ReleaseArrayInfo	Releases memory returned by GetArrayInfo.
	Set<type>ArrayItem	Sets the value of an array item of a specific datatype.
	SetArrayItemToNull	Sets the value of an array item to null.
Working with strings	GetStringLength	Returns the length of a string in bytes without the terminator.
	GetString	Returns a pointer to the string passed in as an argument.
	NewString	Creates a new string.
	SetString	Frees an existing string and assigns a new string value to it.

Purpose	**Method**	**Description**
Working with binary large objects	GetBlob	Returns a pointer to the data buffer for a blob.
	GetBlobLength	Returns the length in bytes of blob data in a buffer.
	NewBlob	Creates a new blob and duplicates a buffer for the new blob data.
	SetBlob	Destroys the existing data in a blob and copies data into it from a buffer.
Working with decimal values	GetDecimalString	Converts decimal data in a pbdec object to a string.
	NewDecimal	Allocates resources for a new decimal data object.
	ReleaseDecimalString	Frees the memory acquired using GetDecimalString.
	SetDecimal	Converts a string to a decimal.
Working with date and time values	GetDateString	Converts data in a pbdate object to a string.
	GetDateTimeString	Converts data in a pbdatetime object to a string.
	GetTimeString	Converts data in a pbtime object to a string.
	NewDate	Creates a new pbdate data object.
	NewDateTime	Creates a new pbdatetime data object.
	NewTime	Creates a new pbtime data object.
	ReleaseDateString	Frees the memory acquired using GetDateString.
	ReleaseDateTimeString	Frees the memory acquired using GetDateTimeString.
	ReleaseTimeString	Frees the memory acquired using GetTimeString.
	SetDate	Resets the value of the specified pbdate object.
	SetDateTime	Resets the value of the specified pbdatetime object.
	SetTime	Resets the value of the specified pbtime object.
	SplitDate	Splits the specified pbdate object into a year, month, and day.
	SplitDateTime	Splits the specified pbdatetime object into a year, month, and day.
	SplitTime	Splits the specified pbtime object into a year, month, and day.

Purpose	Method	Description
Working with data values	AcquireArrayItemValue	Clones the data in the PBCallInfo structure in an array item and resets the IPB_Value pointer.
	AcquireValue	Clones the data in the PBCallInfo structure and resets the IPB_Value pointer.
	ReleaseValue	Frees the value acquired by the AcquireValue or AcquireArrayItemValue method.
	SetValue	Sets the value of one IPB_Value object to the value of another IPB_Value object
Working with fields	GetFieldID	Obtains the internal ID of a class instance variable.
	GetFieldName	Obtains the name of the specified field.
	GetFieldType	Obtains the datatype of a class instance variable.
	GetNumOfFields	Obtains the number of fields in the specified class.
	GetPBAnyField	Obtains the value of a variable of type Any.
	Get<type>Field	Obtains a pointer to the instance variable data for a specified variable.
	IsFieldArray	Returns true if the field contains an array, otherwise returns false.
	IsFieldNull	Returns true if the field contains a null value array, otherwise returns false.
	IsFieldObject	Returns true if the field contains a pbobject, otherwise returns false.
	Set<type>Field	A set of datatype-specific functions. Sets the value of an instance field of an object.
	Set<type>Field	A set of datatype-specific functions. Sets the value of an instance field of an object.
	UpdateField	Refreshes a visual property of a PowerBuilder object.
Working with native classes	GetNativeInterface	Obtains a pointer to the interface of a native class.
	IsNativeObject	Determines whether a pbobject is an instance of a native class.
Accessing result sets from DataWindows and DataStores	CreateResultSet	Creates a result set object using a pointer to an IPB_ResultSetAccessor object.
	GetResultSetAccessor	Obtains an interface through which you can read data from a result set.
	ReleaseResultSetAccessor	Releases the pointer obtained using GetResultSetAccessor.

Purpose	Method	Description
Working with marshaler extensions	GetMarshaler	Obtains the marshaler object associated with a proxy object.
	NewProxyObject	Creates a proxy for a remote object.
	SetMarshaler	Sets a marshaler that will be used to invoke remote methods and convert PowerBuilder data formats to the user's communication protocol.

AcquireArrayItemValue

Description

Clones the data in the PBCallInfo structure in an array item and resets the IPB_Value pointer.

Syntax

AcquireArrayItemValue(pbarray *array*, pblong *dim*[ ])

Argument	Description
array	A valid pbarray structure.
dim	A pblong array to hold the indexes of all dimensions of the array. The size of the array must equal the dimensions of *array*.

Return value

IPB_Value*.

Examples

This FOR loop acquires the value of an item in an array and sets the value in another array:

```
for( i=1; i <= bound; i++)
{
   dim[0]= i;
   ipv = Session -> AcquireArrayItemValue(refArg, dim);
   Session -> SetArrayItemValue(*i_array, dim, ipv);
   Session -> ReleaseValue(ipv);
}
```

Usage

The AcquireArrayItemValue method enables you to retain the data in the PBCallInfo structure for a single array item.

The AcquireArrayItemValue method is independent of the type of the data but is most useful for acquiring the value of pointer values, such as pbvalue_string, pbvalue_blob, and so on. When you call FreeInfo, the data is not freed and the pointer returned by AcquireArrayItemValue is still valid.

When you no longer need the data, you *must* call the ReleaseValue method to free the data. Failing to do so causes a memory leak.

The PBVM clones a new IPB_Value and resets the existing one. If you attempt to get or acquire the original value, the value returned is zero or null until another IPB_Value is set to the value.

Working with large arrays
The processing that the AcquireArrayItemValue and ReleaseValue methods perform results in poor performance when handling large arrays. It is more efficient to get the type of the array and handle each type with appropriate type-specific functions.

See also

ReleaseValue

AcquireValue

Description

Clones the data in the PBCallInfo structure and resets the IPB_Value pointer.

Syntax

AcquireValue (IPBValue* *value*)

Argument	Description
value	The value to be returned

Return value

IPB_Value*.

Examples

The AcquireValue method is used to obtain a message argument value. Later, when the value is no longer needed, it is released using ReleaseValue to avoid memory leaks:

```
// Acquire a value
MessageArg = session->AcquireValue
   ( ci->pArgs->GetAt(0) );
pbstring pbMessage = MessageArg->GetString() ;
Message = (LPSTR)session->GetString(pbMessage) ;
...
// Cleanup phase
if (MessageArg)
{
   Session->ReleaseValue ( MessageArg ) ;
}
```

Usage

The AcquireValue method enables you to retain the data in the PBCallInfo structure. The AcquireValue method is independent of the type of the data but is most useful for acquiring the value of pointer values such as pbvalue_string, pbvalue_blob, and so on. When you call FreeInfo, the data is not freed and the pointer returned by AcquireValue is still valid.

If the value acquired is an array, the entire array is acquired. To acquire a single element in an array, use the AcquireItemValue method.

When you no longer need the data, you *must* call the ReleaseValue method to free the data. Failing to do so causes a memory leak.

The PBVM clones a new IPB_Value and resets the existing one. If you attempt to get or acquire the original value, the value returned is zero or null until another IPB_Value is set to the value.

See also

AcquireArrayItemValue
ReleaseValue

Add<*type*>Argument

Description

Adds an argument of a specific type in a variable argument PowerBuilder call.

Syntax

AddArrayArgument (PBCallInfo **ci*, pbblob *value*, pbboolean *IsNull*)

AddBlobArgument (PBCallInfo **ci*, pbblob *value*, pbboolean *IsNull*)

AddBoolArgument (PBCallInfo **ci*, pbboolean *value*, pbboolean *IsNull*)

AddByteArgument (PBCallInfo **ci*, pbbyte *value*, pbboolean *IsNull*)

AddCharArgument (PBCallInfo **ci*, pbchar *value*, pbboolean *IsNull*)

AddDateArgument (PBCallInfo **ci*, pbdate *value*, pbboolean *IsNull*)

AddDateTimeArgument (PBCallInfo **ci*, pbdatetime *value*, pbboolean *IsNull*)

AddDecArgument (PBCallInfo **ci*, pbdec *value*, pbboolean *IsNull*)

AddDoubleArgument (PBCallInfo **ci*, pbdouble *value*, pbboolean *IsNull*)

AddIntArgument (PBCallInfo **ci*, pbint *value*, pbboolean *IsNull*)

AddLongArgument (PBCallInfo **ci*, pblong *value*, pbboolean *IsNull*)

AddLongLongArgument (PBCallInfo **ci*, pblonglong *value*, pbboolean *IsNull*)

AddObjectArgument (PBCallInfo **ci*, pbobject *value*, pbboolean *IsNull*)

AddPBStringArgument (PBCallInfo **ci*, pbstring *value*, pbboolean *IsNull*)

AddRealArgument (PBCallInfo **ci*, pbreal *value*, pbboolean *IsNull*)

AddStringArgument (PBCallInfo **ci*, LPCTSTR *value*, pbboolean *IsNull*)

AddTimeArgument (PBCallInfo **ci*, pbtime *value*, pbboolean *IsNull*)

AddUintArgument (PBCallInfo **ci*, pbuint *value*, pbboolean *IsNull*)

AddUlongArgument (PBCallInfo **ci*, pbulong *value*, pbboolean *IsNull*)

Argument	Description
ci	The PBCallInfo to which the argument is to be added.
value	The value to be added to the arguments array.
IsNull	Indicates whether the argument is null. The default is false.

Return value

PBXRESULT. PBX_OK on success.

Examples

This code tests that adding an integer argument to a PBCallInfo structure *ci* works correctly:

```
long Cmy_pbni:: f_Retrieve(IPB_Session* session, pbint
retrieve_args, pbobject dwobj)
{
   pbclass cls;
   pbmethodID mid;
   PBCallInfo* ci = new PBCallInfo;
   pblong ret_val;
   PBXRESULT ret;

   cls = session-> GetClass(dwobj);
   mid = session-> GetMethodID
      (cls, "retrieve", PBRT_FUNCTION, "LAV");
   if (mid == kUndefinedMethodID)
      return -1;

   session-> InitCallInfo(cls, mid, ci);

   ci-> pArgs-> GetAt(0)-> SetInt(retrieve_args);
   session-> AddIntArgument(ci, retrieve_args, false);

   ret = session->InvokeObjectFunction(dwobj, mid, ci);
   if (ret!= PBX_OK)
      ret_val= ret;
   else
      ret_val= ci-> returnValue-> GetLong();

   session-> FreeCallInfo(ci);
   delete ci;

   return ret_val;
}
```

Usage

This call is used in variable argument PowerBuilder calls, such as datawindow.retrieve(*arg*). After the call, the value returned by ci->pArgs->GetCount() increases by one.

See also

GetCount
InvokeClassFunction
InvokeObjectFunction

AddGlobalRef

Description

Adds a global reference to the specified PowerBuilder object.

Syntax

AddGlobalRef (pbobject *obj*)

Argument	Description
obj	A valid PowerBuilder object handle

Return value

pbclass or null on error.

Examples

This example checks whether a return value is null, and if it is not, adds a global reference to it to the session:

```
if (ci-> returnValue-> IsNull())
   ret_val = 0;
else
   {
   ret_val = ci-> returnValue-> GetObject();
   Session -> AddGlobalRef(ret_val);
}
```

See also

RemoveGlobalRef

AddLocalRef

Description

Adds a local reference to the specified PowerBuilder object.

Syntax

AddLocalRef (pbobject *obj*)

Argument	Description
obj	A valid PowerBuilder object handle

Return value

pbclass or null on error.

Examples

This example defines functions that add and remove local references:

```
void MyPBNIClass::reference()
{
   d_session->AddLocalRef(d_pbobject);
}

void MyPBNIClass::unreference()
{
   if(d_pbobject != NULL)
      d_session->RemoveLocalRef(d_pbobject);
}
```

See also

PopLocalFrame
PushLocalFrame
RemoveLocalRef

ClearException

Description

Clears the current PowerBuilder exception object.

Syntax

ClearException ()

Return value

None.

Usage

HasExceptionThrown returns false after a call to ClearException. If no exception has been thrown, this call has no effect.

See also

GetException
HasExceptionThrown
ThrowException

CreateResultSet

Description

Creates a result set object using a pointer to an IPB_ResultSetAccessor object.

Syntax

CreateResultSet (IPB_ResultSetAccessor* *rs*)

Argument	Description
rs	A pointer to an IPB_ResultSetAccessor object

Return value

pbobject.

Examples

This example loads the PBVM and calls the f_ret and f_in functions in the custom class user object n_rs in the PBL *pbrs.pbl*. The PowerScript for the functions is shown after the C++ code:

```
#include "stdafx.h"
#include "windows.h"
#include "pbni.h"
#include "vector"
using std::vector;

void main(int argc, char* argv[])
{
   HINSTANCE hinst = LoadLibrary("pbvm105.dll");

   typedef PBXRESULT (*P_PB_GetVM)(IPB_VM** vm);

   P_PB_GetVM getvm = (P_PB_GetVM)GetProcAddress(hinst,
      "PB_GetVM");
   IPB_VM*   pbvm;

   getvm(&pbvm);

   IPB_Session* session = NULL;
   vector<LPCSTR> ll(1);

   ll[0] = "pbrs.pbl";

   pbvm->CreateSession("pbrs", &ll[0], 1, &session);

   pbgroup group = session->FindGroup("n_rs",
      pbgroup_userobject);
   if (group == NULL) return;

   pbclass cls = session->FindClass(group, "n_rs");
   if (cls == NULL) return;

   pbobject obj = session->NewObject(cls);
   if (obj == NULL) return;


   pbmethodID mid = session->GetMethodID(cls, "f_ret",
      PBRT_FUNCTION, "Cresultset.");
   PBCallInfo ci;
   session->InitCallInfo(cls, mid, &ci);
   session->InvokeObjectFunction(obj, mid, &ci);
// Use the result set returned from f_ret to
   // create an IPB_ResultSetAccessor rsa
   pbobject rs = ci.returnValue->GetObject();
   IPB_ResultSetAccessor* rsa =
      session->GetResultSetAccessor(rs);

   // Create a result set object from rsa
   pbobject rsobj = session->CreateResultSet(rsa);


   // Call the f_in method
   mid = session->GetMethodID(cls, "f_in",
      PBRT_FUNCTION, "IRCresultset.");
   PBCallInfo ci1;
   session->InitCallInfo(cls, mid, &ci1);
   // Set the result set object rsobj as the
   // argument for f_in
   ci1.pArgs->GetAt(0)->SetObject(rsobj);
   session->InvokeObjectFunction(obj, mid, &ci1);


   session->FreeCallInfo(&ci);
   session->FreeCallInfo(&ci1);
}
```

f_ret retrieves data from a database into a DataStore and generates a result set:

```
ResultSet rs
DataStore ds

Long sts
Integer li_ret

// Profile EAS Demo DB V10
SQLCA.DBMS = "ODBC"
SQLCA.AutoCommit = False
SQLCA.DBParm = &
   "ConnectString='DSN=EAS Demo DB
V10;UID=dba;PWD=sql'"
connect using sqlca;

ds = Create DataStore
ds.DataObject = ""
ds.DataObject = "d_rs"
ds.SetTransObject(sqlca)
w_main.dw_1.SetTransObject(sqlca)
```

```
long ll_ret, rows, rows2
ll_ret = ds.Retrieve()
ll_ret = w_main.dw_1.Retrieve()
//ds.sharedata(w_main.dw_1)
rows = ds.RowCount()
rows2 = w_main.dw_1.RowCount()
messagebox("info from f_ret", " row count is " &
   + string(rows) + " or " + string(rows2))
sts = ds.GenerateResultSet(rs)

Return rs
```

f_in takes a result set, *rs*, as an argument and uses it to create a DataStore:

```
DataStore ds
Int cnt, li_ret

ds = Create DataStore
ds.CreateFrom(rs)
cnt = ds.RowCount()
messagebox("info from f_in", "row count is " +
string(cnt))
Return cnt
```

Usage

To use the IPB_ResultSetAccessor interface, load the PBVM, obtain a result set from a PowerBuilder application, and call GetResultSetAccessor on this result set to get an IPB_ResultSetAccessor interface object. You can then call the methods of this object to get information about the result set. You can also call CreateResultSet using this object as an argument to create a result set that you can return to PowerBuilder.

When you call CreateResultSet, the AddRef function of the IPB_ResultSetAccessor interface is called on the *rs* argument implicitly to add a reference to the interface pointer.

See also

AddRef

GetResultSetAccessor
IPB_ResultSetAccessor interface
ReleaseResultSetAccessor

FindClass

Description

Searches for a class with a given name within a given group.

Syntax

FindClass(pbgroup *group*, LPCTSTR *name*)

Argument	Description
group	The handle of the group in which the class resides
name	The class name in lowercase

Return value

pbclass or null on failure.

Examples

This example finds the group associated with the f_getrow function and uses the group to find the class:

```
group = session->FindGroup("f_getrow",
   pbgroup_function);
if ( group==NULL )
   return;
cls = session->FindClass(group, "f_getrow");
if ( cls==NULL )
   return;
```

Usage

This method searches for a PowerBuilder class with the given name in the given group. For example, in a window definition w_1, w_1 is a group, and w_1 and controls contained in it are all classes of group w_1.

See also

FindGroup
NewObject

FindClassByClassID

Description

Searches for a class with a given name and a given ID.

Syntax

FindClass(pbgroup *group*, pbint *classID*)

Argument	Description
group	The handle of the group in which the class resides
classID	The class name in lowercase

Return value

pbclass or null on failure.

Usage

This method searches for a PowerBuilder class with the given name and the given ID.

See also

FindGroup
NewObject

FindGroup

Description

Searches for a group with a given name and group type in the current library list.

Syntax

FindGroup(LPCTSTR *name*, pbgroup_type *type*)

Argument	Description
name	The group name in lowercase
type	An enumerated type defined in pbgroup_type

Return value

pbgroup or null on failure.

Examples

This example finds the group associated with user_exception and uses the group to find the class:

```
group = session-> FindGroup("user_exception",
   pbgroup_userobject);
if ( group==NULL )
   return;
cls = session->FindClass(group, "user_exception")
```

See also

FindClass
NewObject

FindMatchingFunction

Description

Finds a function that has the specified argument list.

Syntax

FindMatchingFunction(pbclass *cls*, LPCTSTR *methodName*, PBRoutineType *rt*, LPCTSTR *readableSignature*)

Argument	Description
cls	pbclass containing the method.
methodName	The string name of the method in lowercase.
rt	Type of the method: PBRT_FUNCTION for function or PBRT_EVENT for event.
readableSignature	A comma-separated string listing the types of the method's arguments. The return type of the method is not included in the string. See the Usage section for examples.

Return value

pbmethodID.

Examples

This example returns the method ID of a function named uf_test that takes an integer and a double as arguments:

```
pbclass cls;
pbmethodID mid;
PBCallInfo* ci = new PBCallInfo;
unsigned long ret_val;

cls = Session -> GetClass(myobj);
mid = Session -> FindMatchingFunction(cls, "uf_test",
   PBRT_FUNCTION, "int, double");

Session -> InitCallInfo(cls, mid, ci);
```

Usage

FindMatchingFunction provides an alternative to the GetMethodID function. It requires a list of the function's arguments (the *readableSignature*) instead of the signature obtained using the pbsig105 tool.

This table shows the *readableSignature* for each of several functions.

Table 7-3: FindMatchingFunction readable signature examples

Function prototype	Signature
`void test1()`	`""`
`int test2()`	`""`
`string test3(int a, double b)`	`"int, double"`
`datastore test4(powerobject a[], double b[2 to 10, 1 to 7])`	`"powerobject[], double[2 to 10, 1 to 7]"`
`int test5(readonly int a[10,20], ref long c[])`	`"readonly int[10,20], ref long[])"`

FindMatchingFunction does not check the access type of the function, so you can use it to obtain the method ID of a private function. GetMethodID cannot obtain the method ID of a private function.

See also

GetMethodID

FreeCallInfo

Description Frees memory allocated by InitCallInfo.

Syntax FreeCallInfo(PBCallInfo **ci*)

Argument	Description
ci	A pointer to the preallocated PBCallInfo structure

Return value None.

Examples FreeCallInfo should be called when the PBCallInfo structure is no longer needed:

```
Session->InvokeObjectFunction(myobj, mid, ci);

ret_val = ci.returnValue-> GetInt();
Session-> FreeCallInfo(ci);
delete ci;
return ret_val;
```

Usage This method frees memory allocated by InitCallInfo but does not free the structure *ci* itself.

See also InitCallInfo

Get<*type*>ArrayItem

Description Obtains the value of an array item of a specified type.

Syntax GetBlobArrayItem (pbarray *array*, pblong *dim[ ]*, pbboolean& *IsNull*)

GetBoolArrayItem (pbarray *array*, pblong *dim[ ]*, pbboolean& *IsNull*)

GetByteArrayItem (pbarray *array*, pblong *dim[ ]*, pbboolean& *IsNull*)

GetCharArrayItem (pbarray *array*, pblong *dim[ ]*, pbboolean& *IsNull*)

GetDateArrayItem (pbarray *array*, pblong *dim[ ]*, pbboolean& *IsNull*)

GetDateTimeArrayItem (pbarray *array*, pblong *dim[ ]*, pbboolean& *IsNull*)

GetDecArrayItem (pbarray *array*, pblong *dim[ ]*, pbboolean& *IsNull*)

GetDoubleArrayItem (pbarray *array*, pblong *dim[ ]*, pbboolean& *IsNull*)

GetIntArrayItem (pbarray *array*, pblong *dim[ ]*, pbboolean& *IsNull*)

GetLongArrayItem (pbarray *array*, pblong *dim[ ]*, pbboolean& *IsNull*)

GetLongLongArrayItem (pbarray *array*, pblonglong *dim[ ]*, pbboolean& *IsNull*)

GetObjectArrayItem (pbarray *array*, pblong *dim[ ]*, pbboolean& *IsNull*)

GetRealArrayItem (pbarray *array*, pblong *dim[ ]*, pbboolean& *IsNull*)

GetStringArrayItem (pbarray *array*, pblong *dim[ ]*, pbboolean& *IsNull*)

GetTimeArrayItem (pbarray *array*, pblong *dim[ ]*, pbboolean& *IsNull*)

GetUintArrayItem (pbarray *array*, pblong *dim[ ]*, pbboolean& *IsNull*)

GetUlongArrayItem (pbarray *array*, pblong *dim[ ]*, pbboolean& *IsNull*)

Argument	**Description**
array	A valid pbarray structure
dim	The dimension of the array item to be obtained
IsNull	Indicates whether the array item is null

Return value

The value of the array item.

Examples

This example gets the value of an array item of type pbobject:

```
pbobject      pPBObject = NULL;
pbboolean     bIsNull = 0;
pblong        dim[1];

dim[0] = pbl + 1;
pPBObject = session->GetObjectArrayItem(array, dim,
   bIsNull);
```

See also

GetArrayInfo
GetArrayItemType
GetArrayLength
IsArrayItemNull
NewBoundedObjectArray
NewBoundedSimpleArray
NewUnboundedObjectArray
NewUnboundedSimpleArray
ReleaseArrayInfo
SetArrayItemToNull
SetArrayItemValue

Set<type>ArrayItem

Get<*type*>Field

Description

A set of methods that gets the value of an instance field of an object.

Syntax

GetArrayField (pbobject *obj*, pbfieldID *fid*, pbboolean& *isNull*)

GetBlobField (pbobject *obj*, pbfieldID *fid*, pbboolean& *isNull*)

GetBoolField (pbobject *obj*, pbfieldID *fid*, pbboolean& *isNull*)

GetByteField (pbobject *obj*, pbfieldID *fid*, pbboolean& *isNull*)

GetCharField (pbobject *obj*, pbfieldID *fid*, pbboolean& *isNull*)

GetDateField (pbobject *obj*, pbfieldID *fid*, pbboolean& *isNull*)

GetDateTimeField (pbobject *obj*, pbfieldID *fid*, pbboolean& *isNull*)

GetDecField (pbobject *obj*, pbfieldID *fid*, pbboolean& *isNull*)

GetDoubleField (pbobject *obj*, pbfieldID *fid*, pbboolean& *isNull*)

GetIntField (pbobject *obj*, pbfieldID *fid*, pbboolean& *isNull*)

GetLongField(pbobject *obj*, pbfieldID *fid*, pbboolean& *isNull*)

GetLongLongField(pbobject *obj*, pbfieldID *fid*, pbboolean& *isNull*)

GetObjectField (pbobject *obj*, pbfieldID *fid*, pbboolean& *isNull*)

GetRealField (pbobject *obj*, pbfieldID *fid*, pbboolean& *isNull*)

GetStringField (pbobject *obj*, pbfieldID *fid*, pbboolean& *isNull*)

GetTimeField (pbobject *obj*, pbfieldID *fid*, pbint *value*)

GetUintField (pbobject *obj*, pbfieldID *fid*, pbboolean& *isNull*)

GetUlongField (pbobject *obj*, pbfieldID *fid*, pbboolean& *isNull*)

Argument	**Description**
obj	The handle of the object whose field is to be accessed
fid	The field ID of the specified object
isNull	Indicates whether the field is null

Return value

A predefined PBNI datatype that corresponds to the PowerBuilder datatype in the method name.

Examples

This example gets the value of a field of type pbstring:

```
pbboolean   isNull;
pbstring pstr =
   session->GetStringField(proxy, fid, isNull);
if (pstr != NULL)
{
   myclass = session->GetString(pstr);
   // process myclass
   }
```

See also

GetFieldID
GetFieldType
GetNumOfFields
IsFieldArray
IsFieldNull
IsFieldObject
SetFieldToNull

Set<type>Field

Get<*type*>GlobalVar

Description

A set of methods that gets the value of a global variable of a specific datatype.

Syntax

GetArrayGlobalVar (pbfieldID *fid*, pbboolean& *isNull*)

GetBlobGlobalVar (pbfieldID *fid*, pbboolean& *isNull*)

GetBoolGlobalVar (pbfieldID *fid*, pbboolean& *isNull*)

GetByteGlobalVar (pbfieldID *fid*, pbboolean& *isNull*)

GetCharGlobalVar (pbfieldID *fid*, pbboolean& *isNull*)

GetDateGlobalVar (pbfieldID *fid*, pbboolean& *isNull*)

GetDateTimeGlobalVar (pbfieldID *fid*, pbboolean& *isNull*)

GetDecGlobalVar (pbfieldID *fid*, pbboolean& *isNull*)

GetDoubleGlobalVar (pbfieldID *fid*, pbboolean& *isNull*)

GetIntGlobalVar (pbfieldID *fid*, pbboolean& *isNull*)

GetLongGlobalVar(pbfieldID *fid*, pbboolean& *isNull*)

GetLongLongGlobalVar(pbfieldID *fid*, pbboolean& *isNull*)

GetObjectGlobalVar (pbfieldID *fid*, pbboolean& *isNull*)

GetRealGlobalVar (pbfieldID *fid*, pbboolean& *isNull*)

GetStringGlobalVar (pbfieldID *fid*, pbboolean& *isNull*)

GetTimeGlobalVar (pbfieldID *fid*, pbint *value*)

GetUintGlobalVar (pbfieldID *fid*, pbboolean& *isNull*)

GetUlongGlobalVar (pbfieldID *fid*, pbboolean& *isNull*)

Argument	**Description**
fid	The field ID of the global variable
isNull	Indicates whether the variable is null

Return value

A predefined PBNI datatype that corresponds to the PowerBuilder datatype in the method name.

Examples

This code gets the value of a global variable of datatype long using its field ID:

```
fid = session -> GetGlobalVarID("l_gvar");
l_val = session -> GetLongGlobalVar(fid, isNull);
session -> SetLongGlobalVar(fid, l_val + 1);
```

See also

GetGlobalVarID
GetGlobalVarType

IsGlobalVarArray
IsGlobalVarNull
IsGlobalVarObject
SetGlobalVarToNull
Set<type>GlobalVar

Get<*type*>SharedVar

Description

A set of methods that gets the value of a shared variable of a specific datatype.

Syntax

GetArraySharedVar (pbgroup *group*, pbfieldID *fid*, pbboolean& *isNull*)

GetBlobSharedVar (pbgroup *group*, pbfieldID *fid*, pbboolean& *isNull*)

GetBoolSharedVar (pbgroup *group*, pbfieldID *fid*, pbboolean& *isNull*)

GetByteSharedVar (pbgroup *group*, pbfieldID *fid*, pbboolean& *isNull*)

GetCharSharedVar (pbgroup *group*, pbfieldID *fid*, pbboolean& *isNull*)

GetDateSharedVar (pbgroup *group*, pbfieldID *fid*, pbboolean& *isNull*)

GetDateTimeSharedVar (pbgroup *group*, pbfieldID *fid*, pbboolean& *isNull*)

GetDecSharedVar (pbgroup *group*, pbfieldID *fid*, pbboolean& *isNull*)

GetDoubleSharedVar (pbgroup *group*, pbfieldID *fid*, pbboolean& *isNull*)

GetIntSharedVar (pbgroup *group*, pbfieldID *fid*, pbboolean& *isNull*)

GetLongSharedVar(pbgroup *group*, pbfieldID *fid*, pbboolean& *isNull*)

GetLongLongSharedVar(pbgroup *group*, pbfieldID *fid*, pbboolean& *isNull*)

GetObjectSharedVar (pbgroup *group*, pbfieldID *fid*, pbboolean& *isNull*)

GetRealSharedVar (pbgroup *group*, pbfieldID *fid*, pbboolean& *isNull*)

GetStringSharedVar (pbgroup *group*, pbfieldID *fid*, pbboolean& *isNull*)

GetTimeSharedVar (pbgroup *group*, pbfieldID *fid*, pbint *value*)

GetUintSharedVar (pbgroup *group*, pbfieldID *fid*, pbboolean& *isNull*)

GetUlongSharedVar (pbgroup *group*, pbfieldID *fid*, pbboolean& *isNull*)

Argument	Description
group	The group whose shared variable is to be accessed
fid	The field ID of the shared variable
isNull	Indicates whether the variable is null

Return value

A predefined PBNI datatype that corresponds to the PowerBuilder datatype in the method name.

Examples

This code gets the value of a shared variable of type integer:

```
curGroup = session -> GetCurrGroup();
fid = session -> GetSharedVarID(curGroup, "i_svar");
if (fid == 0xffff)
{
   MessageBox(NULL, "Illegal fid!", "default", MB_OK);
   return;
}
i_val = session-> GetIntSharedVar(curGroup, fid,
   isNull);
session-> SetIntSharedVar(curGroup, fid, i_val+1);
```

See also

GetSharedVarID
GetSharedVarType
IsSharedVarArray
IsSharedVarNull
IsSharedVarObject
Set<type>SharedVar
SetSharedVarToNull

GetArrayInfo

Description

Obtains information about an array.

Syntax

GetArrayInfo(pbarray *array*)

Argument	Description
array	A valid array handle

Return value

PBArrayInfo*.

Examples

This IF-ELSE statement populates a PBArrayInfo structure if the array in the first value of a PBCallInfo structure is not null:

```
if ( !(ci->pArgs->GetAt(0)->IsNull()) )
{
   array = ci->pArgs->GetAt(0)->GetArray();
   pArrayInfo = session->GetArrayInfo (array);
   pArrayItemCount = session->GetArrayLength(array);
}
else
{
   // NULL array
pArrayItemCount = 0;
}
```

Usage

If the array is an unbounded array, the bounds information in PBArrayInfo is undetermined. The returned PBArrayInfo must be freed later by ReleaseArrayInfo.

See also

Get<type>ArrayItem
GetArrayItemType
GetArrayLength
IsArrayItemNull
NewBoundedObjectArray
NewBoundedSimpleArray
NewUnboundedObjectArray
NewUnboundedSimpleArray
ReleaseArrayInfo
SetArrayItemToNull
SetArrayItemValue
Set<type>ArrayItem

GetArrayItemType

Description

Obtains the datatype of an item in an array.

Syntax

GetArrayItemType(pbarray *array*, pblong *dim*[ ])

Argument	**Description**
array	A valid pbarray structure.
dim	A pblong array to hold the indexes of each dimension of the array. The size of the array must equal the dimensions of *array*.

Return value

pbuint.

See also

Get<type>ArrayItem
GetArrayInfo
GetArrayLength
IsArrayItemNull
NewBoundedObjectArray
NewBoundedSimpleArray
NewUnboundedObjectArray
NewUnboundedSimpleArray
ReleaseArrayInfo
SetArrayItemToNull
SetArrayItemValue
Set<type>ArrayItem

GetArrayLength

Description

Obtains the length of an array.

Syntax

GetArrayLength(pbarray *array*)

Argument	Description
array	A valid array handle

Return value

pblong.

Examples

This IF-ELSE statement populates a PBArrayInfo structure. If the array in the first value of a PBCallInfo structure is not null, it sets the value of the *pArrayItemCount* variable to the length of the array:

```
if ( !(ci->pArgs->GetAt(0)->IsNull()) )
{
   array = ci->pArgs->GetAt(0)->GetArray();
   pArrayInfo = session->GetArrayInfo (array);
   pArrayItemCount = session->GetArrayLength(array);
}
else
{
   // NULL array
pArrayItemCount = 0;
}
```

See also

Get<type>ArrayItem
GetArrayInfo
IsArrayItemNull
NewBoundedObjectArray
NewBoundedSimpleArray
NewUnboundedObjectArray
NewUnboundedSimpleArray
ReleaseArrayInfo
SetArrayItemToNull
SetArrayItemValue
Set<type>ArrayItem

GetBlob

Description

Returns a pointer to the data buffer for a blob.

Syntax

GetBlob(pbblob *bin*)

Argument	Description
bin	A pointer to the source buffer

Return value

void*.

Examples

In this CASE clause, the value returned from GetBlob is cast to the LPCTSTR variable *pStr*. If it is not null, the return value in the PBCallInfo structure is set to the value of the blob:

```
case pbvalue_blob:
   pStr = (LPCTSTR)Session-> GetBlob(retVal.blob_val);
   if (strncmp(pStr, "null", 4)==0 )
      ci -> returnValue ->SetToNull();
   else
      {
         ci -> returnValue->SetBlob(retVal.blob_val);
         Session -> ReleaseValue(retVal);
      }
   break;
```

See also

GetBlobLength
NewBlob
SetBlob

GetBlobLength

Description

Returns the length in bytes of blob data in a buffer.

Syntax

GetBlobLength (pbblob *bin*)

Argument	Description
bin	A pointer to the source buffer

Return value

pblong.

Examples

In this example, the IPB_Value GetBlob function is used to get a blob value from the PBCallInfo structure. The length of the blob is used as an argument to the NewBlob function:

```
PBCallInfo* ci = new PBCallInfo;
pbblob ret_val;
```

```
pblong bloblen;

ret_val = ci.returnValue-> GetBlob();
bloblen = Session-> GetBlobLength(ret_val);
ret_val = Session-> NewBlob
   (Session->GetBlob(ret_val), bloblen);
```

See also

GetBlob
NewBlob
SetBlob

GetClass

Description

Returns the class handle of a PowerBuilder object. This function is most frequently used to obtain a class handle for use with the GetMethodID function.

Syntax

GetClass (pbobject *obj*)

Argument	Description
obj	A valid PowerBuilder object handle

Return value

pbclass or null on error.

Examples

In this example, GetClass is used to obtain the class of a variable of type UserData so that the class can be used as an argument to the GetMethodID function:

```
BOOL CALLBACK CFontEnumerator::EnumFontProc
(
   LPLOGFONT lplf,
   LPNEWTEXTMETRIC lpntm,
   DWORD FontType,
   LPVOID userData
)
{
   UserData* ud = (UserData*)userData;
   pbclass clz = ud->session->GetClass(ud->object);
   pbmethodID mid = ud->session->GetMethodID
      (clz, "onnewfont", PBRT_EVENT, "IS");

   PBCallInfo ci;
   ud->session->InitCallInfo(clz, mid, &ci);

   pbstring str = ud->session->NewString
      (lplf->lfFaceName);
   ci.pArgs->GetAt(0)->SetPBString(str);
```

```
      ud->session->TriggerEvent(ud->object, mid, &ci);

      pbint ret = ci.returnValue->GetInt();

      ud->session->FreeCallInfo(&ci);

      return ret == 1 ? TRUE : FALSE;
   }
```

See also GetClassName
GetMethodID

GetClassName

Description Returns the name of a class in lowercase.

Syntax GetClassName(pbclass *cls*)

Argument	Description
cls	A valid class handle

Return value LPCTSTR.

Examples This example gets the name of a class and sets the size of the variable *stLength* to the length of the returned string plus 1:

```
LPCTSTR myClassName = session->GetClassName( myClass );
size_t stLength = strlen( (LPSTR)myClassName ) + 1;
```

See also GetClass

GetCurrGroup

Description Obtains the name of the current group.

Syntax GetCurrGroup( )

Return value pbgroup or null on failure.

Examples This example gets the name of the current group and uses it to obtain the identifier of a shared variable, get the shared variable's value, and reset the shared variable's value:

```
curGroup = session -> GetCurrGroup();
fid = session -> GetSharedVarID(curGroup, "i_svar");
if (fid == 0xffff)
```

```
{
   MessageBox(NULL, "Illegal fid!", "default", MB_OK);
   return;
}
i_val = session-> GetIntSharedVar(curGroup, fid,
   isNull);
session-> SetIntSharedVar(curGroup, fid, i_val+1);
```

See also

Get<type>SharedVar
GetSharedVarID
Set<type>SharedVar

GetDateString

Description

Converts data in a pbdate object to a string.

Syntax

GetDateString(pbdate *date*)

Argument	Description
date	The pbdate data object to be converted to a string.

Return value

LPCTSTR.

See also

NewDecimal
SetDecimal

GetDateTimeString

Description

Converts data in a pbdatetime object to a string.

Syntax

GetDateTimeString(pbdatetime *datetime*)

Argument	Description
datetime	The pbdatetime data object to be converted to a string.

Return value

LPCTSTR.

See also

NewDecimal
SetDecimal

GetDecimalString

Description Converts decimal data in a pbdec object to a string.

Syntax GetDecimalString(pbdec *dec*)

Argument	**Description**
dec	The pbdec data object to be converted to a string.

Return value LPCTSTR.

Examples This code checks whether a value in the PBCallInfo structure is null. If it is not, it sets the value in the *pArguments* array to the value in PBCallInfo:

```
case pbvalue_dec:
if (ci->pArgs->GetAt(i)->IsNull())
{
   pArguments[i].dec_val = Session->NewDecimal();
   Session->SetDecimal(pArguments[i].dec_val, "1.0");
}
else
   pArguments[i].dec_val =
      ci->pArgs->GetAt(i)->GetDecimalString();
break;
```

See also NewDecimal
ReleaseDecimalString
SetDecimal

GetEnumItemName

Description Obtains the name of an enumerated variable.

Syntax GetEnumItemName(LPCTSTR *enumName*, long *enumItemValue*)

Return value LPCTSTR.

See also GetEnumItemValue

GetEnumItemValue

Description

Obtains the value of an enumerated variable.

Syntax

GetEnumItemValue(LPCTSTR *enumName*, LPCTSTR *enumItemName*)

Return value

Long.

Examples

This example gets the numeric value for the boolean! enumerated value, then uses it to return the string value:

```
pblong lType = session->GetEnumItemValue("object",
   boolean" ); // returns 138
LPCTSTR szEnum = session->GetEnumItemName( "object",
   lType ); // returns "boolean"
```

Usage

GetEnumItemValue and GetEnumItemName support enumerated types. They allow you to convert the name of an enumerated value, a string with an appended exclamation mark (!), to an integer value, and vice versa.

The ! character must be omitted
When you use these functions, the *enumItemName* should not use the appended exclamation mark (!) character.

To return an enumerated value from an extension to PowerScript, you must use the SetLong function to set the value of the enumerated variable into IPB_Value. Using SetInt or SetShort fails. However, you can use GetInt or GetShort as well as GetLong to obtain the enumerated variable's value, assuming the value is in the appropriate range. For example, if you attempt to use GetInt to obtain a value that is more than 32767, the returned value is truncated.

See also

GetEnumItemName

GetException

Description

Obtains the current thrown exception object.

Syntax

GetException ()

Return value

pbobject.

Examples

This code gets the current exception object, clears the exception, and gets the class of the exception object:

```
pbclass cls;
pbobject  ex;
...
ex = session-> GetException();
session-> ClearException();
cls = session-> GetClass(ex);
```

See also

ClearException
HasExceptionThrown

GetFieldID

Description

Obtains the internal ID of a class instance variable.

Syntax

GetFieldID(pbclass *cls*, LPCTSTR *fieldName*)

Argument	Description
cls	The class in which the field resides
fieldName	The instance member name, in lowercase

Return value

pbfieldID or 0xffff if a field ID cannot be found.

Examples

This function obtains the identifier of a class's visible field, if it exists, and uses it to set the value of the field:

```
void CallBack::f_setvisible(IPB_Session* session,
   pbobject dwobj)
{
   pbclass cls;
   IPB_Value* pv;
   pbfieldID fid;
   pbstring strtmp;
   bool isTrue;
   pbboolean isNull;

   cls = session-> GetClass(dwobj);
   fid = session-> GetFieldID(cls, "visible");
```

```
        if (fid == kUndefinedFieldID)
           return;
        isTrue = session-> GetBoolField(dwobj, fid, isNull);
        if (isTrue)
           session -> SetBoolField(dwobj, fid, false);
         else
           session -> SetBoolField(dwobj, fid, true);
         return ;
    }
```

Usage

GetFieldID is one of a set of functions that allows native code to access the fields of Java objects and get and set their values. You use GetFieldID to retrieve the value of a field, specifying the class name and the field name. The field ID returned can be used as an argument to the related functions.

See also

GetFieldType
Get<type>Field
GetNumOfFields
IsFieldArray
IsFieldNull
IsFieldObject
Set<type>Field
SetFieldToNull

GetFieldName

Description

Obtains the name of the specified field.

Syntax

GetFieldName(pbclass *cls*, pbfieldID *fid*)

Argument	Description
cls	The class that defines the field
fid	The internal ID of the class instance variable

Return value

LPCTSTR. The field name of the specified field. If an incorrect field ID is specified, this function returns null.

GetFieldType

Description
Obtains the datatype of a field declared by a class.

Syntax
GetFieldType(pbclass *cls*, pbfieldID *fid*)

Argument	Description
cls	The class that defines the field
fid	The internal ID of the class instance variable

Return value
pbint. A simple datatype defined in the list of pbvalue_*type* enumerated types, such as pbvalue_int. See “PBNI enumerated types” on page 82.

Examples
This statement gets the type of the specified field ID:

```
pbint pbfieldType = session->GetFieldType(cls, fid);
```

See also
GetFieldID
Get<type>Field
GetNumOfFields
IsFieldArray
IsFieldNull
IsFieldObject
Set<type>Field
SetFieldToNull

GetGlobalVarID

Description
Returns the internal ID of a global variable.

Syntax
GetGlobalVarID(LPCTSTR *name*)

Argument	Description
name	The name of the global variable in lowercase

Return value
pbfieldID or null on failure.

Examples
This example gets the internal identifier of a long variable and uses it to get and set a global variable:

```
fid = session -> GetGlobalVarID("l_gvar");
l_val = session -> GetLongGlobalVar(fid, isNull);
session -> SetLongGlobalVar(fid, l_val + 1);
```

See also
GetGlobalVarType
Get<type>GlobalVar
IsGlobalVarArray

IsGlobalVarNull
IsGlobalVarObject

SetGlobalVarToNull
Set<type>GlobalVar

GetGlobalVarType

Description

Obtains the datatype of a global variable.

Syntax

GetGlobalVarType(pbfieldID *fid*)

Argument	Description
fid	The internal ID of the class instance variable

Return value

pbuint. A simple datatype defined in the list of pbvalue_type enumerated types.

Examples

This code tests getting and setting a global integer variable using the field ID *fid*:

```
fid = session -> GetGlobalVarID("i_gvar");
if (session -> GetGlobalVarType(fid) == pbvalue_int)
    {
        i_val=session -> GetIntGlobalVar(fid,isNull);
        session -> SetIntGlobalVar(fid,i_val+1);
    }
```

See also

GetGlobalVarID
Get<type>GlobalVar
IsGlobalVarArray
IsGlobalVarNull
IsGlobalVarObject

SetGlobalVarToNull
Set<type>GlobalVar

GetMarshaler

Description

Obtains the marshaler object associated with a proxy object.

Syntax

GetMarshaler(pbproxyObject *obj*)

Argument	Description
obj	An object of type pbproxyObject for which you want to find the marshaler.

Return value

IPBX_Marshaler*.

Examples

This code creates a Java marshaler object and associates it with a proxy. Later, GetMarshaler is used to get the marshaler object:

```
// Create JavaMarshaler
JavaMarshaler* marshaler = new JavaMarshaler(env,
   proxy, jobj);

// Associate the JavaMarshaler with the
// PowerBuilder proxy
session-> SetMarshaler(proxy, marshaler);

ci-> pArgs-> GetAt(0)-> SetObject(proxy);

ci-> returnValue-> SetLong(kSuccessful);

return PBX_OK;
...
// Get the marshaler
IPBX_Marshaler* pIPBX_Marshaler = NULL;

pIPBX_Marshaler =(IPBX_Marshaler*)session
   -> GetMarshaler(proxy);
```

See also

SetMarshaler

GetMethodID

Description

Returns the ID of the requested method.

Syntax

GetMethodID(pbclass *cls*, LPCTSTR *methodName*, PBRoutineType *rt*, LPCTSTR *signature*, pbboolean *publicOnly*)

Argument	Description
cls	pbclass containing the function.
methodName	The string name of the method in lowercase.
rt	Type of the method: PBRT_FUNCTION for function or PBRT_EVENT for event.
signature	Internal signature of the PowerBuilder function, used to identify polymorphic methods in one class. Obtained with the pbsig105 tool. If the signature is a null string (" "), the first method found with the name *methodName* is returned.
publicOnly	A boolean that determines whether only public methods are searched (true) or all methods are searched (false). The default is true.

Return value

pbMethodID of the method or kUndefinedMethodID on error.

Examples

This function uses GetMethodID to obtain the identifier (*mid*) of the onnewfont function so that the identifier can be used to initialize the PBCallInfo structure and call the function:

```
BOOL CALLBACK CFontEnumerator::EnumFontProc
(
   LPLOGFONT lplf,
   LPNEWTEXTMETRIC lpntm,
   DWORD FontType,
   LPVOID userData
)
{
   UserData* ud = (UserData*)userData;
   pbclass clz = ud->session->GetClass(ud->object);
   pbmethodID mid = ud->session->GetMethodID(clz,
      "onnewfont", PBRT_EVENT, "IS");

   PBCallInfo ci;
   ud->session->InitCallInfo(clz, mid, &ci);
   pbstring str = ud->session->
      NewString(lplf->lfFaceName);
   ci.pArgs->GetAt(0)->SetPBString(str);
   ud->session->TriggerEvent(ud->object, mid, &ci);
   pbint ret = ci.returnValue->GetInt();
```

```
       ud->session->FreeCallInfo(&ci);

       return ret == 1 ? TRUE : FALSE;
    }
```

Usage

The GetMethodID function is used to obtain the ID of a method so you can use it to invoke functions and trigger events.

See also

FindMatchingFunction
InvokeObjectFunction
TriggerEvent
"Calling PowerScript from an extension" on page 37

GetMethodIDByEventID

Description

Returns the ID of the method that has a given predefined PowerBuilder event ID.

Syntax

GetMethodIDByEventID(pbclass *cls*, LPCTSTR *eventID*)

Argument	**Description**
cls	pbclass containing the method
eventID	A PowerBuilder predefined event string, such as pbm_bnclicked

Return value

pbMethodID of the method or kUndefinedMethodID on error.

Examples

This statement obtains the ID of the event identified by the name *pbm_lbuttonup*:

```
pbmethodID mid = d_session->GetMethodIDByEventID(clz,
   "pbm_lbuttonup");
```

See also

GetMethodID

GetNativeInterface

Description	Obtains a pointer to the interface of a native class.
Syntax	GetNativeInterface(pbobject *obj*)

Argument	Description
obj	A valid object handle

Return value: IPBX_UserObject.

Examples: This example invokes the function f_retrieve in the native class Cmy_pbni to retrieve a DataWindow object:

```
long f_retrieve(IPB_Session* session, pbint iarg,
   pbobject dwObj, pbobject extObj)
{
   Imy_pbni* pImy_pbni = NULL;
   pblong lRet;
   if (session -> IsNativeObject(extObj) )
   {
      pImy_pbni = (Imy_pbni*) session ->
         GetNativeInterface(extObj);

      lRet = pImy_pbni-> f_Retrieve(session,
         iarg, dwObj);
   }
   return lRet;
}
```

Usage: Use this method in conjunction with IsNativeObject to obtain a direct reference to the IPBX_UserObject associated with a native class in the same PowerBuilder extension. The class and its methods can then be accessed directly.

See also: IsNativeObject

GetNumOfFields

Description
Returns the number of fields in the specified class.

Syntax
GetNumOfFields(pbclass *cls*)

Argument	Description
cls	A valid class handle for the class whose field is to be accessed

Return value
pbulong.

Examples
This code gets the numbers of fields in the class *clz*:

```
pbclass clz = d_session->GetClass(d_pbobj);
pbulong nf = d_session->GetNumOfFields(clz);
```

See also
GetFieldID
Get<type>Field
IsFieldArray
IsFieldNull
IsFieldObject
SetFieldToNull
Set<type>Field

GetPBAnyArrayItem

Description
Obtains the value of a global variable of type Any.

Syntax
GetPBAnyArrayItem(pbarray *array*, pblong *dim*[], pbboolean& *isNull*)

Argument	Description
array	A valid pbarray structure.
dim	A pblong array to hold the indexes of each dimension of the array. The size of the array must equal the dimensions of *array*.
isNull	Indicates whether the variable is null

Return value
IPB_Value*.

Usage
See GetPBAnyField.

See also
GetPBAnyField
GetPBAnyGlobalVar
GetPBAnySharedVar

GetPBAnyField

Description

Obtains the value of a variable of type Any.

Syntax

GetPBAnyField(pbobject *obj*, pbfieldID *fid*, pbboolean& *isNull*)

Argument	Description
obj	A valid object handle for the object whose value is to be obtained
fid	The field ID of the variable
isNull	Indicates whether the variable is null

Return value

IPB_Value*.

Examples

This example tests all the functions used to get the value of variables of type Any, using PushLocalFrame and PopLocalFrame to simulate the scope of a function call:

```
session->PushLocalFrame();
pbgroup vgroup = session->FindGroup("n_test",
   pbgroup_userobject);
pbclass vcls = session->FindClass(vgroup, "n_test");
pbobject vobj = session->NewObject(vcls);
pbboolean isNull;

pbfieldID vfid = session->GetFieldID(vcls, "i_a");
IPB_Value* value = session->GetPBAnyField(vobj,
   vfid, isNull);
pbstring str = value->GetString(); // save actual value

vfid = session->GetSharedVarID(vgroup, "s_a");
value = session->GetPBAnySharedVar(vgroup,
   vfid, isNull);
//Get the actual value here.

vfid = session->GetGlobalVarID("g_a");
value = session->GetPBAnyGlobalVar(vfid, isNull);
//Get the actual value here.

vfid = session->GetFieldID(vcls, "i_array");
pbarray arr = session->GetArrayField(vobj,
   vfid, isNull);    //Get the any array first.

long dim = 1;
value = session->GetPBAnyArrayItem(arr, &dim, isNull);
//Get the actual value here.
session->PopLocalFrame();
```

Usage

The value you retrieve must be of datatype Any to use this function; that is, the variable associated with the function must be declared as a variable of type Any in the development environment. If it is not, the function returns a null pointer and the value of *isNull* is set to true.

This function returns a pointer to an IPB_Value instance. When it is called, memory is allocated for the returned IPB_Value instance, and the pointer is recorded in the current local frame. The pointer is deleted automatically when the current local frame is popped, which occurs when the current local function returns (you can also call PopLocalFrame to force the frame to be popped).

If you want to use the value returned, you must save the value pointed to by the IPB_Value instance (not the IPB_Value instance itself) before the frame is popped. If you save the pointer itself, the value is only valid until the original value is destroyed.

You can use the AcquireValue function to save the value, or one of the IPB_Value Get<*type*> functions. For example, the following code saves the string value in the IPB_Value instance *ivalue* into the string *str*. The value in *str* can be used after the local frame is popped and *ivalue* is deleted:

```
IPB_Value* ivalue = session->GetPBAnyField(vobj, vfid,
   isNull);
pbstring str = ivalue->GetString();
```

If you do not know the actual datatype of the Any variable, use the IPB_Value GetType function to get its datatype first, then use the appropriate get function to get its value.

IPB_Value holds a reference to the original value
The value in the IPB_Value instance is a reference to the original value. If you change the actual value of the returned IPB_Value, the original value is also changed. If you use the AcquireValue function to save the value, it clones a new IPB_Value and resets the existing IPB_Value pointer.

See also

GetPBAnyArrayItem
GetPBAnyGlobalVar
GetPBAnySharedVar

GetPBAnyGlobalVar

Description Obtains the value of a global variable of type Any.

Syntax GetPBAnyGlobalVar(pbfieldID *fid*, pbboolean& *isNull*)

Argument	Description
fid	The field ID of the variable
isNull	Indicates whether the variable is null

Return value IPB_Value*.

Usage See GetPBAnyField.

See also GetPBAnyArrayItem
GetPBAnyField
GetPBAnySharedVar

GetPBAnySharedVar

Description Obtains the value of a shared variable of type Any.

Syntax GetPBAnySharedVar(pbgroup *group*, pbfieldID *fid*, pbboolean& *isNull*)

Argument	Description
group	The group to which the variable belongs
fid	The field ID of the variable
isNull	Indicates whether the variable is null

Return value IPB_Value*.

Usage See GetPBAnyField.

See also GetPBAnyArrayItem
GetPBAnyField
GetPBAnyGlobalVar

GetProp

Description
Retrieves a pointer to the data value of a variable that has been registered as a shared property for the current IPB session.

Syntax
GetProp(LPCTSTR *name*)

Argument	Description
name	The name of the variable whose value is to be retrieved.

Return value
Void*. If the variable does not exist, returns null.

Examples
See SetProp.

Usage
The variable's name must first be registered with the session using the SetProp function.

See also
RemoveProp
SetProp

GetResultSetAccessor

Description
Obtains an interface through which you can read data from a result set.

Syntax
GetResultSetAccessor (pbobject *rs*)

Argument	Description
rs	A pbobject holding a result set obtained using CreateResultSet

Return value
IPB_ResultSetAccessor

Examples
This example gets a result set, *rs*, from the return value of a PowerScript function and uses it to create an IPB_ResultSetAccessor object, *rsa*:

```
pbobject rs = ci.returnValue->GetObject();
IPB_ResultSetAccessor* rsa =
   session->GetResultSetAccessor(rs);
```

See also
CreateResultSet
ReleaseResultSetAccessor

GetSharedVarID

Description

Returns the internal ID of a shared variable.

Syntax

GettSharedVarID(pbgroup *group*, LPCTSTR *fieldname*)

Argument	Description
group	The group to which the shared variable belongs
fieldname	The name of the field that contains the shared variable, in lowercase

Return value

pbfieldID. Returns 0xffff if the ID cannot be found.

Examples

This code uses GetSharedVarID to obtain the field ID of a shared variable, then uses that ID to obtain the value of the variable:

```
curGroup = session -> GetCurrGroup();
fid = session -> GetSharedVarID(curGroup,"i_svar");
if (fid == 0xffff)
{
   MessageBox(NULL, "Illegal fid!", "default", MB_OK);
   return;
}
i_val = session -> GetIntSharedVar(curGroup, fid,
   isNull);
```

See also

Get<type>SharedVar
GetSharedVarType
IsSharedVarArray
IsSharedVarNull
IsSharedVarObject
Set<type>SharedVar
SetSharedVarToNull

GetSharedVarType

Description

Obtains the datatype of the specified shared variable.

Syntax

GetSharedVarType (pbgroup *group*, pbfieldID *fid*)

Argument	**Description**
group	The group to which the shared variable belongs
fid	The internal field ID of the shared variable

Return value

pbuint. A simple datatype defined in the list of pbvalue_type enumerated types.

Examples

This example gets the field ID of a shared variable, then uses that ID to get the type of the shared variable:

```
pbuint pbvaltype;
curGroup = session -> GetCurrGroup();
fid = session -> GetSharedVarID(curGroup,"i_svar");
pbvaltype = session -> GetSharedVarType(curGroup, fid);
```

See also

Get<type>SharedVar
GetSharedVarID
IsSharedVarArray
IsSharedVarNull
IsSharedVarObject
Set<type>SharedVar
SetSharedVarToNull

GetString

Description

Returns a pointer to the string passed in as an argument.

Syntax

GetString (pbstring* *string*)

Argument	Description
string	A pointer to a pbstring

Return value

LPCTSTR.

Examples

This example uses the IPB_Value GetString function to obtain a string value from the PBCallInfo structure. If the string is not null, the IPB_Session GetString function sets the value of the *proxyname* string to a pointer to the returned value:

```
string proxyName;
{
   pbstring pn = ci->pArgs->GetAt(2)->GetString();

   if (pn == NULL)
   {
      ci->returnValue->SetLong(kInvalidProxyName);
      return PBX_OK;
   }
   else
   {
      proxyName = session->GetString(pn);
   }
}
```

See also

GetStringLength
NewString
SetString

GetStringLength

Description

Returns the length of a string in bytes without the terminator.

Syntax

GetStringLength (pbstring *string*)

Argument	Description
string	The pbstring whose length is to be determined

Return value

pblong.

Examples

These statements set the value of a pblong variable to the length of a string:

```
pblong long_val;
pbstring str_val;
long_val = session-> GetStringLength( str_val );
```

See also

GetString
NewString
SetString

GetSuperClass

Description

Returns the ancestor class of the specified class, if any.

Syntax

GetSuperClass(pbclass *cls*)

Argument	Description
cls	A valid class handle for the descendent class

Return value

pbclass or 0 if the class has no ancestor.

Examples

These statements get the class of an object in the PBCallInfo structure, the ancestor class of that class, and then the name of the ancestor class:

```
pbclass cls, cls_parent;
LPCSTR clsname;

cls = Session-> GetClass(ci-> pArgs-> GetAt(0)->
   GetObject());
cls_parent = Session-> GetSuperClass(cls);
clsname = Session-> GetClassName(cls_parent);
```

See also

GetClass
GetClassName

GetSystemClass

Description Returns the first system class that the input class inherits from.

Syntax GetSystemClass (pbclass *cls*)

Argument	Description
cls	A descendent class whose ancestor system class is to be determined

Return value pbclass or null on error.

See also GetMethodID
GetSystemGroup

GetSystemGroup

Description Returns a PowerBuilder internal system group.

Syntax GetSystemGroup()

Return value pbclass or null on error.

Usage GetSystemGroup returns the PowerBuilder internal system group, which contains all the system types such as PowerObject, NonVisualObject, Structure, Window, CommandButton, and so on. You can use this system group to obtain a system class. You might need to call PowerScript functions in the PowerBuilder extension. To achieve this, you first need to get the pbclass that the PowerScript function class resides in. This code gets the PowerBuilder system function class:

```
pbgroup sysGroup = session->GetSystemGroup();
pbclass sysFuncClass = session->FindClass(sysGroup,
   "SystemFunctions");
```

After you get the system class, you can obtain the method ID of a PowerScript function by calling FindMatchingFunction, and then you can invoke the PowerScript function.

See also FindMatchingFunction
GetSystemClass

GetTimeString

Description
Converts data in a pbtime object to a string.

Syntax
GetTimeString(pbtime *time*)

Argument	Description
time	The pbtime data object to be converted to a string.

Return value
LPCTSTR.

See also
NewDecimal
SetDecimal

HasExceptionThrown

Description
Checks for the existence of an exception that has been thrown but not cleared.

Syntax
HasExceptionThrown()

Return value
pbboolean. Returns true if a PowerBuilder exception has been thrown but not cleared.

Examples
This example tests whether an exception has been thrown so it can be handled and cleared:

```
try
{
   session->InvokeObjectFunction(pbobj, mid, &ci);
   // Was PB exception thrown?
   if (session-> HasExceptionThrown())
   {
       // Handle PB exception
       session-> ClearException();
   }
}
```

See also
ClearException
GetException
ThrowException

InitCallInfo

Description

Initializes the PBCallInfo structure.

Syntax

InitCallInfo(pbclass *cls*, pbmethodID *mid*, PBCallInfo **ci*)

Argument	Description
cls	The pbclass containing the method
mid	The pbMethodID returned by GetMethodID
ci	A pointer to a preallocated PBCallInfo structure

Return value

PBXRESULT. Returns PBX_OK on success, and PBX_E_INVALID_ARGUMENT on failure.

Examples

This example shows the implementation of a TriggerEvent function in a visual class. It takes an event name as an argument, obtains the class and method ID needed to initialize the PBCallInfo structure, triggers the event, and frees the PBCallInfo structure:

```
void CVisualExt::TriggerEvent(LPCTSTR eventName)
{
   pbclass clz = d_session->GetClass(d_pbobj);
   pbmethodID mid = d_session->GetMethodID(clz,
      eventName, PBRT_EVENT, "I");

   PBCallInfo ci;
   d_session->InitCallInfo(clz, mid, &ci);
   d_session->TriggerEvent(d_pbobj, mid, &ci);
   d_session->FreeCallInfo(&ci);
}
```

Usage

On return, this method allocates enough space for the arguments, and then initializes the arguments and return value. You must set appropriate values in the PBCallInfo structure. Note that the structure itself must have been allocated before the call.

See also

FreeCallInfo

InvokeClassFunction

Description

Invokes system or user global functions.

Syntax

InvokeClassFunction(pbclass *cls*, pbmethodID *mid*, PBCallInfo **ci*)

Argument	Description
cls	The class that contains the global function. If this is a system function, *cls* is obtained with GetSystemFunctionsClass; otherwise, it is obtained with FindGroup and FindClass, with the function name as the group/class name.
mid	The pbMethodID returned by GetMethodID.
ci	A pointer to a preallocated PBCallInfo structure.

Return value

PBXRESULT. Returns PBX_OK for success, or one of the following for failure:

PBX_E_INVALID_ARGUMENT
PBX_E_INVOKE_METHOD_INACCESSABLE
PBX_E_INVOKE_WRONG_NUM_ARGS
PBX_E_INVOKE_REFARG_ERROR
PBX_E_INVOKE_METHOD_AMBIGUOUS
PBX_E_INVOKE_FAILURE
PBX_E_INVOKE_FAILURE

Examples

This example gets the PowerBuilder system class and uses it to invoke the double function:

```
cls = session-> GetSystemClass();
mid = session-> GetMethodID
   (cls, "double", PBRT_FUNCTION, "DA");
session-> InitCallInfo(cls, mid, ci);
ci->pArgs -> GetAt(0) -> SetPBString(mystr);
session -> InvokeClassFunction(cls, mid, ci);
```

Usage

On return, this method allocates enough spaces for the arguments, and then initializes arguments and return value. You must set appropriate values in the PBCallInfo structure. Note that the structure itself must have been allocated before the call.

See also

InvokeObjectFunction

InvokeObjectFunction

Description

Invokes a class member method.

Syntax

InvokeObjectFunction(pbobject *obj*, pbmethodID *mid*, PBCallInfo **ci*)

Argument	Description
obj	The pbobject containing the method
mid	The pbMethodID returned by GetMethodID
ci	A pointer to a preallocated PBCallInfo structure

Return value

PBXRESULT. Returns PBX_OK for success, or one of the following for failure:

PBX_E_INVALID_ARGUMENT
PBX_E_INVOKE_METHOD_INACCESSABLE
PBX_E_INVOKE_WRONG_NUM_ARGS
PBX_E_INVOKE_REFARG_ERROR
PBX_E_INVOKE_METHOD_AMBIGUOUS
PBX_E_INVOKE_FAILURE
PBX_E_INVOKE_FAILURE

Examples

This code invokes the DataWindow Update function and returns its integer return value:

```
pbclass cls;
pbmethodID mid;
PBCallInfo* ci = new PBCallInfo;
pbint ret_val;

cls = session->GetClass(dwobj);
mid = session->GetMethodID
   (cls, "Update", PBRT_FUNCTION, "I");
session->InitCallInfo(cls, mid, ci);

session->InvokeObjectFunction(dwobj, mid, ci);

ret_val = ci.returnValue->GetInt();
session->FreeCallInfo(ci);
delete ci;
return ret_val;
```

See also

InvokeClassFunction

IsArrayItemNull

Description Returns true if the array item contains a null value; otherwise it returns false.

Syntax IsArrayItemNull(pbarray *array*, pblong *dim*[ ])

Argument	Description
array	A valid pbarray structure that you want to check for a null-valued array item.
dim	A pblong array to hold the indexes of each dimension of the array. The size of the array must equal the dimensions of *array*.

Return value pbboolean.

See also GetArrayItemType
Set<type>ArrayItem
SetArrayItemToNull

IsAutoInstantiate

Description Returns true if the specified class is an autoinstantiated class; otherwise it returns false.

Syntax IsAutoInstantiate(pbclass)

Argument	Description
cls	A valid class handle or structure

Return value pbboolean.

IsFieldArray

Description Returns true if the field of the specified object is an array; otherwise it returns false.

Syntax IsFieldArray(pbclass *cls*, pbfield *fid*)

Argument	Description
cls	A valid class handle for the class whose field is to be accessed
fid	The field ID of the specified object

Return value pbboolean.

Examples

This code tests whether the field identified by *fid* is an array, and if so, gets the array value:

```
fid = session->GetFieldID(cls, "arr_val");
if (session->IsFieldArray(cls, fid))
{
   arr_val=session->GetArrayField(myobj, fid, isNull);

...
```

See also

GetFieldID
GetFieldType
Get<type>Field
GetNumOfFields
IsFieldNull
IsFieldObject
SetFieldToNull
Set<type>Field

IsFieldNull

Description

Returns true if the field of the specified object is a null value; otherwise it returns false.

Syntax

IsFieldNull(pbobject *obj*, pbfield *fid*)

Argument	Description
obj	A valid object handle for the object whose field is to be accessed
fid	The field ID of the specified object

Return value

pbboolean.

Examples

These statements test whether the field identified by *fid* is null:

```
fid = session -> GetFieldID(cls, "i_val");
if (session -> IsFieldNull(myobj, fid))
```

See also

GetFieldID
GetFieldType
Get<type>Field
GetNumOfFields
IsFieldArray
IsFieldObject
SetFieldToNull
Set<type>Field

IsFieldObject

Description

Returns true if the field of the specified object is an object; otherwise it returns false.

Syntax

IsFieldObject(pbclass *cls*, pbfield *fid*)

Argument	Description
cls	A valid class handle for the class whose field is to be accessed
fid	The field ID of the specified object

Return value

pbboolean.

Examples

These statements test whether the field identified by *fid* is an object:

```
fid = session -> GetFieldID(cls, "obj_val");
if (session -> IsFieldObject(myobj, fid))
```

See also

GetFieldID
GetFieldType
Get<type>Field
GetNumOfFields
IsFieldArray
IsFieldNull
SetFieldToNull
Set<type>Field

IsGlobalVarArray

Description

Returns true if the global variable contains an array; otherwise it returns false.

Syntax

IsGlobalVarArray(pbfield *fid*)

Argument	Description
fid	The field ID of the global variable

Return value

pbboolean.

Examples

These statements test whether the field identified by *fid* is a global variable array:

```
fid = session -> GetGlobalVarID("arr_gvar");
if (session -> IsGlobalVarArray(fid))
{
   arr_val=session -> GetArrayGlobalVar(fid, isNull);
...
```

See also

GetGlobalVarID
GetGlobalVarType
Get<type>GlobalVar
IsGlobalVarNull
IsGlobalVarObject
SetGlobalVarToNull
Set<type>GlobalVar

IsGlobalVarNull

Description

Returns true if the global variable contains a null value; otherwise it returns false.

Syntax

IsGlobalVarNull(pbfield *fid*)

Argument	Description
fid	The field ID of the global variable

Return value

pbboolean.

Examples

These statements test whether the field identified by *fid* is a global variable array:

```
fid = session -> GetGlobalVarID("arr_gvar");
if (session -> IsGlobalVarArray(fid))
{
   arr_val=session -> GetArrayGlobalVar(fid, isNull);
...
```

See also

GetGlobalVarID
GetGlobalVarType
Get<type>GlobalVar
IsGlobalVarArray
IsGlobalVarObject
SetGlobalVarToNull
Set<type>GlobalVar

IsGlobalVarObject

Description

Returns true if the global variable contains an object; otherwise it returns false.

Syntax

IsGlobalVarObject(pbfield *fid*)

Argument	Description
fid	The field ID of the global variable

Return value

pbboolean.

Examples

These statements test whether the field identified by *fid* is a global variable object. If it is, its value is set to another global variable object:

```
fid = session -> GetGlobalVarID("obj2_gvar");
   if (session -> IsGlobalVarObject(fid))
   {
      obj_val = session -> GetObjectGlobalVar(fid,
         isNull);
      cls = session -> GetClass(obj_val);
      fid = session -> GetFieldID(cls, "text");
      s_val = session -> GetStringField(obj_val, fid,
         isNull);
      mystr = session -> GetString(s_val);
      // Set the value of obj2_gvar to obj1_gvar
      fid = session -> GetGlobalVarID("obj1_gvar");
      session -> SetObjectGlobalVar(fid, obj_val);
   }
```

See also

GetGlobalVarID
GetGlobalVarType
Get<type>GlobalVar
IsGlobalVarArray
IsGlobalVarNull
SetGlobalVarToNull
Set<type>GlobalVar

IsNativeObject

Description

Determines whether a pbobject is an instance of a native class.

Syntax

IsNativeObject(pbobject *obj*)

Argument	Description
obj	A valid object handle

Return value

pbboolean.

Examples

The f_getrow function uses IsNativeObject to test whether *extObj* is a native class. If so, it gets the native interface and invokes the f_getrowcount function in the other class:

```
long f_getrow(IPB_Session* session, pbobject dwObj,
   pbobject extObj)
{
   long lRet;
   Imy_pbni* pImy_pbni = NULL;
   IPBX_NonVisualObject* pp=NULL;

    if (session -> IsNativeObject(extObj) )
   {
      pp = (IPBX_NonVisualObject*) session ->
         GetNativeInterface(extObj);
      pImy_pbni = static_cast<Imy_pbni*>(pp);
      lRet = pImy_pbni-> f_GetRowCount(session, dwObj);
   }
   return lRet;
}
```

Usage

Use this method in conjunction with GetNativeInterface to obtain a direct reference to the IPBX_UserObject associated with another native class, so that the class and its methods can be accessed directly.

See also

GetNativeInterface

IsSharedVarArray

Description

Returns true if the shared variable contains an array; otherwise it returns false.

Syntax

IsSharedVarArray(pbgroup *group*, pbfield *fid*)

Argument	**Description**
group	The group whose shared variable is to be accessed
fid	The field ID of the shared variable

Return value

pbboolean.

See also

Get<type>SharedVar
GetSharedVarID
GetSharedVarType
IsSharedVarNull
IsSharedVarObject
Set<type>SharedVar
SetSharedVarToNull

IsSharedVarNull

Description

Returns true if the shared variable contains a null value; otherwise it returns false.

Syntax

IsSharedVarNull(pbgroup *group*, pbfield *fid*)

Argument	**Description**
group	The group whose shared variable is to be accessed
fid	The field ID of the shared variable

Return value

pbboolean.

See also

Get<type>SharedVar
GetSharedVarID
GetSharedVarType
IsSharedVarArray
IsSharedVarObject
Set<type>SharedVar
SetSharedVarToNull

IsSharedVarObject

Description Returns true if the shared variable contains an object; otherwise it returns false.

Syntax IsSharedVarObject(pbgroup *group*, pbfield *fid*)

Argument	Description
group	The group whose shared variable is to be accessed
fid	The field ID of the shared variable

Return value pbboolean.

See also Get<type>SharedVar
GetSharedVarID
GetSharedVarType
IsSharedVarArray
IsSharedVarNull
Set<type>SharedVar
SetSharedVarToNull

NewBlob

Description Creates a new blob and duplicates a buffer for the new blob data.

Syntax NewBlob (const void* *bin*, pblong *len*)

Argument	Description
bin	A void pointer that points to the source buffer
len	The length in bytes of the data in the buffer

Return value pbblob.

Examples If the blob value in the PBCallInfo structure is null, this code creates a new blob value with four bytes in the *pArguments* array; otherwise, it sets the blob value in the *pArguments* array to the value in the PBCallInfo structure:

```
if (ci->pArgs->GetAt(i)->IsNull())
   pArguments[i].blob_val =
      Session->NewBlob("null", 4);
else
   pArguments[i].blob_val =
      ci->pArgs->GetAt(i)->GetBlob();
```

Usage The buffer containing the new blob data is freed when PopLocalFrame is called.

See also PopLocalFrame
SetBlob

NewBoundedObjectArray

Description

Creates a bounded PowerBuilder object or structure array.

Syntax

NewBoundedObjectArray(pbclass *cls*, pbuint *dimension*, PBArrayInfo::ArrayBound* *bounds*)

Argument	Description
cls	A valid class handle of the type of PowerBuilder object or structure array to be created
dimension	A number greater than one that indicates the dimension of the array to be created
bounds	An array containing the upper and lower boundaries of the array to be created

Return value

pbarray or null on failure.

Examples

```
int size;
pbarray pbin_a;
PBArrayInfo* ai;
PBXRESULT ret;
pbclass cls;
pbgroup group;

size = sizeof(PBArrayInfo) +
   sizeof(PBArrayInfo::ArrayBound);
ai = (PBArrayInfo*)malloc(size);
ai-> bounds[0].upperBound=2;
ai-> bounds[0].lowerBound=1;
ai-> bounds[1].upperBound=2;
ai-> bounds[1].lowerBound=1;
ai-> numDimensions=2;

// Create new array pbin_a
group = session-> FindGroup("w_main", pbgroup_window);
if (group==NULL)
   return;
cls = session->FindClass(group, "commandbutton");
if( cls==NULL)
   return;
pbin_a = session->NewBoundedObjectArray(cls,
   ai-> numDimensions, ai-> bounds);
```

See also

Get<type>ArrayItem
GetArrayInfo
GetArrayItemType
GetArrayLength

IsArrayItemNull
NewBoundedSimpleArray
NewUnboundedObjectArray
NewUnboundedSimpleArray
ReleaseArrayInfo
Set<type>ArrayItem
SetArrayItemToNull
SetArrayItemValue

NewBoundedSimpleArray

Description

Creates a bounded simple data array.

Syntax

NewBoundedSimpleArray(pbuint *type*, pbuint *dimension*, PBArrayInfo::ArrayBound* *bounds*)

Argument	Description
type	An enumerated variable of type pbvalue_* indicating the type of simple unbounded array to be created
dimension	A number greater than one that indicates the dimension of the array to be created
bounds	An array containing the upper and lower boundaries of the array to be created

Return value

pbarray or null on failure.

See also

Get<type>ArrayItem
GetArrayInfo
GetArrayItemType
GetArrayLength
IsArrayItemNull
NewBoundedObjectArray
NewUnboundedObjectArray
NewUnboundedSimpleArray
ReleaseArrayInfo
Set<type>ArrayItem
SetArrayItemToNull
SetArrayItemValue

NewDate

Description

Creates a new pbdate data object.

Syntax

NewDate()

Return value

pbdate.

Examples

This example tests whether a date value exists, and, if it does not, it creates a new pbdate object and sets its value to the first day in January, 1900:

```
if (ci->pArgs->GetAt(0)->IsNull())
{
   pArguments[i].date_val = Session->NewDate();

   Session->SetDate(pArguments[i].date_val,
      1900,1,1); // Date: 1900-01-01
   isNull[i]=true;
}
else
{
   pArguments[i].date_val =
      ci->pArgs->GetAt(i)->GetDate();
   isNull[i]=false;
}
```

Usage

The initial value is 1900-1-1.

See also

SetDate
SplitDate

NewDateTime

Description

Creates a new pbdatetime data object.

Syntax

NewDateTime()

Return value

pbdatetime.

Examples

This example tests whether a date/time value exists, and, if it does not, it creates a new pbdate object and sets its value to the beginning of January, 1900:

```
if (ci->pArgs->GetAt(i)->IsNull())
{
   pArguments[i].datetime_val=Session->NewDateTime();
   Session->SetDateTime(pArguments[i].datetime_val,
      1900, 1 , 1, 1, 1, 1); // Datetime:
                             // 1900-01-01 01:01:01
}
```

```
else
{
   pArguments[i].datetime_val =
      ci->pArgs->GetAt(i)->GetDateTime();
}
```

Usage
The initial value is 1900-1-1 0:0:0.0.

See also
SetDateTime
SplitDateTime

NewDecimal

Description
Allocates resources for a new decimal data object.

Syntax
NewDecimal( )

Return value
pbdec or null on failure.

Examples

```
if (ci->pArgs->GetAt(i)->IsNull())
{
   pArguments[i].dec_val=Session->NewDecimal();
   Session->SetDecimal(pArguments[i].dec_val,"1.0");
}
else
   pArguments[i].dec_val =
      ci->pArgs->GetAt(i)->GetDecimal();
```

See also
GetDecimalString
ReleaseDecimalString
SetDecimal

NewObject

Description
Creates a new object of the specified type.

Syntax
NewObject(pbclass *cls*)

Argument	Description
cls	The type of object or structure instance to be created

Return value
pbobject of the given class or structure.

Examples

```
pbclass cls;
pbobject ex;
pbgroup group;

group = session-> FindGroup
   ("user_exception", pbgroup_userobject);
if (group==NULL)
   return;
cls = session->FindClass(group, "user_exception");
if (group==NULL)
   return;
ex = session->NewObject(cls);
```

Usage
The returned object's life cycle is restricted to the current frame unless AddGlobalRef is called on the object.

See also
FindClass
FindGroup

NewProxyObject

Description
Creates a proxy for a remote object. The proxy is used to extend the network protocol in PowerBuilder.

Syntax
NewProxyObject(pbclass *cls*)

Argument	Description
cls	The type of object or structure instance to be created

Return value
pbproxyobject.

Examples
This example creates a new proxy object, creates a marshaler, and associates the marshaler with the proxy object:

```
pbproxyObject proxy = session->NewProxyObject(cls);
if (proxy == NULL)
{
      ci->returnValue->SetLong(kFailToCreateProxy);
      return PBX_OK;
   }

   // Create MyMarshaler
   MyMarshaler* marshaler = new MyMarshaler(env,
      proxy, obj);

   // Associate MyMarshaler with the proxy
   session->SetMarshaler(proxy, marshaler);

   ci->pArgs->GetAt(0)->SetObject(proxy);

   ci->returnValue->SetLong(kSuccessful);

   return PBX_OK;
```

See also

GetMarshaler
SetMarshaler

NewString

Description

Creates a new string.

Syntax

NewString(LPCTSTR)

Return value

pbstring.

Examples

```
pbclass cls;

cls = session->GetSystemFunctionsClass();
if( cls == NULL )
{
   ret_val = session->NewString("null");
   return ret_val;
}
```

Usage

The returned string is destroyed when PopLocalFrame is called.

See also

SetString

NewTime

Description

Creates a new pbtime data object.

Syntax

NewTime()

Return value

pbtime.

Examples

These statements split a time into hours, minutes, and seconds, and then use the resulting values to set the value of a new time object:

```
Session->SplitTime(ci.returnValue->GetTime(), &hh,
   &mm, &ss);
ret_val = Session-> NewTime();
Session-> SetTime(ret_val, hh, mm, ss);
```

Usage

The initial value is 0:0:0.0.

See also

SetTime
SplitTime

NewUnboundedObjectArray

Description

Creates an unbounded PowerBuilder object or structure data array.

Syntax

NewUnboundedObjectArray(pbclass *cls*)

Argument	Description
cls	A valid class handle of the type of PowerBuilder object or structure array to be created

Return value

pbarray or null on failure.

Usage

An unbounded array can have only one dimension, so no dimension information is needed.

See also

Get<type>ArrayItem
GetArrayInfo
GetArrayItemType
GetArrayLength
IsArrayItemNull
NewBoundedObjectArray
NewBoundedSimpleArray
NewUnboundedSimpleArray
ReleaseArrayInfo
Set<type>ArrayItem
SetArrayItemToNull
SetArrayItemValue

NewUnboundedSimpleArray

Description

Creates an unbounded simple data array.

Syntax

NewUnboundedSimpleArray(pbuint *type*)

Argument	Description
type	An enumerated variable of type pbvalue_* indicating the type of simple unbounded array to be created

Return value

pbarray or null on failure.

Examples

This example creates an unbounded simple data array of the type returned by the getDataType method, which returns a string of the form `dt_`*type*. Most of the case statements have been removed for the sake of brevity:

```
if (d_returnType.isArray())
   {
      returnValue.l = env->CallObjectMethodA(obj,
         mid, values.get());
      pbarray v;

      switch(d_returnType.getDataType())
      {
      case dt_boolean:
         v = session->NewUnboundedSimpleArray
            (pbvalue_boolean);
         break;

      case dt_short:
         v = session->NewUnboundedSimpleArray
            (pbvalue_int);
         break;
// CASE statements omitted
...
      default:
         v = session->NewUnboundedSimpleArray
            (pbvalue_any);
         break;
      }

      ci->returnValue->SetArray(v);
```

Usage

An unbounded array can have only one dimension, so no dimension information is needed.

See also

Get<type>ArrayItem
GetArrayInfo
GetArrayItemType
GetArrayLength
IsArrayItemNull
NewBoundedObjectArray
NewBoundedSimpleArray
NewUnboundedObjectArray
ReleaseArrayInfo
Set<type>ArrayItem
SetArrayItemToNull
SetArrayItemValue

PopLocalFrame

Description

Pops the current local reference frame from the current native method stack frame, removing all local references to the objects added in that local frame. All the pbobject, pbstring, and pbdecimal variables created by calling NewDecimal, NewObject, or NewString in the current frame are destroyed automatically.

Syntax

PopLocalFrame()

Return value

None.

See also

AddLocalRef
PushLocalFrame
RemoveLocalRef

ProcessPBMessage

Description

Checks the PowerBuilder message queue and, if there is a message in the queue, attempts to process it.

Syntax

ProcessPBMessage()

Return value

pbboolean. Returns true if a PowerBuilder message was processed, and false otherwise.

Examples

This message loop in a WinMain function processes a PowerBuilder message if a message has been received and an IPB session is running:

```
try
{
    while (GetMessage(&msg, NULL, 0, 0))
    {
       TranslateMessage(&msg);
       DispatchMessage(&msg);

       // Call to ProcessPBMessage
       if (session)
          session->ProcessPBMessage();
   }
```

This overloaded WindowProc function in an MFC application processes a PowerBuilder message:

```
LRESULT CCallPBVCtrl::WindowProc(UINT message,
   WPARAM wParam, LPARAM lParam)
{
   d_session->ProcessPBMessage();
   return CDialog::WindowProc(message, wParam, lParam);
}
```

Usage

Each time this function is called, it attempts to retrieve a message from the PowerBuilder message queue and process it. It is similar to the PowerBuilder Yield function; however, ProcessPBMessage processes only one message at a time, and it processes only PowerBuilder messages. The Yield function also processes Windows messages.

Use this function when PowerBuilder windows or visual controls are called from C++ applications or from extensions to ensure that events posted to the PowerBuilder message queue are processed.

If the function is not inserted in the C++ application in a way that results in it being called repeatedly, posted events are not processed in the PowerBuilder application.

For most applications, ProcessPBMessage can be inserted in a message loop in the WinMain function. If you use Microsoft Foundation Classes (MFC), you cannot modify the built-in message loop. To ensure that the ProcessPBMessage function is called repeatedly, you can overload the CWnd::WindowProc function and insert ProcessPBMessage into the overloaded function.

PushLocalFrame

Description

Pushes a local reference frame onto the current native method stack frame. A local frame is analogous to a scope in C++.

Syntax

PushLocalFrame()

Return value

None.

See also

PopLocalFrame
RemoveLocalRef

Release

Description

Releases the current IPB_Session. The IPB_Session object becomes invalid after the call.

Syntax

Release()

Return value

None.

Examples

This example shows a call to Release. The example checks whether there is a valid session object before attempting to release it:

```
if (pIPB_ObjectFactory)
{
   pIPB_ObjectFactory->Release();
   pIPB_ObjectFactory = NULL;
}
```

ReleaseArrayInfo

Description

Releases memory returned by GetArrayInfo.

Syntax

ReleaseArrayInfo(PBArrayInfo* *pbarrayinfo*)

Argument	Description
pbarrayinfo	A valid PBArrayInfo handle

Return value

PBXRESULT. PBX_OK for success.

Examples

This example shows how ReleaseArrayInfo should be called when memory allocated by GetArrayInfo is no longer needed:

```
PBArrayInfo* ai;
...
session->ReleaseArrayInfo(ai);
```

Usage

If the array is an unbounded array, the bounds information in PBArrayInfo is undetermined.

See also

Get<type>ArrayItem
GetArrayInfo
GetArrayItemType
GetArrayLength
IsArrayItemNull
NewBoundedObjectArray
NewBoundedSimpleArray
NewUnboundedObjectArray
NewUnboundedSimpleArray
Set<type>ArrayItem
SetArrayItemToNull
SetArrayItemValue

ReleaseDateString

Description

Frees the memory acquired using GetDateString.

Syntax

ReleaseDateString(LPCTSTR *string*)

Argument	Description
string	The string to be released from memory

Return value

None.

See also

GetDateString

ReleaseDateTimeString

Description

Frees the memory acquired using GetDateTimeString.

Syntax

ReleaseDateTimeString(LPCTSTR *string*)

Argument	Description
string	The string to be released from memory

Return value

None.

See also

GetDateTimeString

ReleaseDecimalString

Description

Frees the memory acquired using GetDecimalString.

Syntax

ReleaseDecimalString(LPCTSTR *string*)

Argument	Description
string	The string to be released from memory

Return value

None.

See also

GetDecimalString

ReleaseResultSetAccessor

Description

Releases the pointer obtained using GetResultSetAccessor.

Syntax

ReleaseResultSetAccessor (IPB_ResultSetAccessor* *rs*)

Argument	Description
rs	A pointer to the IPB_ResultSetAccessor object to be released

Return value

None.

Examples

This statement releases the IPB_ResultSetAccessor object *rsa*:

```
Session->ReleaseResultSetAccessor(rsa);
```

Usage

When you call ReleaseResultSetAccessor, the Release function of the IPB_ResultSetAccessor interface is called on the *rs* argument to release the interface pointer.

See also

CreateResultSet
GetResultSetAccessor

ReleaseTimeString

Description

Frees the memory acquired using GetTimeString.

Syntax

ReleaseTimeString(LPCTSTR *string*)

Argument	Description
string	The string to be released from memory

Return value

None.

See also

GetTimeString

ReleaseValue

Description

Frees the IPB_Value acquired using AcquireValue or AcquireArrayItemValue.

Syntax

ReleaseValue(IPB_Value* *value*)

Argument	Description
value	The string to be released from memory

Return value

None.

Examples

The AcquireValue method is used to obtain a message argument value. Later, when the value is no longer needed, it is released using ReleaseValue to avoid memory leaks:

```
// Acquire a value
MessageArg = session->AcquireValue
   ( ci->pArgs->GetAt(0) );
pbstring pbMessage = MessageArg->GetString() ;
Message = (LPSTR)session->GetString(pbMessage) ;
...
// Cleanup phase
if (MessageArg)
{
   Session->ReleaseValue ( MessageArg ) ;
}
```

Usage

When you no longer need the data acquired using the AcquireValue or AcquireArrayItemValue method, you *must* call the ReleaseValue method to free the data. Failing to do so causes a memory leak.

Warning! Do not use ReleaseValue to release a value that was not acquired using AcquireValue or AcquireArrayItemValue. If you do, the PowerBuilder VM might crash.

See also

AcquireArrayItemValue
AcquireValue

RemoveGlobalRef

Description

Removes a global reference to the specified PowerBuilder object.

Syntax

RemoveGlobalRef (pbobject *obj*)

Argument	Description
obj	A valid PowerBuilder object handle

Return value

None.

Examples

```
void MyPBNIClass::reference()
{
   d_session->AddGlobalRef(d_pbobject);
}

void MyPBNIClass::unreference()
{
   if(d_pbobject != NULL)
      d_session -> RemoveGlobalRef(d_pbobject);
}
```

See also

AddGlobalRef

RemoveLocalRef

Description

Removes a local reference to the specified PowerBuilder object.

Syntax

RemoveLocalRef (pbobject *obj*)

Argument	Description
obj	A valid PowerBuilder object handle

Return value

None.

See also

AddLocalRef
PopLocalFrame
PushLocalFrame

RemoveProp

Description

Removes the specified variable from the list of properties of the current IPB session. You must free the memory to which the property points.

Syntax

RemoveProp(LPCTSTR *name*)

Argument	Description
name	The name of the variable to be removed

Return value

None.

Examples

These statements remove *prop_name* from the list of variables associated with the session and delete the pointer created to point to the variables value:

```
session -> RemoveProp(prop_name);
delete SetValue;
```

Usage

SetProp enables you to use a variable value throughout an IPB session. Use RemoveProp to remove the variable from the list of variables associated with the session when it is no longer needed. You must also free the memory associated with the variable.

See also

GetProp
SetProp

Set<*type*>ArrayItem

Description

Assigns a value to an array item of a specific type.

Syntax

SetBlobArrayItem (pbarray *array*, pblong *dim[ ]*, pbblob *value*)

SetBoolArrayItem (pbarray *array*, pblong *dim[ ]*, pbboolean *value*)

SetByteArrayItem (pbarray *array*, pblong *dim[ ]*, pbbyte *value*)

SetCharArrayItem (pbarray *array*, pblong *dim[ ]*, pbchar *value*)

SetDateArrayItem (pbarray *array*, pblong *dim[ ]*, pbdate *value*)

SetDateTimeArrayItem (pbarray *array*, pblong *dim[ ]*, pbdatetime *value*)

SetDecArrayItem (pbarray *array*, pblong *dim[ ]*, pbdec *value*)

SetDoubleArrayItem (pbarray *array*, pblong *dim[ ]*, pbdouble *value*)

SetIntArrayItem (pbarray *array*, pblong *dim[ ]*, pbint *value*)

SetLongArrayItem (pbarray *array*, pblong *dim[ ]*, pblong *value*)

SetLongLongArrayItem (pbarray *array*, pblonglong *dim[ ]*, pblong *value*)

SetObjectArrayItem (pbarray *array*, pblong *dim[ ]*, pbobject *obj*)

SetPBStringArrayItem (pbarray *array*, pblong *dim[ ]*, pbstring *value*)

SetRealArrayItem (pbarray *array*, pblong *dim[ ]*, pbreal *value*)

SetStringArrayItem (pbarray *array*, pblong *dim[ ]*, LPCTSTR *value*)

SetTimeArrayItem (pbarray *array*, pblong *dim[ ]*, pbtime *value*)

SetUintArrayItem (pbarray *array*, pblong *dim[ ]*, pbuint *value*)

SetUlongArrayItem (pbarray *array*, pblong *dim[ ]*, pbulong *value*)

Argument	Description
array	A valid pbarray handle.
dim	A pblong array to hold indexes of each dimension. The number of dimensions must equal the number of dimensions of the array.
value	The new value of the array item.

Return value

PBXRESULT. PBX_OK for success.

If the index exceeds the bounds of a bounded array, it returns PBX_E_ARRAY_INDEX_OUTOF_BOUNDS.

If the data passed in does not match the datatype of the array, it returns PBX_E_MISMATCHED_DATA_TYPE.

Examples

This example creates a new unbounded simple array. In the FOR loop, application-specific code (not shown here) gets array values, which are then added to the array using SetPBStringArrayItem:

```
pblong          dim[1];
char *          cstr;
pbuint   numDimensions = 1;
PBArrayInfo::ArrayBound bound;

bound.lowerBound = 1;
bound.upperBound = size;
d_pbarray = d_session->NewBoundedSimpleArray
    (pbvalue_string, numDimensions, &bound);

for (int i = 1; i <= size; i++ )
{
   dim[0] = i;
   // add application-specific code here to
   // get array value
   pbstring pValue = d_session->NewString(cstr);
   d_session->SetPBStringArrayItem(d_pbarray, dim,
      pValue);

   delete [] cstr;
}
```

```
pbv.SetArray(d_pbarray);
```

Usage

This method assigns the IPB_Value pointed to by the *value* argument to the array item in the same way that the IPB_Value Set<type> method sets a value.

See also

Get<type>ArrayItem
GetArrayInfo
GetArrayItemType
GetArrayLength
IsArrayItemNull
NewBoundedObjectArray
NewBoundedSimpleArray
NewUnboundedObjectArray
NewUnboundedSimpleArray
ReleaseArrayInfo
SetArrayItemToNull
SetArrayItemValue

Set<*type*>Field

Description

A set of methods that set a new value in an instance field of an object.

Syntax

SetArrayField (pbobject *obj*, pbfieldID *fid*, pbarray *value*)

SetBlobField (pbobject *obj*, pbfieldID *fid*, pbblob *value*)

SetBoolField (pbobject *obj*, pbfieldID *fid*, pbboolean *value*)

SetByteField (pbobject *obj*, pbfieldID *fid*, pbbyte *value*)

SetCharField (pbobject *obj*, pbfieldID *fid*, pbchar *value*)

SetDateField (pbobject *obj*, pbfieldID *fid*, pbdate *value*)

SetDateTimeField (pbobject *obj*, pbfieldID *fid*, pbdatetime *value*)

SetDecField (pbobject *obj*, pbfieldID *fid*, pbdec *value*)

SetDoubleField (pbobject *obj*, pbfieldID *fid*, pbdouble *value*)

SetIntField (pbobject *obj*, pbfieldID *fid*, pbint *value*)

SetLongField (pbobject *obj*, pbfieldID *fid*, pblong *value*)

SetLongLongField (pbobject *obj*, pbfieldID *fid*, pblonglong *value*)

SetObjectField (pbobject *obj*, pbfieldID *fid*, pbobject *value*)

SetPBStringField (pbobject *obj*, pbfieldID *fid*, pbstring *value*)

SetRealField (pbobject *obj*, pbfieldID *fid*, pbreal *value*)

SetStringField (pbobject *obj*, pbfieldID *fid*, LPCTSTR *value*)

SetTimeField (pbobject *obj*, pbfieldID *fid*, pbtime *value*)

SetUintField (pbobject *obj*, pbfieldID *fid*, pbuint *value*)

SetUlongField (pbobject *obj*, pbfieldID *fid*, pbulong *value*)

Argument	**Description**
obj	The handle of the object whose field is to be accessed
fid	The field ID of the specified object
value	The value to be set

Return value

PBX_RESULT.

Examples

These statements set a new string value in a string field:

```
pbstring str = session->NewString(d_message.c_str());
if (str != NULL)
   session->SetPBStringField(d_pbobj, d_fidMsg, str);
```

Usage

When you change any visual property of a PowerBuilder object by calling Set<*type*>field functions, the property is changed but the property is not refreshed in the graphical user interface. UpdateField refreshes the visual properties of PowerBuilder objects. You must call UpdateField explicitly when changing any visual property with the Set<*type*>field functions.

See also

GetFieldID
GetFieldType
Get<type>Field
GetNumOfFields
IsFieldArray
IsFieldNull
IsFieldObject
SetFieldToNull
UpdateField

Set<*type*>GlobalVar

Description

A set of methods that set the value of a global variable of a specific datatype.

Syntax

SetArrayGlobalVar (pbfieldID *fid*, pbarray *value*)

SetBlobGlobalVar (pbfieldID *fid*, pbblob *value*)

SetBoolGlobalVar (pbfieldID *fid*, pbboolean *value*)

SetByteGlobalVar (pbfieldID *fid*, pbbyte *value*)

SetCharGlobalVar (pbfieldID *fid*, pbchar *value*)

SetDateGlobalVar (pbfieldID *fid*, pbdate *value*)

SetDateTimeGlobalVar (pbfieldID *fid*, pbdatetime *value*)

SetDecGlobalVar (pbfieldID *fid*, pbdec *value*)

SetDoubleGlobalVar (pbfieldID *fid*, pbdouble *value*)

SetIntGlobalVar (pbfieldID *fid*, pbint *value*)

SetLongGlobalVar(pbfieldID *fid*, pblong *value*)

SetLongLongGlobalVar(pbfieldID *fid*, pblonglong *value*)

SetObjectGlobalVar (pbfieldID *fid*, pbobject *value*)

SetPBStringGlobalVar (pbfieldID *fid*, pbstring *value*)

SetRealGlobalVar (pbfieldID *fid*, pbreal *value*)

SetStringGlobalVar (pbfieldID *fid*, LPCTSTR *value*)

SetTimeGlobalVar (pbfieldID *fid*, pbtime *value*)

SetUintGlobalVar (pbfieldID *fid*, pbuint *value*)

SetUlongGlobalVar (pbfieldID *fid*, pbulong *value*)

Argument	**Description**
fid	The field ID of the global variable
value	The value to be set

Return value

PBX_RESULT.

Examples

This code fragment shows how SetLongGlobalVar is used to add 1 to the value of a global variable:

```
fid = session -> GetGlobalVarID("l_gvar");
l_val = session -> GetLongGlobalVar(fid, isNull);
session -> SetLongGlobalVar(fid, l_val + 1);
```

See also

GetGlobalVarID
GetGlobalVarType
Get<type>GlobalVar
IsGlobalVarObject
SetGlobalVarToNull

Set<*type*>SharedVar

Description

A set of methods that set the value of a shared variable of a specific datatype.

Syntax

SetArraySharedVar (pbgroup *group*, pbfieldID *fid*, pbarray *value*)

SetBlobSharedVar (pbgroup *group*, pbfieldID *fid*, pbblob *value*)

SetBoolSharedVar (pbgroup *group*, pbfieldID *fid*, pbboolean *value*)

SetByteSharedVar (pbgroup *group*, pbfieldID *fid*, pbbyte *value*)
SetCharSharedVar (pbgroup *group*, pbfieldID *fid*, pbchar *value*)
SetDateSharedVar (pbgroup *group*, pbfieldID *fid*, pbdate *value*)
SetDateTimeSharedVar (pbgroup *group*, pbfieldID *fid*, pbdatetime *value*)
SetDecSharedVar (pbgroup *group*, pbfieldID *fid*, pbdec *value*)
SetDoubleSharedVar (pbgroup *group*, pbfieldID *fid*, pbdouble *value*)
SetIntSharedVar (pbgroup *group*, pbfieldID *fid*, pbint *value*)
SetLongSharedVar(pbgroup *group*, pbfieldID *fid*, pblong *value*)
SetLongLongSharedVar(pbgroup *group*, pbfieldID *fid*, pblonglong *value*)
SetObjectSharedVar (pbgroup *group*, pbfieldID *fid*, pbobject *value*)
SetPBStringSharedVar (pbgroup *group*, pbfieldID *fid*, pbstring *value*)
SetRealSharedVar (pbgroup *group*, pbfieldID *fid*, pbreal *value*)
SetStringSharedVar (pbgroup *group*, pbfieldID *fid*, LPCTSTR *value*)
SetTimeSharedVar (pbgroup *group*, pbfieldID *fid*, pbtime *value*)
SetUintSharedVar (pbgroup *group*, pbfieldID *fid*, pbuint *value*)
SetUlongSharedVar (pbgroup *group*, pbfieldID *fid*, pbulong *value*)

Argument	Description
group	The group whose shared variable is to be accessed
fid	The field ID of the shared variable
value	The value to be set

Return value

PBX_RESULT.

See also

Get<type>SharedVar
GetSharedVarID
GetSharedVarType
IsSharedVarArray
IsSharedVarNull
IsSharedVarObject
SetSharedVarToNull

SetArrayItemToNull

Description

Sets the value of an array item to a null value.

Syntax

SetArrayItemToNull(pbarray *array*, pblong *dim*[ ])

Argument	Description
array	A valid pbarray structure in which you want to set an array item to null.
dim	A pblong array to hold the indexes of each dimension of the array. The size of the array must equal the dimensions of *array*.

Return value pbboolean.

See also IsArrayItemNull

SetArrayItemValue

Description Sets the value of an array item to the value of an IPB_Value.

Syntax SetArrayItemValue(pbarray *array*, pblong *dim*[ ], IPB_Value* *src*)

Argument	Description
array	A valid pbarray structure in which you want to set an array item to null.
dim	A pblong array to hold the indexes of each dimension of the array. The size of the array must equal the dimensions of *array*.
src	The value to which the array item is to be changed.

Return value None.

Examples This code sets the value of each item in an array:

```
for( i=1; i <= bound; i++)
{
   dim[0]= i;
   ipv = Session -> AcquireArrayItemValue(refArg, dim);
   Session -> SetArrayItemValue(*i_array, dim, ipv);
   Session -> ReleaseValue(ipv);
}
```

Usage The SetArrayItemValue method does not verify that the datatype of the replacement value matches the datatype of the original value.

See also AcquireArrayItemValue
ReleaseValue
SetArrayItemToNull
SetValue

SetBlob

Description
Destroys the existing data in a blob and copies data into it from a buffer.

Syntax
SetBlob (pbblob *blb*, const void* *bin*, pblong *len*)

Argument	Description
blb	A valid pbblob object whose value is to be reset
bin	A pointer to the source buffer
len	The length in bytes of the data in the buffer

Return value
PBXRESULT. Returns PBX_OK for success or PBX_E_INVALID_ARGUMENT if the new blob value is invalid; otherwise, returns PBX_E_OUTOF_MEMORY.

Usage
A deep copy is performed. The existing value is destroyed first, and then the contents of the *bin* argument are copied into a new value.

See also
NewBlob

SetDate

Description
Resets the value of the specified pbdate object.

Syntax
SetDate (pbdate *date*, pbint *year*, pbint *month*, pbint *day*)

Argument	Description
date	The pbdate object to be reset
year	A year in the range 1000 to 3000
month	A month in the range 1 to 12
day	A day in the range 1 to 31

Return value
PBX_RESULT. PBX_OK for success or PBX_E_INVALID_ARGUMENT if the new date is invalid.

Examples
This example sets the date to March 12, 1938:

```
session->SetDate(date_val, 1938, 3, 12);
```

Usage
If the parameters are invalid, the date is reset to 1900-1-1.

See also
NewDate
SplitDate

SetDateTime

Description

Resets the value of the specified pbdatetime object.

Syntax

SetDate (pbdatetime *dt*, pbint *year*, pbint *month*, pbint *day*, pbint *hour*, pbint *minute*, pbdouble *second*)

Argument	Description
dt	The pbdatetime object to be reset
year	A year in the range 1000 to 3000
month	A month in the range 1 to 12
day	A day in the range 1 to 31
hour	An hour in the range 0 to 23
minute	A minute in the range 0 to 59
second	A second in the range 0 to 59.999999

Return value

PBX_RESULT. PBX_OK for success or PBX_E_INVALID_ARGUMENT if the new datetime is invalid.

Examples

This example sets the datetime value to August 19, 1982 at 10:30:45.10:

```
session->SetDate(date_val, 1982, 8, 19, 10, 30, 45.1);
```

Usage

If the parameters are invalid, the datetime value is reset to 1900-1-1 0:0:0.0.

See also

NewDateTime
SplitDateTime

SetDecimal

Description

Sets the value of a decimal variable to decimal data in a string.

Syntax

SetDecimal(pbdec *dec*, LPCTSTR *dec_str*)

Argument	Description
dec	The decimal data object to be set
dec_str	The string containing the data to be converted to a decimal

Return value

PBXRESULT. PBX_OK for success.

Examples

This example uses the IPB_Session SetDecimal method to set the value of a variable of type pbdec, then uses the IPB_Value SetDecimal method to set the return value in the PBCallInfo structure:

```
pbdec pbdecRet = NULL;
LPTSTR  lpDecValueToReturn = NULL;
```

```
...
pbdecRet = session -> NewDecimal();
session -> SetDecimal( pbdecRet,
    (LPCTSTR)lpDecValueToReturn);
ci -> returnValue -> SetDecimal(pbdecRet);
```

Usage

If the string contains invalid data, the decimal value is set to 0.0.

See also

GetDecimalString
NewDecimal
ReleaseDecimalString

SetFieldToNull

Description

Sets the value of the specified field to null.

Syntax

SetFieldToNull(pbobject *obj*, pbfield *fid*)

Argument	Description
obj	A valid object handle
fid	The field ID of the specified object

Return value

None.

See also

GetFieldID
GetFieldType
Get<type>Field
GetNumOfFields
IsFieldArray
IsFieldNull
IsFieldObject
Set<type>Field

SetGlobalVarToNull

Description

Sets the value of the specified global variable to null.

Syntax

SetGlobalVarToNull(pbobject *obj*, pbfield *fid*)

Argument	Description
fid	The field ID of the global variable

Return value

None.

See also

GetGlobalVarID
GetGlobalVarType
Get<type>GlobalVar
IsGlobalVarArray
IsGlobalVarNull
IsGlobalVarObject
Set<type>GlobalVar

SetMarshaler

Description

Sets a marshaler that will be used to invoke remote methods and convert PowerBuilder data formats to the user's communication protocol.

Syntax

SetMarshaler(pbproxyObject *obj*, IPBX_Marshaler* *marshaler*)

Argument	Description
obj	An object of type pbproxyObject to be used as a proxy for a remote object that was created using NewProxyObject
marshaler	A class inherited from IPBX_Marshaler

Return value

None.

Examples

This example creates a JavaMarshaler class and associates it with a proxy object:

```
// Create JavaMarshaler
JavaMarshaler* marshaler = new JavaMarshaler(env,
   proxy, jobj);

// Associate the JavaMarshaler with the PB proxy
session->SetMarshaler(proxy, marshaler);

ci->pArgs->GetAt(0)->SetObject(proxy);

ci->returnValue->SetLong(kSuccessful);
return PBX_OK;
```

Usage

The SetMarshaler function associates an object of type IPBX_Marshaler with a PBProxy object. It is possible to associate multiple marshaler objects with a single proxy object. It is also possible to associate one marshaler object with multiple proxy objects. Neither of these is good coding practice and should be avoided.

Before calling SetMarshaler, you can call the IPB_Session GetMarshaler function to obtain an existing marshaler object associated with a given proxy object, and then destroy the existing marshaler object before associating a new marshaler with the proxy.

When a proxy object is destroyed, it calls the associated marshaler object's Destroy method. If multiple proxy objects are associated with a single marshaler object, you need to implement some form of reference counting. Otherwise, the marshaler object is destroyed when the first associated proxy object is destroyed, and subsequent calls to the marshaler object's Destroy method, when other associated proxy objects are destroyed, will throw exceptions.

To avoid these issues, there should be a one-to-one relationship between marshaler and proxy objects.

See also

GetMarshaler
GetMethodID

SetProp

Description

Adds a new variable to the list of properties of the current session or changes the value of an existing variable.

Syntax

SetProp(LPCTSTR *name*, void* *data*)

Argument	Description
name	The name of the property to be set
data	A pointer to the data buffer where the variable's value resides

Return value

None.

Examples

In this example, the native class has two functions. This is their description passed in the PBX_GetDescription function:

```
"subroutine f_setprop(int a)\n"
"function int f_getprop()\n"
```

The functions are associated with these enumerated values:

```
enum MethodIDs
{
   mid_SetProp = 0,
   mid_GetProp = 1
};
```

When the f_setprop function is called from PowerBuilder, the following code sets the value of the pointer *SetVal* to the integer value passed in by f_setprop, then registers that value in the session with the property name *prop_name*:

```
int* SetVal = new int;

if (mid == mid_SetProp)
{
   *SetValue = ci -> pArgs -> GetAt(0) -> GetInt();
   session -> SetProp(prop_name, SetVal);
}
```

When the f_getprop function is called, the following code uses GetProp to set the *GetValue* pointer to point to the value associated with *prop_name*, and then sets the return value to **GetValue*:

```
if (mid == mid_GetProp)
{
   int* GetVal;
   GetValue = (int *)session -> GetProp(prop_name);
   ci -> returnValue -> SetInt(*GetVal);
}
```

Usage

SetProp enables you to use a variable value throughout an IPB session without using a global variable, which is susceptible to namespace conflicts with other sessions. SetProp is one of a set of three functions:

- Use SetProp to register a new variable with the session or to change the value of an existing variable.
- Use GetProp to access the variable.
- Use RemoveProp to remove the variable from the list of variables associated with the session when it is no longer needed.

This set of functions is particularly useful for working with multiple threads of execution in EAServer.

Suppose you want to throw an exception from within a PBNI extension and the exception itself is also defined by the PBNI extension. You call the IPB_Session NewObject function to create an instance of the exception, causing the PBX_CreateNonVisualObject function to be called.

One way to set the value of the fields of the exception before the function returns in a thread-safe manner is to create a new object or structure to hold the exception information before calling NewObject. You can call SetProp to store the structure or the object in the current IPB_Session. When PBX_CreateNonVisualObject is called, you can call GetProp to get the structure or object to obtain the exception information, then call RemoveProp to remove the data you stored in the current session.

See also

GetProp
RemoveProp

SetSharedVarToNull

Description

Sets the value of the specified shared variable to null.

Syntax

SetSharedVarToNull(pbgroup *group*, pbfield *fid*)

Argument	**Description**
group	The group to which the shared variable belongs
fid	The field ID of the shared variable

Return value

None.

Examples

This example tests the IsSharedVarNull and SetSharedVarToNull functions:

```
curGroup = session -> GetCurrGroup();
cls = session -> GetClass(myobj);

fid = session -> GetSharedVarID(curGroup, "i_svar");
if (session -> IsSharedVarNull(curGroup, fid))
   session -> SetIntSharedVar(curGroup, fid, 1);
else
   session -> SetSharedVarToNull(curGroup, fid);
```

See also

Get<type>SharedVar
GetSharedVarID

GetSharedVarType
IsSharedVarArray
IsSharedVarNull
IsSharedVarObject
Set<type>SharedVar

SetString

Description

Frees an existing string and assigns a new string value to it by performing a deep copy.

Syntax

SetString (pbstring *string*, LPCTSTR *src*)

Argument	Description
string	A valid pbstring variable whose value is to be replaced
src	The string to be assigned to *string*

Return value

PBXRESULT. Returns PBX_OK for success or PBX_E_INVALID_ARGUMENT if the new string value is invalid; otherwise, returns PBX_E_OUTOF_MEMORY.

Examples

This example uses the IPB_Session SetString method to set the ret_val string to the return value in the PBCallInfo structure. It also uses the IPB_Value SetPBString method to set values in PBCallInfo:

```
pbclass cls;
pbmethodID mid;
PBCallInfo* ci = new PBCallInfo;
pbstring ret_val;
LPCTSTR pStr;

cls= Session -> GetClass(myobj);
if (isAny)
   mid=Session-> GetMethodID(cls, "uf_any_byvalue",
      PBRT_FUNCTION, "AAAAA");
else
   mid=Session-> GetMethodID(cls, "uf_string_byvalue",
      PBRT_FUNCTION, "SSSSS");
Session-> InitCallInfo(cls, mid, ci);

ci-> pArgs -> GetAt(0) -> SetPBString(s_low);
ci-> pArgs -> GetAt(1) -> SetPBString(s_mid);
ci-> pArgs -> GetAt(2) -> SetPBString(s_high);
pStr = Session -> GetString(s_null);
if (pStr != 0)
{
   if (strcmp(pStr, "null") == 0 )
      ci-> pArgs -> GetAt(3) -> SetToNull();
   else
      ci-> pArgs -> GetAt(3) -> SetPBString(s_null);
}
Session -> InvokeObjectFunction(myobj, mid, ci);
```

```
ret_val = Session -> NewString("");
Session -> SetPBString(ret_val, Session->GetString
               (ci->returnValue->GetString()));
Session -> FreeCallInfo(ci);
delete ci;
return ret_val;
```

Usage

A deep copy is performed. The existing value is destroyed first, and then the contents of the *src* argument are copied into a new value.

See also

NewString

SetTime

Description

Resets the value of the specified pbtime object.

Syntax

SetTime (pbtime *time*, pbint *hour*, pbint *minute*, pbdouble *second*)

Argument	Description
time	The pbtime object to be reset
hour	An hour in the range 0 to 23
minute	A minute in the range 0 to 59
second	A second in the range 0 to 59.999999

Return value

PBX_RESULT. PBX_OK for success or PBX_E_INVALID_ARGUMENT if the new time is invalid.

Examples

This code puts a new time with the value 01:01:01 into the *time_val* property of the *pArguments* array if the value in the PBCallInfo structure is null. Otherwise it sets *time_val* to the time in the PBCallInfo structure:

```
if (ci->pArgs->GetAt(i)->IsNull())
{
   pArguments[i].time_val = Session-> NewTime();
  Session->SetTime(pArguments[i].time_val, 1, 1, 1);
                                  // Time: 01:01:01
}
else
{
   pArguments[i].time_val =
      ci-> pArgs-> GetAt(i)-> GetTime();
}
```

Usage

If the parameters are invalid, the time is reset to 0:0:0.0.

See also

NewTime
SplitTime

SetValue

Description

Sets the value of one IPB_Value object to the value of another IPB_Value object.

Syntax

SetValue(IPB_Value* *dest*, IPB_Value* *src*)

Argument	Description
dest	The value to be replaced
src	The value to which *dest* is to be changed

Return value

None.

Examples

These statements set the return value in the PBCallInfo structure *ci* to the value *IPBValue_ret*, then release the *IBPValue_ret* structure:

```
Session -> SetValue(ci -> returnValue, IPBValue_ret);
Session -> ReleaseValue(IPBValue_ret);
```

Usage

Unlike the IPB_Value Set<*type*> methods, the SetValue method does not verify that the datatype of the replacement value matches the datatype of the original value. The original value is freed and a new value is cloned from the *src* value. Use this method if you want to swap two different IPB_Value objects that have different types.

See also

AcquireValue
ReleaseValue

SplitDate

Description

Splits the specified pbdate object into a year, month, and day.

Syntax

SplitDate (pbdate *date*, pbint **year*, pbint **month*, pbint **day*)

Argument	Description
date	The pbdate object to be split
year	A year in the range 1000 to 3000
month	A month in the range 1 to 12
day	A day in the range 1 to 31

Return value

PBX_RESULT. PBX_OK for success.

Examples

This statement splits the date in the first value in the PBCallInfo structure:

```
Session -> SplitDate(ci-> pArgs -> GetAt(0) ->
   GetDate(), &yy, &mm, &dd);
```

See also

NewDate
SetDate
SplitDateTime

SplitDateTime

Description

Splits the specified pbdatetime object into a year, month, day, hour, minute, and second.

Syntax

SplitDateTime(pbdatetime *dt*, pbint **year*, pbint **month*, pbint **day*, pbint **hour*, pbint **minute*, pbdouble **second*)

Argument	Description
dt	The pbdatetime object to be split
year	A year in the range 1000 to 3000
month	A month in the range 1 to 12
day	A day in the range 1 to 31
hour	An hour in the range 0 to 23
minute	A minute in the range 0 to 59
second	A second in the range 0 to 59.999999

Return value

PBX_RESULT. PBX_OK for success.

See also

NewDateTime
SetDateTime
SplitDate
SplitTime

SplitTime

Description

Splits the specified time object into an hour, minute, and second.

Syntax

SplitTime(pbtime *time*, pbint **hour*, pbint **minute*, pbdouble **second*)

Argument	Description
time	The pbtime object to be split
hour	An hour in the range 0 to 23
minute	A minute in the range 0 to 59
second	A second in the range 0 to 59.999999

Return value

PBX_RESULT. PBX_OK for success.

Examples

These statements split a time into hours, minutes, and seconds, and then use the resulting values to set the value of a new time object:

```
Session->SplitTime(ci.returnValue->GetTime(), &hh,
   &mm, &ss);
ret_val = Session-> NewTime();
Session-> SetTime(ret_val, hh, mm, ss);
```

See also

NewTime
SetTime

ThrowException

Description

Throws a PowerBuilder exception or inherited exception, and replaces the existing exception if there is one.

Syntax

ThrowException (pbobject *ex*)

Argument	**Description**
ex	The exception to be thrown. The exception must first be created with NewObject.

Return value

None.

Examples

This code creates a new exception object in the class user_exception_pspp, invokes its SetMessage function, and throws the exception:

```
pbclass cls;
pbmethodID mid;
pbobject ex;
pbgroup group;
PBCallInfo* ci = new PBCallInfo;

//  Throw exception
group = session-> FindGroup("user_exception_pspp",
   pbgroup_userobject);
if (group==NULL)
   return;
cls = session->FindClass(group, "user_exception_pspp");
if (group==NULL)
   return;
ex = session -> NewObject(cls);
mid = session-> GetMethodID(cls,
   "setmessage", PBRT_FUNCTION, "QS");
session-> InitCallInfo(cls,mid,ci);
```

```
ci-> pArgs[0].SetPBString(session, "Test exception");

session -> InvokeObjectFunction(ex,mid,ci);
session -> ThrowException(ex);
if (!ThrowToPB)
   session -> ClearException();
session -> FreeCallInfo(ci);
delete ci;
return;
```

See also

ClearException
GetException
HasExceptionThrown

TriggerEvent

Description

Triggers a PowerBuilder event.

Syntax

TriggerEvent(pbobject *obj*, pbmethodID *mid*, PBCallInfo **ci*)

Argument	Description
obj	The pbobject containing the method
mid	The pbMethodID returned by GetMethodID
ci	A pointer to a preallocated PBCallInfo structure

Return value

PBXRESULT. Returns PBX_OK for success, or one of the following for failure:

PBX_E_INVALID_ARGUMENT
PBX_E_INVOKE_METHOD_INACCESSABLE
PBX_E_INVOKE_WRONG_NUM_ARGS
PBX_E_INVOKE_REFARG_ERROR
PBX_E_INVOKE_METHOD_AMBIGUOUS
PBX_E_INVOKE_FAILURE

Examples

This code triggers the clicked event on a DataWindow object:

```
cls = session->GetClass(dwobj);
mid = session->GetMethodID
   (cls, "clicked", PBRT_EVENT, "LIILCdwobject.");
session->InitCallInfo(cls, mid, ci);
session->TriggerEvent(dwobj, mid, ci);
...
```

See also

GetClass
GetMethodID

UpdateField

Description

Refreshes a visual property of a PowerBuilder object.

Syntax

UpdateField(pbobject *obj*, pbfieldID *fid*)

Argument	Description
obj	The pbobject whose user interface property needs to be changed
fid	The field ID of the object

Return value

PBXRESULT. Returns success or failure.

Examples

This function changes the title of a DataWindow control:

```
void CallBack::f_newtitle(IPB_Session* session,
pbstring str_val, pbobject dwobj)
{

   pbclass cls;
   pbfieldID fid;
   cls=session->GetClass(dwobj);
   fid=session->GetFieldID(cls, "title");
   if (fid==kUndefinedFieldID)
      return;
   session -> SetPBStringField(dwobj,fid,str_val);
   session -> UpdateField(dwobj,fid);
   return ;
 }
```

Usage

When you change any visual property of a PowerBuilder object by calling Set<*type*>field functions, the property is changed but the property is not refreshed in the graphical user interface. UpdateField refreshes the visual properties of PowerBuilder objects. You must call this function explicitly when changing any visual property with the Set<*type*>field functions.

See also

Set<type>Field

IPB_Value interface

Description

The IPB_Arguments and IPB_Value interfaces pass values between the PowerBuilder VM and PowerBuilder extension modules. Through the IPB_Value interface, you can access information about each variable, including its type, null flag, access privileges, array or simple type, and reference type.

Methods

Table 7-4: IPB_Value methods

Method	Description
Get<type>	Set of datatype-specific methods that return a pointer to the data in IPB_Value
GetClass	Returns the class handle of a PowerBuilder object
GetType	Returns the datatype of a single data item or array
IsArray	Returns true if the IPB_Value instance contains an array, otherwise returns false
IsByRef	Returns true if the IPB_Value instance is passed by reference
IsEnum	Returns true if the IPB_Value instance contains a null value, otherwise returns false
IsObject	Returns true if the IPB_Value instance contains an object or object array, otherwise returns false
SetToNull	Used to set the data contained in the IPB_Value instance to null so that data can be reset
Set<type>	Set of datatype-specific methods that set the value of the IPB_Value instance

Get<*type*>

Description

A set of datatype-specific methods that return a pointer to the data in IPB_Value.

Syntax

GetArray ( )

GetBlob( )

GetBool ( )

GetByte ( )

GetChar ( )

GetDate ( )

GetDateTime( )

GetDecimal ( )

GetDouble ( )

GetInt ( )

GetLong( )

GetLongLong( )

GetObject ( )

GetReal( )

GetString ( )

GetTime( )

GetUint( )

GetUlong ( )

Return value

A predefined PBNI datatype that corresponds to the PowerBuilder datatype in the method name.

Examples

This statement gets the date in the first value in the PBCallInfo structure and splits it into year, month, and day:

```
Session -> SplitDate(ci-> pArgs -> GetAt(0) ->
   GetDate(),&yy,&mm,&dd);
```

Usage

If IPB_Value contains a null value, or if you are trying to get a specific datatype from an IPB_Value instance of another datatype, the data retrieved is undetermined. If the datatype is string, blob, decimal, time, date, datetime, array, or object, the return value points to the same address pointed to by IPB_Value. As a result, changing either the variable that holds the return value or the value of the IPB_Value instance affects the other.

See also

Set<type>

GetClass

Description
Returns the class handle of a PowerBuilder object.

Syntax
GetClass( )

Return value
pbclass or null on error.

Examples

```
pbclass clz = ci-> pArgs-> GetAt(i)-> GetClass();
```

See also
Get<type>
GetType
Set<type>

GetType

Description
Returns the datatype of a single data item or array.

Syntax
GetType()

Return value
pbuint

Examples

```
ArgsType = ci->pArgs->GetAt(i)->GetType();
switch (ArgsType)
{
case pbvalue_int:
  if (ci->pArgs->GetAt(i)->IsNull())
    pArguments[i].int_val=1;
  else
    pArguments[i].int_val =
      ci->pArgs->GetAt(i)->GetInt();
  break;
...
```

Usage
If the IPB_Value instance contains an object or structure, GetType returns the class ID of the data. Otherwise, it returns a simple datatype defined in the list of pbvalue_*type* enumerated types.

See also
Get<type>
GetClass
Set<type>

IsArray

Description	Returns true if the IPB_Value instance contains an array; otherwise, returns false.
Syntax	IsArray( )
Return value	pbboolean
Examples	This example tests whether an IPB_Value instance is an array before obtaining the array:

```
if(ci->pArgs->GetAt(i)->IsArray())
{
   pArguments[i].array_val =
      ci->pArgs->GetAt(i)->GetArray();
   continue;
}
```

See also

IsByRef
IsEnum
IsObject

IsByRef

Description	Returns true if the IPB_Value instance contains a by reference argument; otherwise it returns false.
Syntax	IsByRef()
Return value	pbboolean
Examples	This example shows how you would use IsByRef to test whether an argument is obtained by reference:

```
if(ci->pArgs->GetAt(i)->IsByRef())
...
```

See also

IsArray
IsEnum
IsObject

IsEnum

Description

Returns true if the IPB_Value instance contains an enumerated value; otherwise it returns false.

Syntax

IsEnum( )

Return value

pbboolean

See also

GetEnumItemName
GetEnumItemValue

IsNull

Description

Returns true if the IPB_Value instance contains a null value; otherwise, it returns false.

Syntax

IsNull( )

Return value

pbboolean

Examples

This example tests whether an IPB_Value instance contains a null value before attempting to obtain its value:

```
if(ci->pArgs->GetAt(i)->IsObject())
{
   if (ci->pArgs->GetAt(i)->IsNull())
     pArguments[i].obj_val=0;
   else
     pArguments[i].obj_val =
        ci->pArgs->GetAt(i)->GetObject();
     continue;
}
...
```

See also

IsArray
IsByRef
IsObject
SetToNull

IsObject

Description

Returns true if the IPB_Value instance contains an object or object array; otherwise it returns false.

Syntax

IsObject( )

Return value

pbboolean

Examples

This example tests whether an IPB_Value instance contains an object before attempting to obtain the object:

```
if( ci->pArgs->GetAt(i)->IsObject())
{
   if (ci->pArgs->GetAt(i)->IsNull())
      pArguments[i].obj_val = 0;
   else
      pArguments[i].obj_val =
         ci->pArgs->GetAt(i)->GetObject();
     continue;
}
...
```

See also

IsArray
IsByRef
IsEnum

Set<*type*>

Description

Set of datatype-specific methods that set the value of the IPB_Value instance.

Syntax

SetArray (pbarray *array*)

SetBlob(pbblob *blob*)

SetBool (pbboolean *boolean*)

SetByte (pbbyte *byte*)

SetChar (pbchar *char*)

SetDate (pbdate *date*)

SetDateTime(pbdatetime *datetime*)

SetDecimal (pbdecimal *dec*)

SetDouble (pbdouble *double*)

SetInt (pbint *int*)

SetLong(pblong *long*)

SetLongLong(pblonglong *longlong*)

SetObject (pbobject *object*)

SetPBString (pbstring *string*)

SetReal(pbreal *real*)

SetString (LPCTSTR *string*)

SetTime(pbtime *time*)

SetUint(pbuint *uint*)

SetUlong (pbulong *ulong*)

Return value

PBXRESULT.

Examples

This example uses the IPB_Value SetPBString method to set values in PBCallInfo. It also uses the IPB_Session SetString method to set the ret_val string to the return value in the PBCallInfo structure:

```
pbclass cls;
pbmethodID mid;
PBCallInfo* ci = new PBCallInfo;
pbstring ret_val;
LPCTSTR pStr;

cls= Session -> GetClass(myobj);
if (isAny)
   mid=Session-> GetMethodID(cls, "uf_any_byvalue",
      PBRT_FUNCTION, "AAAAA");
else
   mid=Session-> GetMethodID(cls, "uf_string_byvalue",
      PBRT_FUNCTION, "SSSSS");
Session-> InitCallInfo(cls, mid, ci);

// Call IPB_Value SetPBString method
ci-> pArgs -> GetAt(0) -> SetPBString(s_low);
ci-> pArgs -> GetAt(1) -> SetPBString(s_mid);
ci-> pArgs -> GetAt(2) -> SetPBString(s_high);
pStr = Session -> GetString(s_null);

if (pStr != 0)
{
   if (strcmp(pStr, "null") == 0 )
      ci-> pArgs -> GetAt(3) -> SetToNull();
   else
      ci-> pArgs -> GetAt(3) -> SetPBString(s_null);
}

Session -> InvokeObjectFunction(myobj, mid, ci);
ret_val = Session -> NewString("");
```

```
// Call IPB_Session SetString method
Session -> SetString(ret_val, Session->GetString
               (ci->returnValue->GetString()));
Session -> FreeCallInfo(ci);
delete ci;
return ret_val;
```

Usage

These methods automatically set the value of IPB_Value to not null and return an error if the datatype to be set does not match the existing datatype. The error code is PBX_E_MISMATCHED_DATA_TYPE. If the value is a read-only argument, it returns the error PBX_E_READONLY_ARGS. If the datatype is string or blob, a deep copy is performed. The existing value is destroyed first, and then the contents of the argument are copied into a new value.

See also

Get<type>

SetToNull

Description

Sets the data contained in the IPB_Value instance to null so the data can be reset.

Syntax

SetToNull( )

Return value

PBXRESULT. If the value is a read-only argument, the error PBX_E_READONLY_ARGS is returned.

Examples

This example shows the use of SetToNull when a null blob value is returned:

```
case pbvalue_blob:
   pStr=(LPCTSTR)Session-> GetBlob(retVal.blob_val);
   if (strncmp(pStr, "null", 4)==0 )
      ci->returnValue->SetToNull();
   else
      ci->returnValue->SetBlob(retVal.blob_val);
    break;
...
```

See also

IsEnum

IPB_VM interface

Description

The IPB_VM interface loads PowerBuilder applications in third-party applications and interoperates with the PowerBuilder virtual machine (PBVM).

Methods

IPB_VM has two methods:

CreateSession
RunApplication

CreateSession

Description

Creates an IPB_Session object that can be used to call PowerBuilder functions.

Syntax

CreateSession(LPCTSTR *applicationName*, LPCTSTR* *libraryList*, pbuint *numLibs*, IPB_Session** *session*)

Argument	Description
applicationName	The name of the current application object in lowercase
libraryList	The library list of the PowerBuilder application that contains the objects and functions to be called
numLibs	The number of libraries in the library list
session	A pointer to IPB_Session*, which will return the current IPB_Session pointer after the call

Return value

PBXRESULT. PBX_OK for success.

Examples

This example creates an IPB_Session with the simple library list *mydemo.pbl*:

```
IPB_Session* session;
IPB_VM* vm = NULL;
fstream out;
ifstream in;
PBXRESULT ret;

HINSTANCE hinst=LoadLibrary("pbvm105.dll");
if ( hinst== NULL) return 0;

out<< "Loaded PowerBuilder VM successfully!"<<endl;

P_PB_GetVM getvm = (P_PB_GetVM)GetProcAddress
   (hinst, "PB_GetVM");
if (getvm == NULL) return 0;
```

```
getvm(&vm);
if (vm == NULL) return 0;

static const char *liblist[] =
{
   "mydemo.pbl"
};

ret= vm->CreateSession("mydemo", liblist, 1, &session);
if (ret != PBX_OK)
{
   out << "Create session failed." << endl;
   return 0;
}
out << "Create session succeeded!" <<endl;
```

See also

RunApplication

RunApplication

Description

Runs the specified application.

Syntax

RunApplication(LPCTSTR *applicationName*, LPCTSTR* *libraryList*, pbuint *numLibs*, LPCSTR *commandLine*, IPB_Session** *session*)

Argument	Description
applicationName	The name of the application object to be run, in lowercase
libraryList	The library list of the application
numLibs	The number of libraries in the library list
commandLine	Parameters to be passed to the application object
session	A pointer to IPB_Session*, which will return the current IPB_Session pointer after the call

Return value

PBXRESULT. PBX_OK for success.

Examples

This code fragment loads the PowerBuilder VM and runs an application called runapp that uses one library, *runapp.pbd*. It passes in a command line with two arguments:

```
LRESULT CALLBACK WndProc(HWND hWnd, UINT message,
WPARAM wParam, LPARAM lParam)
{
   LPCTSTR szHello = "Hello world";
```

```
// Provide command line parameters (employee ids)
// to be passed to the PowerBuilder application
   LPCTSTR szcommandline = "102 110";

   int wmId, wmEvent, ret;
   PAINTSTRUCT ps;
   HDC hdc;

   switch (message)
   {
      case WM_CREATE:
         {
         hPBVMInst = ::LoadLibrary("pbvm105.dll");

         P_PB_GetVM getvm = (P_PB_GetVM)
            GetProcAddress(hPBVMInst,"PB_GetVM");

         IPB_VM* vm = NULL;

         getvm(&vm);

         static const char *liblist [] =
            {"runapp.pbd"};

         vm->RunApplication("runapp", liblist, 1,
            szcommandline, &session);

         break;
         }
```

See also CreateSession

IPBX_Marshaler interface

Description

The IPBX_Marshaler interface is used to invoke remote methods and convert PowerBuilder data formats to the user's communication protocol. A marshaler extension is a PowerBuilder extension that acts as the bridge between PowerBuilder and other components, such as EJBs, Java classes, CORBA objects, Web services, and so on.

Methods

Table 7-5: IPBX_Marshaler methods

Method	Description
Destroy	Destroys an instance of an object inherited from the IPBX_Marshaler structure
GetModuleHandle	Returns the handle of the PBX that contains the native class
InvokeRemoteMethod	Used in PowerBuilder marshaler native classes to call remote methods

Destroy

Description

Use the Destroy method to destroy instances of objects inherited from the IPBX_Marshaler structure.

Syntax

Destroy( )

Return value

None.

Examples

This code destroys the current instance of the SampleMarshaler structure:

```
void SampleMarshaler::Destroy()
{
  delete this;
}
```

Usage

You must implement this method in the marshaler native class after creating an instance of a marshaler structure and invoking remote methods.

See also

GetModuleHandle
InvokeRemoteMethod

GetModuleHandle

Description

Returns the handle of the PBX that contains the native class. This method is required to allow the PowerBuilder VM to determine which PBXs can be unloaded.

Syntax

GetModuleHandle( )

Return value

pbulong

Examples

This code in the implementation of a marshaler class returns the handle of the PBX:

```
extern pbulong thisModuleHandle;
pbulong SampleMarshaler::GetModuleHandle()
{
   return thisModuleHandle;
}
```

The handle is set in the main module:

```
pbulong thisModuleHandle = 0;

BOOL APIENTRY DllMain( HANDLE hModule,
                       DWORD  ul_reason_for_call,
                       LPVOID lpReserved
                )
{
   thisModuleHandle = (pbulong)hModule;

    switch (ul_reason_for_call)
   {
      case DLL_PROCESS_ATTACH:
      case DLL_THREAD_ATTACH:
      case DLL_THREAD_DETACH:
      case DLL_PROCESS_DETACH:
         break;
    }
    return TRUE;
}
```

Usage

You must implement this method in the marshaler native class.

See also

Destroy
InvokeRemoteMethod

InvokeRemoteMethod

Description

Used in PowerBuilder marshaler native classes to call remote methods.

Syntax

InvokeRemoteMethod(IPB_Session **session*, pbproxyobject *obj*, LPCTSTR *methodDesc*, PBCallInfo **ci*)

Argument	Description
session	This IPB session
obj	The proxy object for the remote object
methodDesc	An arbitrary string stored as an alias name for the remote method in the proxy, for example: `function int foo(int a) alias "This is a method in remote BizTalk"`
ci	The parameters and return value setting for the call

Return value

PBXRESULT.PBX_OK if the call succeeded.

Examples

This example shows a header file for a sample marshaler class:

```
#include "sampleinclude.h"
#include <pbext.h>

class SampleMarshaler : public IPBX_Marshaler
{
private:
   string   d_mystring;
   long     d_mylong;

private:
   void myMethod(string arg1);

public:
   SampleMarshaler(
      string myString,
      long   mylong
      );
   ~SampleMarshaler();

   virtual PBXRESULT InvokeRemoteMethod
      (
      IPB_Session*   session,
      pbproxyObject  obj,
      LPCTSTR        methodDesc,
      PBCallInfo*    ci
      );
      virtual pbulong   GetModuleHandle();
      virtual void Destroy();

   };
```

The associated C++ implementation file contains code like this:

```
   PBXRESULT SampleMarshaler::InvokeRemoteMethod
   (
      IPB_Session*   session,
      pbproxyObject  obj,
      LPCTSTR        methodDesc,
      PBCallInfo*    ci
   )
   {
      // method invocation
   }
```

Usage

You must implement this method in the marshaler native class.

See also

Destroy
GetModuleHandle

IPBX_NonVisualObject interface

Description

The IPBX_NonVisualObject interface inherits from IPBX_UserObject and is the direct ancestor class of nonvisual PowerBuilder native classes.

Methods

IPBX_NonVisualObject inherits two methods from the IPBX_UserObject interface:Destroy and Invoke.

IPBX_UserObject interface

Description

The IPBX_UserObject interface is the ancestor class of the PowerBuilder native classes.

Methods

IPBX_UserObject has two methods:Destroy and Invoke

Destroy

Description

Destroys the current instance of a PowerBuilder native class that inherits from IPBX_UserObject.

Syntax

Destroy( )

Return value

None.

Examples

This example shows how you would call Destroy for the class MyPBNIClass:

```
void MyPBNIClass::Destroy()
{
   delete this;
}
```

Usage

You must implement this method in the native class after creating an instance of the class and invoking remote methods.

See also

Invoke

Invoke

Description

Calls methods in PowerBuilder native classes.

Syntax

Invoke(IPB_Session * *session*, pbobject *obj*, pbmethodID *mid*, PBCallInfo **ci*)

Argument	Description
session	This IPB session
obj	The PowerBuilder extension object to be invoked
mid	The pbMethodID returned by GetMethodID
ci	The parameters and return value setting for the call

Return value

PBXRESULT.PBX_OK for success.

Examples

In this example, the method invoked depends on the value (0, 1, or 2) of the method ID returned from the GetMethodID method:

```
PBXRESULT PBNIExt::Invoke
```

```
   (
   IPB_Session   *session,
   pbobject   obj,
   pbmethodID   mid,
   PBCallInfo   *ci
   )
{
   PBXRESULT result = PBX_OK;

   switch (mid)
   {
   case mFuncA:
      result = FuncA(session, obj, ci);
      break;

   case mFuncB:
      result = FuncB(session, obj, ci);
      break;

   case mFuncC:
      result = FuncC(session, obj, ci);
      break;

   default:
      result = PBX_E_INVOKE_FAILURE;
      break;
   }

   return PBX_OK;
}
```

See also GetMethodID

IPBX_VisualObject interface

Description

The IPBX_VisualObject interface inherits from IPBX_UserObject and is the direct ancestor class of visual PowerBuilder native classes.

Methods

IPBX_VisualObject has three direct methods:

CreateControl
GetEventID
GetWindowClassName.

IPBX_NonVisualObject inherits two methods from the IPBX_UserObject interface:

Destroy
Invoke

CreateControl

Description

Creates a window control and returns its handle to the PowerBuilder VM.

Syntax

CreateControl(DWORD *dwExStyle*, LPCTSTR *lpWindowName*, DWORD *dwStyle*, int *x*, int *y*, int *nWidth*, int *nHeight*, HWND *hWndParent*, HINSTANCE *hInstance*)

Argument	Description
dwExStyle	The extended window style
lpWindowName	The window name
dwStyle	The window style
x	The horizontal position of the window
y	The vertical position of the window
nWidth	The window's width
nHeight	The window's height
hWndParent	The handle of the parent or owner window
hInstance	The handle of the application instance

Return value

HWND.

Examples

This is part of a visual extension example available on the Sybase Web site:

```
LPCTSTR CVisualExt::GetWindowClassName()
{
   return s_className;
}

HWND CVisualExt::CreateControl
```

```
(
   DWORD dwExStyle,      // extended window style
   LPCTSTR lpWindowName, // window name
   DWORD dwStyle,   // window style
   int x,           // horizontal position of window
   int y,           // vertical position of window
   int nWidth,      // window width
   int nHeight,     // window height
   HWND hWndParent, // handle to parent or owner window
   HINSTANCE hInstance   // handle to application
instance
)
{
   d_hwnd = CreateWindowEx(dwExStyle, s_className,
      lpWindowName, dwStyle, x, y, nWidth, nHeight,
      hWndParent, NULL, hInstance, NULL);

   ::SetWindowLong(d_hwnd, GWL_USERDATA, (LONG)this);

   return d_hwnd;
}
```

Usage

The window must be registered before you call CreateControl.

See also

GetEventID
GetWindowClassName

GetEventID

Description

Returns the identifier of an event when the window's parent is notified that the event occurred.

Syntax

GetEventID(HWND *hWnd*, uint *iMsg*, WPARAM *wParam*, LPARAM *lParam*)

Argument	Description
hWnd	The handle of the parent window.
iMsg	The message sent to the parent.
wParam	The word parameter of the message. For WM_COMMAND, the high-order word specifies: • The notification code if the message is from a control • 1 if the message is from an accelerator • 0 if the message is from a menu. The low-order word specifies the identifier of the control, accelerator, or menu. For WM_NOTIFY, this parameter contains the identifier of the control sending the message.
lParam	The long parameter of the message. For WM_COMMAND, this parameter contains the handle of the control sending the message if the message is from a control. Otherwise, this parameter is null. For WM_NOTIFY, this parameter contains a pointer to a structure.

Return value

Integer.

Examples

In this example, the GetEventID function returns the identifier PB_BNCLICKED if a WM_COMMAND message with the notification code BN_CLICKED was sent. It returns the identifier PB_ENCHANGE if a WM_NOTIFY message was sent; otherwise it returns PB_NULL.

```
TCHAR CVisualExt::s_className[] = "PBVisualExt";

LPCTSTR CVisualExt::GetWindowClassName()
{
  return s_className;
}

HWND CVisualExt::CreateControl
(
  DWORD dwExStyle,      // extended window style
  LPCTSTR lpWindowName, // window name
  DWORD dwStyle,        // window style
  int x,               // horizontal position of window
  int y,            // vertical position of window
  int nWidth,       // window width
  int nHeight,      // window height
  HWND hWndParent,  // handle of parent or owner window
  HINSTANCE hInstance // handle of application instance
)
{
  d_hwnd = CreateWindowEx(dwExStyle, s_className,
    lpWindowName, dwStyle, x, y, nWidth, nHeight,
    hWndParent, NULL, hInstance, NULL);

  ::SetWindowLong(d_hwnd, GWL_USERDATA, (LONG)this);

  return d_hwnd;
}

int CVisualExt::GetEventID(
   HWND    hWnd,     /* Handle of parent window */
   UINT    iMsg,     /* Message sent to parent window*/
   WPARAM  wParam,   /* Word parameter of message*/
   LPARAM  lParam    /* Long parameter of message*/
  )
{
  if (iMsg == WM_COMMAND)
  {
    if ((HWND)lParam == d_hwnd)
    {
      switch(HIWORD(wParam))
      {
      case BN_CLICKED:
        return PB_BNCLICKED;
        break;
      }
    }
  }

  if (iMsg == WM_NOTIFY)
  {
    return PB_ENCHANGE;
  }
  return PB_NULL;
}
```

Usage

This function is used to process Windows messages, such as WM_COMMAND and WM_NOTIFY, that are sent to the parent of an object and not to the object itself. Such messages cannot be caught in the visual extension's window procedure. The PBVM calls GetEventID to process these messages.

If the message is mapped to a PowerBuilder event, GetEventID returns the event's identifier, for example PB_BNCLICKED, and the event is fired automatically. PowerBuilder event token identifiers are mapped to unsigned integer values in the *pbevtid.h* header file. The identifiers in *pbevtid.h* are associated with PowerBuilder event token names. For example, the identifier PB_BNCLICKED is associated with the token name pbm_bnclicked.

If the message is not mapped to an event, GetEventID returns the value PB_NULL and the message is discarded.

See also

CreateControl
GetWindowClassName

GetWindowClassName

Description

Returns the name of the window.

Syntax

GetWindowClassName()

Return value

LPCTSTR.

Examples

The string returned by GetWindowClassName is passed as an argument to the CreateControl method:

```
LPCTSTR CVisualExt::GetWindowClassName()
{
   return s_className;
}
```

Usage

The window must be registered before you call GetWindowClassName.

See also

CreateControl
GetEventID

PBArrayInfo structure

Description

PBArrayInfo is a C++ structure used to hold information about arrays.

Properties

Table 7-6: PBArrayInfo members

Member	Type	Description
ArrayBound	Local struct declaration	Structure of type pblong containing the boundaries (*upperBound*, *lowerBound*) of a dimension.
BoundedArray	Enum data	Used in *arrayType* to identify that the array is a bounded array.
UnboundedArray	Enum data	Used in *arrayType* to identify that the array is an unbounded array.
arrayType	Enum type	Used in IPB_Session::GetArrayInfo to identify the datatype of the array. Do not set this variable manually.
valueType	pbuint	The datatype of array items. Set it to pbvalue_*type* if it is a simple type, or pbobject if the item is a class or structure.
numDimensions	pbuint	Number of dimensions of the array. An unbounded array can have only one dimension. The lower bound is one.
bounds	ArrayBound[]	Array bounds declaration array, used in a bounded array.

PBCallInfo structure

Description

PBCallInfo is a C++ structure used to hold arguments and return type information in function calls between PBNI and PowerBuilder.

Table 7-7: PBCallInfo members

Member	Type	Description
pArgs	IPB_Arguments*	Interface used to access arguments
returnValue	IPB_Value	Holds return data after the call
returnClass	pbclass	Holds return class after the call

PB_DateData structure

Description

The PB_DateData structure is used to pass data of type Date in the SetData function in the IPB_RSItemData interface.

Table 7-8: PB_DateData members

Field	Description
year	A short identifying the year
month	A short identifying the month
day	A short identifying the day
filler	A short used for structure alignment only

See also

SetData

PB_DateTimeData structure

Description

The PB_DateTimeData structure is used to pass data of type DateTime in the SetData function in the IPB_RSItemData interface.

Table 7-9: PB_DateTimeData members

Field	Description
date	A PB_DateData structure identifying the date
time	A PB_TimeData structure identifying the time

See also

SetData

PB_TimeData structure

Description

The PB_TimeData structure is used to pass data of type Time in the SetData function in the IPB_RSItemData interface.

Table 7-10: PB_DateData members

Field	Description
hour	A short identifying the hour
minute	A short identifying the minute
second	A short identifying the second
filler	A short used for structure alignment only

See also

SetData

PBX_DrawItemStruct structure

Description

The PBX_DrawItemStruct structure contains the properties of an external visual control that you want to draw using the PBX_DrawVisualObject function.

Table 7-11: PBX_DrawItemStruct members

Field	**Description**
x	X coordinate of the visual control relative to its parent control (for example, the window that contains it).
y	Y coordinate of the visual control relative to its parent control.
width	Width of the visual control.
height	Height of the visual control.
objectName	The name of the visual object, for example: uo_1.
tag	Field to be used to pass any value at the user’s discretion.
enabled	Whether the visual control is enabled. Possible values are true and false.
visible	Whether the visual control is visible. Possible values are true and false. In the development environment, PowerBuilder does not call the PBX_DrawVisualObject function if this field is set to false and the Design>Show Invisibles menu item is not selected.
borderstyle	Border style of the visual control. A value of the *pbborder_style* enumerated variable. Possible values are: • 0 – none • 1 – shadowbox • 2 – box • 5 – lowered • 6 – raised
backColor	Background color of the visual control. You can obtain the RGB value of the background color using the Windows API functions GetRValue, GetGValue, and GetBValue.

See also

PBX_DrawVisualObject

PBArrayAccessor template class

Description

There are two versions of the PBArrayAccessor template class. The first version is used to access the items in an array of a standard type. The second version is used to access items in a string array. The standard types are defined as ValueTypes in *pbtraits.h* and are pbint, pbuint, pbbyte, pblong, pblonglong, pbulong, pbboolean, pbreal, pbdouble, pbdec, pbdate, pbtime, pbdatetime, pbchar, pbblob, and pbstring.

PBArrayAccessor has four methods:

GetAt

IsNull

SetAt

SetToNull

GetAt

Description

Obtains the array item at the specified dimension.

Syntax

GetAt(pblong *dim*[])

Return value

ValueType (defined in *pbtraits.h*).

Argument	Description
dim	The dimension of the array item to be obtained

Examples

See SetAt.

See also

SetAt

IsNull

Description

Returns true if the array item contains a null value, otherwise returns false.

Syntax

IsNull(pblong *dim*[ ])

Argument	Description
dim	The dimension of the array item to be tested

Return value

pbboolean.

See also

GetAt
SetAt
SetToNull

SetAt

Description

Sets the array item at the specified dimension.

Syntax

For arrays of a specified ValueType:

SetAt(pblong *dim*[ ], ValueType *v*)

For string arrays:

SetAt(pblong *dim*[ ], LPCTSTR *string*)

SetAt(pblong *dim*[ ], pbstring *string*)

Argument	Description
dim	The dimension of the array item to be set
v	A ValueType defined in *pbtraits.h*
string	A string of type pbstring or LPCTSTR

Return value

None.

Examples

This example shows the use of GetAt and SetAt in arrays of a type specified by a ValueType:

```
template < typename T, pbvalue_type I>
void ArrayCreator<T, I>::f_unbounded_simple_array(
   IPB_Session* session,
   ifstream in,
   fstream out,
   LPCSTR data_type)
{
  pbarray out_array;
  int i;
  pblong dim[4], itemcount1, itemcount2;

  T *iarg, oarg;

  in >> itemcount1;
  iarg = new T[itemcount1];
// Create unbounded integer array
  {
   PBUnboundedArrayCreator<I> ac(session);
   out_array = ac.GetArray();
```

```
      PBArrayAccessor<I> aa(session, out_array);
      for(i=0; i<itemcount1; i++)
         in >> iarg[i];
      for (i=0; i<itemcount1; i++)
      {
        dim[0]=i+1;
        aa.SetAt(dim, iarg[i]);
      }
      itemcount2 = session->GetArrayItemCount(out_array);
      out <<"The array item count is "<< itemcount2 <<
         endl;
      for (i=0; i<itemcount2; i++)
      {
       dim[0]=i+1;
       oarg=aa.GetAt(dim);
       if (oarg != iarg[i])
        out << "*** ERROR"<< endl;
       else
        out << oarg << "  ";
      }
     }
     delete []iarg;
     out << endl;
     return;
  }
```

See also GetAt

SetToNull

Description Sets the value of the specified array item to null.

Syntax SetToNull(pblong *dim*[ ])

Argument	Description
dim	The dimension of the array item to be set

Return value None.

See also GetAt
IsNull
SetAt

PBBoundedArrayCreator template class

Description

There are two versions of the PBBoundedArrayCreator template class. The first version is used to create a bounded array of a standard type. The standard types are defined as ValueTypes in *pbtraits.h* and are pbint, pbuint, pbbyte, pblong, pblonglong, pbulong, pbboolean, pbreal, pbdouble, pbdec, pbdate, pbtime, pbdatetime, pbchar, pbblob, and pbstring. The second version is used to create a bounded array of strings.

Methods

PBBoundedArrayCreator has two methods:

GetArray
SetAt

GetArray

Description

Obtains an array that has been created.

Syntax

GetArray()

Return value

pbarray.

Examples

This example sets up an array, reads in values, and then obtains the values in the array:

```
LPCTSTR *ostr_a;
char **sp;
int i;
pbarray out_array;
arrayBounds* bounds;
pbuint dim1, dim2, current_dim;
pblong itemcount1, itemcount2;
PBXRESULT ret;
PBArrayInfo* ai;
pbstring *iarg, *oarg;
typedef PBBoundedArrayCreator<pbvalue_string>
   BoundedStringArrayCreator;

in >> dim1;
// allocate memory for pointer bounds
bounds = (arrayBounds*)malloc(dim1*sizeof
   (PBArrayInfo::ArrayBound));
bounds = new arrayBounds[dim1];
// read in lowerbound and upperbound for each dimension
// and calculate the array item count
itemcount1 = 1;
for (i=0;i<dim1;i++)
```

```
{
  in >> bounds[i].lowerBound >> bounds[i].upperBound;
  itemcount1 = itemcount1*
    (bounds[i].upperBound - bounds[i].lowerBound +1);
}
sp = new char*[itemcount1];
ostr_a = new LPCTSTR[itemcount1];
iarg = new pbstring[itemcount1];
// Read in array items
for (i=0; i<itemcount1; i++)
{
  sp[i] = new char[20];
  in >> sp[i];
  iarg[i]= session->NewString(sp[i]);
}
// create bounded simple array and set iarg[i] to it
{
  BoundedStringArrayCreator ac(session, dim1, bounds);
  current_dim = 1;
  BoundedArrayItem<pbstring, pbvalue_string,
        BoundedStringArrayCreator>::f_set_arrayitem
        (session, ac, dim1, bounds, iarg, current_dim);
  BoundedArrayItem<pbstring, pbvalue_string,
      BoundedStringArrayCreator>::array_itemcount = 0;
  out_array = ac.GetArray();
}
```

See also

SetAt

SetAt

Description

Sets a value or string to the array item at the specified dimension.

Syntax

For arrays of a specified ValueType:

SetAt(pblong *dim*[], ValueType *v*)

For string arrays:

SetAt(pblong *dim*[], LPCTSTR *string*)

SetAt(pblong *dim*[], pbstring *string*)

Argument	Description
dim	The dimension of the array item to be set
v	A ValueType defined in *pbtraits.h*
string	A string of type pbstring or LPCTSTR

Return value

None.

Examples

This example shows the use of SetAt in arrays of a type specified by a ValueType:

```
// arguments:
// ac:  class object of PBBoundedArrayCreator or
// PBBoundedObjectArrayCreator to set items into
// dimensions:  array dimension, can be 1,2,3,...,n
// bounds:  upper and lower bound for each dimension
// iarg:  T type array to store the data value set
// into array creator ac
// current_dim:  remember which dimension is looped into

template < typename T, pbvalue_type I,class C>
void BoundedArrayItem<T,I,C>::f_set_arrayitem
    (IPB_Session* session, C& ac, pblong dimensions,
    arrayBounds* bounds, T* iarg, int current_dim)
{
  int i;
  if (current_dim > dimensions)
    return;
  for(i= bounds[current_dim-1].lowerBound;
    i<= bounds[current_dim-1].upperBound; i++)
  {
    if (current_dim == dimensions)
    {
      dim[current_dim-1]= i;
      ac.SetAt(dim,iarg[array_itemcount]);
      array_itemcount++;
    }
    else
    {
      dim[current_dim-1]= i;
      BoundedArrayItem<T,I,C>::f_set_arrayitem
        (session, ac, dimensions, bounds, iarg,
         current_dim+1);
    }
  }
}
```

See also

GetArray

PBBoundedObjectArrayCreator class

Description

The PBBoundedObjectArrayCreator class is used to create an object array.

Methods

PBBoundedObjectArrayCreator has two methods:

GetArray
SetAt

GetArray

Description

Obtains an array that has been created.

Syntax

GetArray()

Return value

pbarray.

Examples

This example sets the values in an array and then uses GetArray to obtain the array:

```
PBBoundedObjectArrayCreator<pbvalue_string>
   ac(session);
for (i=0;i<itemcount1;i++)
{
   ac.SetAt(i+1,iarg[i]);
}
out_array = ac.GetArray();
```

See also

SetAt

SetAt

Description

Sets the array item at the specified dimension.

Syntax

For arrays of a specified ValueType:

SetAt(pblong *dim*[], ValueType *v*)

For string arrays:

SetAt(pblong *dim*[], LPCTSTR *string*)

SetAt(pblong *dim*[], pbstring *string*)

Argument	Description
dim	The dimension of the array item to be set
v	A ValueType defined in *pbtraits.h*
string	A string of type pbstring or LPCTSTR

Return value None.

Examples This method is included in the example for GetArray.

See also GetArray

PBObjectArrayAccessor class

Description The PBObjectArrayAccessor class is used to access the items in an object array.

Methods PBObjectArrayAccessor has two methods:

GetAt
SetAt

GetAt

Description Obtains the array item at the specified dimension.

Syntax GetAt(pblong *dim*[])

Return value pbobject.

Argument	Description
dim	The dimension of the array item to be set

Examples This example shows the use of GetAt in an object array:

```
PBObjectArrayAccessor aa(session, *array_val);
for (i=0;i<itemcount2;i++)
{
   dim[0] = i+1;
   oarg = aa.GetAt(dim);
   cls = session->GetClass(oarg);
   if( cls == NULL )
     return;
   fid = session->GetFieldID(cls, "text");
   if ( fid == 0xffff)
     return;
   fid_pv = session->GetFieldAddress(oarg,fid);
   mystr = fid_pv->GetString();
   ostr_a[i] = session->GetString(mystr);
}
```

See also SetAt

SetAt

Description

Sets the array item at the specified dimension.

Syntax

SetAt(pblong *dim*[], pbobject *obj*)

Argument	Description
dim	The dimension of the array item to be set
obj	A valid object handle

Return value

None.

Examples

This example shows the use of SetAt in an object array:

```
PBObjectArrayAccessor aa(session,*array_val);
for (i=0;i<itemcount1;i++)
{
   cls = session->FindClass(group,sp[i]);
   if( cls == NULL )
     return;
   iarg = session->NewObject(cls);
   session->ReferenceObject(iarg);
   dim[0] = i+1;
   aa.SetAt(dim, iarg);
   fid = session->GetFieldID(cls, "text");
   if ( fid == 0xffff )
     return;
   fid_pv = session->GetFieldAddress(iarg, fid);
   mystr = fid_pv->GetString();
   istr_a[i] = session->GetString(mystr);
}
```

See also

GetAt

PBUnboundedArrayCreator template class

Description

There are two versions of the PBUnboundedArrayCreator template class. The first version is used to create an unbounded array of a standard type. The standard types are defined as ValueTypes in *pbtraits.h* and are pbint, pbbyte, pbuint, pblong, pblonglong, pbulong, pbboolean, pbreal, pbdouble, pbdec, pbdate, pbtime, pbdatetime, pbchar, pbblob, and pbstring. The second version is used to create an unbounded array of strings.

Methods

PBUnboundedObjectArrayCreator has two methods:

GetArray
SetAt

GetArray

Description

Obtains an array that has been created.

Syntax

GetArray()

Return value

pbarray.

Examples

This example sets the values in an array and then uses GetArray to obtain the array:

```
PBUnboundedArrayCreator<pbvalue_string> ac(session);
for (i=0; i<itemcount1; i++)
{
   ac.SetAt(i+1,iarg[i]);
}
out_array = ac.GetArray();
```

See also

SetAt

SetAt

Description

Sets the array item at the specified position.

Syntax

For arrays of a specified ValueType:

SetAt(pblong *pos*, ValueType *v*)

For string arrays:

SetAt(pblong *pos*, LPCTSTR *string*)

SetAt(pblong *pos*, pbstring *string*)

Argument	Description
pos	A pblong identifying a position in the array
v	A ValueType defined in *pbtraits.h*
string	A string of type pbstring or LPCTSTR

Return value

None.

Examples

This example shows the use of SetAt in arrays of a type specified by a ValueType:

```
PBUnboundedArrayCreator<I> ac(session);
in >> iarg[i];
for (i=0; i<itemcount1; i++)
    {
      ac.SetAt(i+1, iarg[i]);
    }
out_array = ac.GetArray();
```

See also

GetArray

PBUnboundedObjectArrayCreator class

Description

The PBUnboundedObjectArrayCreator class is used to create an object array.

Methods

PBUnboundedObjectArrayCreator has two methods:

GetArray
SetAt

GetArray

Description

Obtains an array that has been created.

Syntax

GetArray( )

Return value

pbarray.

See also

SetAt

SetAt

Description

Sets the array item at the specified dimension.

Syntax

For arrays of a specified ValueType:

SetAt(pblong *pos*, ValueType *v*)

For string arrays:

SetAt(pblong *pos*, LPCTSTR *string*)

SetAt(pblong *pos*, pbstring *string*)

Argument	Description
pos	A pblong identifying a position in the array
v	A ValueType defined in *pbtraits.h*
string	A string of type pbstring or LPCTSTR

Return value

None.

See also

GetArray

Exported methods

Description

The following table lists methods that must be implemented in the PowerBuilder extension module when the conditions shown in the table apply. The methods are described after the table.

Methods

Table 7-12: Methods that must be exported by all extensions

Method	Required
PBX_CreateNonVisualObject	When the extension contains nonvisual native classes
PBX_CreateVisualObject	When the extension contains visual native classes
PBX_DrawVisualObject	When you want to be able to draw a visual representation of the visual object in the PowerBuilder development environment
PBX_GetDescription	In all extensions
PBX_InvokeGlobalFunction	When the extension contains global functions
PBX_Notify	When you need to initialize and uninitialize a session

PBX_CreateNonVisualObject

Description

Creates a new instance of a nonvisual PowerBuilder extension object.

Syntax

PBX_CreateNonVisualObject(IPB_Session* *pbsession*, pbobject *pbobj*, LPCTSTR *xtraName*, IPBX_NonVisualObject ****obj*)·

Argument	Description
pbsession	This IPB session
pbobj	The name of a pbobject corresponding to the PowerBuilder extension object to be created
xtraname	The name of the PowerBuilder native class in lowercase
obj	The PowerBuilder extension object to be created

Return value

PBXRESULT. PBX_OK for success.

Examples

In this example, the extension contains several classes. The object created depends on the string value of the class name passed in.

```
PBXEXPORT PBXRESULT PBXCALL PBX_CreateNonVisualObject
(
   IPB_Session*          pbsession,
   pbobject              pbobj,
   LPCTSTR               xtraName,
   IPBX_NonVisualObject  **obj
)
{
   PBXRESULT result = PBX_OK;

   string cn(className);
   if (cn.compare("class_a") == 0)
   {
      *obj = new class_a(pbobj);
   }
   else if (cn.compare("class_b") == 0)
   {
      *obj = new class_b(pbobj);
   }
   else if (cn.compare("class_c") == 0)
   {
      *obj = new class_b(pbobj);
   else
   {
      *obj = NULL;
      result = PBX_E_NO_SUCH_CLASS;
   }
   return PBX_OK;
};
```

Usage

You must implement this method in every PowerBuilder extension module that contains nonvisual classes. When you use the CREATE statement in PowerScript to create a new PowerBuilder extension object, the PBVM calls this method.

See also

PBX_GetDescription

PBX_CreateVisualObject

Description

Creates a new instance of a visual PowerBuilder extension object.

Syntax

PBX_CreateVisualObject(IPB_Session* *pbsession*, pbobject *pbobj*, LPCTSTR *xtraName*, IPBX_NonVisualObject ****obj*)·

Argument	Description
pbsession	This IPB session
pbobj	The name of a pbobject corresponding to the PowerBuilder extension object to be created
xtraname	The name of the PowerBuilder native class in lowercase
obj	The PowerBuilder extension object to be created

Return value

PBXRESULT. PBX_OK for success.

Examples

In this example the extension contains several classes. The object created depends on the string value of the class name passed in.

```
PBXEXPORT PBXRESULT PBXCALL PBX_CreateVisualObject
(
   IPB_Session*          pbsession,
   pbobject             pbobj,
   LPCTSTR                className,
   IPBX_VisualObject    **obj
)
{
   PBXRESULT result = PBX_OK;

   string cn(className);
   if (cn.compare("visualext") == 0)
   {
      *obj = new CVisualExt(pbsession, pbobj);
   }
```

```
         else
         {
            *obj = NULL;
            result = PBX_FAIL;
         }

         return PBX_OK;
      };
```

Usage
You must implement this method in every PowerBuilder extension module that contains visual classes. When you use a visual extension in a PowerBuilder application, the PBVM calls this method.

See also
PBX_GetDescription

PBX_DrawVisualObject

Description
Draws a visual object in the PowerBuilder development environment.

Syntax
PBX_DrawVisualObject(HDC *hDC*, LPCTSTR *className*, const PBX_DrawItemStruct& *property*)·

Argument	Description
hDC	A handle to the device context of the object
classname	The name of the visual extension object to be drawn
property	A PBX_DrawItemStruct structure specifying the display properties of the object

Return value
PBXRESULT. The return value of this function is currently ignored.

Examples
This is an extension of a sample that is available on the PowerBuilder CodeXchange Web site at http://powerbuilder.codexchange.sybase.com. It draws a representation of a light-emitting diode (LED) and uses Microsoft Foundation Classes (MFC):

```
PBXEXPORT PBXRESULT PBXCALL PBX_DrawVisualObject
(
HDC hDC,
LPCTSTR xtraName,
const PBX_DrawItemStruct& property
)
{
   // If this PBX is dynamically linked against the MFC
   // DLLs, any functions exported from this PBX that
   // call into MFC must have the AFX_MANAGE_STATE macro
   // added at the very beginning of the function.
   AFX_MANAGE_STATE( AfxGetStaticModuleState() );

   // Variables to hold the Led control and a pointer
   // to Device Context
   CLed *myLed;
   CDC* pDC;

   // The name must not contain uppercase letters
   if ( strcmp( xtraName, "u_cpp_led" ) == 0 )
   {
      CRect rc( property.x, property.y, property.x +
        property.width, property.y + property.height );

      //Create a new LED
      myLed = new CLed();

      // Get the handle from the hDC
      pDC = CDC::FromHandle(hDC);
      CWnd* pWnd = pDC->GetWindow();

      // Create the window
      myLed->Create(NULL, WS_CHILD | WS_VISIBLE |
        SS_BITMAP, rc,  pWnd);

      // Function that handles the background
      // rendering of the control
      myLed->OnEraseBkgndIDE(pDC);

      // Draw the LED in default mode (red, on, round)
      myLed->DrawLed(pDC,0,0,0);
      myLed->SetLed(0,0,0);

      //done
      delete myLed;
   }

   return PBX_OK;
}
```

Usage

In a visual extension, export this function if you want the visual control to be drawn in the development environment. If you do not export the function, you need to run the application to see the appearance of the visual control.

See also

PBX_CreateVisualObject
PBX_DrawItemStruct structure

PBX_GetDescription

Description

Passes a description of all the classes and methods in the PowerBuilder extension module to PowerBuilder.

Syntax

PBX_GetDescription ( )

Return value

LPCTSTR containing the description of the module.

Examples

The following extension module contains three classes:

```
PBXEXPORT LPCTSTR PBXCALL PBX_GetDescription()
{
   static const TCHAR desc[] = {
      "class class_a from nonvisualobject\n"
      "function long meth1(string classpath)\n"
      "function string meth2()\n"
      "end class\n"

      "class class_b from nonvisualobject\n"
      "subroutine sbrt1()\n"
      "subroutine sbrt2()\n"
      "function long func1()\n"
      "end class\n"

      "class class_c from nonvisualobject\n"
      "end class\n"
   };

  return desc;
}
```

The following module contains a visual class that has two subroutines (functions that do not return values), two events that require that Windows messages be captured in the extension (onclick and ondoubleclick), and one event that maps a Windows message directly to a PowerBuilder event (testmouse). The module also contains two global functions, funca and funcb.

```
PBXEXPORT LPCTSTR PBXCALL PBX_GetDescription()
{
   static const TCHAR desc[] = {
      "class visualext from userobject\n"
      "event int onclick()\n"
      "event int ondoubleclick()\n"
      "subroutine setcolor(int r, int g, int b)\n"
      "subroutine settext(string txt)\n"
      "event testmouse pbm_mousemove \n"
      "end class\n"
```

```
            "globalfunctions\n"
            "function int funca(int a, int b)\n"
            "function int funcb(int a, int b)\n"
            "end globalfunctions\n"
         };

      return desc;
    }
```

Usage

You must implement this method in every PowerBuilder extension module. The method is exported from the PowerBuilder extension module and is used by PowerBuilder to display the prototype of each class, function, and event in the module.

The syntax of the description follows:

Multiple instances
A syntax element with an asterisk indicates that multiple instances of that element can appear in a description. For example, [*Desc*]* indicates that one description can contain multiple classes, global functions, and forward declarations.

Desc ::=
    class_desc | *globalfunc_desc* | *forward_desc* | [*Desc*]*

class_desc ::=
    class *className* from *parentClass* newline
    [*methods_desc*]* end class newline

globalfunc_desc :=
    globalfunctions newLine [*func_desc*]* end globalfunctions

forward_desc :=
    forward newLine [*forwardtype_desc*]* end forward

forwardtype_desc :=
    class *className* from *parentClass* newline

className ::=
    a PowerBuilder token (cannot duplicate an existing group name)

parentClass ::=
    any class inherited from NonVisualObject or UserObject

newline ::=
    a newline character

methods_desc ::=
    method_desc [*methods_desc*]*

method_desc ::=
    func_desc | *sub_desc* | *event_desc*

func_desc ::=
function *returnType funcName*(*args_desc*) newline

returnType :: =
pbType

pbType ::=
any PowerBuilder type | previous declared PBNI class

funcName ::=
a PowerBuilder token

args_desc ::=
None | *arg_desc*, [*args_desc*]*

arg_desc ::=
[ref | readonly] *pbType argName* [*array_desc*]

argName ::=
a PowerBuilder token

array_desc ::=
array declaration of PowerBuilder

sub_desc ::=
subroutine *subName*(*args_desc*) newline

event_desc ::=
event *returnType eventName*(*args_desc*) newline
| event *eventName pbevent_token* newline

pbevent_token :: =
string

This syntax for event_desc allows you to map a Windows message directly to a PowerBuilder event:

event *eventName pbevent_token* newline

For more information, see "Event processing in visual extensions" on page 32.

See also

PBX_CreateNonVisualObject
PBX_CreateVisualObject
PBX_InvokeGlobalFunction

PBX_InvokeGlobalFunction

Description

Contains the implementation of one or more global functions used in the PowerBuilder extension module.

Syntax

PBX_InvokeGlobalFunction(IPB_Session* *pbsession*, LPCTSTR *functionname*, PBCallinfo* *ci*);

Argument	Description
pbsession	This IPB session
functionname	The name of the global function
ci	A pointer to a preallocated PBCallInfo structure containing the parameters and return value setting for the function

Return value

PBXRESULT. PBX_OK for success.

Examples

This PBX_GetDescription call declares three global functions: bitAnd, bitOr, and bitXor:

```
PBXEXPORT LPCTSTR PBXCALL PBX_GetDescription()
{
   static const TCHAR desc[] = {
      "globalfunctions\n"
      "function int bitAnd(int a, int b)\n"
      "function int bitOr(int a, int b)\n"
      "function int bitXor(int a, int b)\n"
      "end globalfunctions\n"
   };

  return desc;
}
```

The PBX_InvokeGlobalFunction call contains the implementation of the functions:

```
PBXEXPORT PBXRESULT PBXCALL PBX_InvokeGlobalFunction
(
   IPB_Session*   pbsession,
   LPCTSTR        functionName,
   PBCallInfo*    ci
   )
{

  PBXRESULT pbrResult = PBX_OK;

  int arg1 = ci->pArgs->GetAt(0)->GetInt();
  int arg2 = ci->pArgs->GetAt(1)->GetInt();
```

```
     if (stricmp(functionName, "bitand") == 0)
     {
        ci->returnValue->SetInt(arg1 & arg2);
     }else if (strcmp(functionName, "bitor") == 0)
     {
        ci->returnValue->SetInt(arg1 | arg2);
     }else if (strcmp(functionName, "bitxor") == 0)
     {
        ci->returnValue->SetInt(arg1 ^ arg2);
     }else
     {
        return PBX_FAIL;
     }

     return pbrResult;
  }
```

Usage

Use this function in a PowerBuilder native class that uses global functions. The function is exported from the PowerBuilder extension module and is used to identify global functions included in the module. Like global functions in PowerScript, global functions in PowerBuilder extensions cannot be overloaded.

See also

PBX_GetDescription

PBX_Notify

Description

Used to initialize and uninitialize a session.

Syntax

PBXEXPORT PBXRESULT PBXCALL PBX_Notify(IPB_Session* *pbsession*, pbint *reasonForCall*)

Return value

PBXRESULT

Examples

This sample shows code that exports PBX_Notify and displays a message box after the PBX is loaded and before it is unloaded:

```
PBXEXPORT PBXRESULT PBXCALL PBX_Notify
(
   IPB_Session*   pbsession,
   pbint          reasonForCall
)
{
   switch(reasonForCall)
   {
   case kAfterDllLoaded:
         MessageBox(NULL, "After PBX loading", "",
             MB_OK);
         break;
      case kBeforeDllUnloaded:
         MessageBox(NULL, "Before PBX unloading", "",
             MB_OK);
         break;
      }
      return PBX_OK;
   }
```

Usage

If PBX_NOTIFY is exported, the PBVM calls PBX_Notify immediately after an extension PBX is loaded and just before the PBX is unloaded. You can use this function to initialize and uninitialize a session. For example, you could create a session manager object, and store it in the IPB session using the SetProp function. Later, you could use GetProp to obtain the session object.

Method exported by PowerBuilder VM

Description

This method is exported by the PowerBuilder VM:

PB_GetVM

PB_GetVM

Description

Passes the IPB_VM interface to the user.

Syntax

PB_GetVM (IPB_VM** *vm*)

Examples

This example loads the PowerBuilder VM and calls the f_getrowcount function on the nvo_dw custom class user object:

```
#include <pbext.h>
#include <iostream.h>
typedef PBXEXPORT PBXRESULT (*P_PB_GetVM)(IPB_VM** vm);

class LibraryLoader
{
public:
  LibraryLoader(LPCSTR libname)
  {
    d_hinst = LoadLibrary(libname);
  }
  ~LibraryLoader()
  {
    FreeLibrary(d_hinst);
  }

  operator HINSTANCE()
  {
    return d_hinst;
  }

private:
  HINSTANCE d_hinst;
};

int main()
{
  int int_rowcount;
  PBXRESULT ret;
  LibraryLoader loader("pbvm105.dll");
  if ((HINSTANCE)loader == NULL) return 0;

  P_PB_GetVM getvm = (P_PB_GetVM)
    GetProcAddress((HINSTANCE)loader, "PB_GetVM");
  if (getvm == NULL) return 0;

  IPB_VM* vm = NULL;
  getvm(&vm);
  if (vm == NULL) return 0;

  static const char *liblist[] =
  {
    "load_pbvm.pbl"
  };

  IPB_Session* session = NULL;
  ret = vm->CreateSession
    ("load_pbvm", liblist, 1, &session);
  if (ret!= PBX_OK)
    {
    cout << " Create session failure!" << endl;
    return 0;
  }
  return 1;
}
```

Usage	To load the PowerBuilder VM and run a PowerBuilder application in a third-party server or application, you first create an IPB_VM object using the PB_GetVM method. Then, create an IPB_Session object within IPB_VM, using the application's name and library list as arguments.
See also	CreateSession

CHAPTER 8

PBNI Tool Reference

About this chapter

This chapter describes two tools provided with the PBNI SDK:

- The pbsig105 tool gets the internal signature of a PowerBuilder function from a PBL name.
- The pbx2pbd105 tool generates a PBD from a PBX.

When you install PowerBuilder, these tools are installed in the *SDK* subdirectory of your PowerBuilder 10.5 directory and in *Shared\PowerBuilder*.

Contents

pbsig105

Description

The PowerBuilder function signature is the internal signature of a PowerBuilder function that is used to identify polymorphism functions in a class. The pbsig105 tool obtains these function signatures from a PBL.

Inherited functions
You can also obtain a signature by selecting the function in the System Tree or Browser and selecting Properties from its pop-up menu. The pbsig105 tool does not report the signature of functions that are inherited from an ancestor object unless they are extended in the descendant. For such functions, you must use the Properties dialog box to obtain the signature. The Properties dialog box in the Browser also allows you to obtain the signature of PowerBuilder system functions.

Syntax

pbsig105 *pbl_name*

Examples

This command extracts function signatures from one of the PBLs in the Code Examples sample application:

```
pbsig105 pbexamw1.pbl
```

Here is some of the output from the previous command:

```
PB Object Name: w_date_sort
   public subroutine of_sort (string as_Column,
      string as_Order)
      /* QSS */

PB Object Name: w_date_window
   public function boolean of_is_leap_year
      (integer ai_year)
      /* BI */

   public subroutine of_days ()
      /* Q */

PB Object Name: w_dde_server
   public subroutine check_hotlink (checkbox status,
      string data, string item)
      /* QCcheckbox.SS */

PB Object Name: w_dir_treepublic function integer
   wf_collapse_rows (datawindow
      adw_datawindow, long al_startrow)
      /* ICdatawindow.L */
   public function long of_recurse_dir_list (string
      as_path, long al_parent)
      /* LSL */
   public function string of_build_dw_tree
     (long al_handle)
      /* SL */
```

The following example illustrates the use of a letter code to represent a PowerBuilder system class or a custom class. Consider this function:

```
function integer of_get_all_sales_orders (Ref
s_sales_order astr_order[], date adt_date, integer
ai_direction)
```

For this function, the pbsig105 tool returns the following string. The first argument is an unbounded array of type s_sales_order and is passed by reference:

```
/* IRCs_sales_order.[]YI */
```

Usage

The pbsig105 tool generates a string that represents the declaration and signature of all the functions and events in the PBL, including argument types, return types, and passing style. Each function and event is followed by a commented string. You pass the commented string, for example, `QSS` in the first comment in the previous example, as the last argument to the GetMethodID method.

For example, the following output indicates that the function returns an integer and has a single integer argument passed by reference:

```
/* IRI */
```

PowerBuilder arrays PowerBuilder arrays are indicated with a pair of square brackets [ ] as a suffix. For bounded arrays, the brackets enclose the bounds.

```
/* IRCdatastore.RS[]SS */
```

PowerBuilder system or custom class Additional letter codes represent a PowerBuilder system class or a custom class. The letter C followed by the name of a PowerBuilder object or enumerated class and a period (`C`*name*`.`) represents an argument or return value of that type.

The following table shows how the output from pbsig105 maps to datatypes and other entities.

Table 8-1: Return value and argument representation in pbsig105 output

Output	Datatype
[ ]	array
A	any
B	boolean
C	class
D	double
E	byte
F	real
G	basictype
H	character
I	integer
J	cursor
K	longlong
L	long
M	decimal
N	unsigned integer (uint)
O	blob

Output	**Datatype**
P	dbproc
Q	No type (subroutine)
S	string
T	time
U	unsigned long (ulong)
W	datetime
Y	date
Z	objhandle

The passing style is indicated by a prefix on the type.

Table 8-2: Passing style and varargs representation in pbsig105 output

Prefix	**Meaning**
None	Pass by value
R	Pass by reference
X	Pass as read only
V	Variable arguments (varargs)

pbx2pbd105

Description

The pbx2pbd105 tool generates a PowerBuilder dynamic library (PBD) file from a PowerBuilder extension PBX. The generated PBD can be added to the library list of any PowerBuilder application target that will use the objects and methods in the PowerBuilder extension.

Syntax

pbx2pbd105 [+] *des*.pbd *src1*.pbx [*src2*.pbx *src3*.pbx ...*srcn*.pbx]

Examples

This example generates a new PBD *test.pbd* from *test.pbx*. The input and output files are in the current directory:

```
pbx2pbd105 test.pbd  test.pbx
```

This example appends generated information from *C:\myproject\src.pbx* to *C:\mypbds\des.pbd.* (If *des.pbd* does not exist, it is created.)

```
pbx2pbd105 + C:\mypbds\des.pbd  C:\myproject\src.pbx
```

This example generates a new PBD *D:\pbds\test.pbd* from all the PBX files in the *C:\myproject* directory:

```
pbx2pbd105 D:\pbds\test.pbd C:\myproject\*.pbx
```

This example generates PBD information from all the PBX files in the *C:\temp* and *D:\temp* directories and appends the information to the existing generated PBD file *D:\pbds\test.pbd*:

```
pbx2pbd105 + D:\pbds\test.pbd c:\temp\*.pbx
d:\temp\*.pbx
```

Usage

You can import an extension into a PowerBuilder library using the Import PB Extension pop-up menu item for the library in the PowerBuilder System Tree. Prior to PowerBuilder 10.5, you had to use the pbx2pbd*nnn* tool to create a PBD file from a PBX file, then add the PBD to the library list of your PowerScript target. The tool is still available in this release.

You can include multiple PBXs in a single PBD file. If you want to add additional PBXs to an existing PBD, use the plus (+) sign before the name of the PBD.

The pbx2pbd105 tool is installed in the system PATH in the *Shared\PowerBuilder* directory so you can invoke it in the directory where the PBXs reside.

If you specify an absolute path for the PBX file when you generate the PBD, the PowerBuilder application searches for the PBX *only in the specified path*.

If you do not specify the path for the PBX file, the PowerBuilder application searches the system path for the PBX.

P A R T   3

Appendix

This appendix describes wizards provided for Microsoft Visual Studio .NET.

APPENDIX A

Using the Visual Studio .NET Wizard

About this appendix

If you use Visual Studio .NET 2002 or 2003, you can use a wizard to create a PBNI extension project. The wizard creates a project with *.cpp* and *.h* files that contain required code as well as template code to help you get started. Check for wizard updates in the PBNI section of the PowerBuilder CodeXchange Web site at http://powerbuilder.codeXchange.sybase.com/.

Contents

Where the wizards are installed

When you install PowerBuilder, the setup program installs three directories into the *PowerBuilder 10.5\SDK\PBNI\wizards* directory:

- *VCProjects 7.0*
- *VCProjects 7.1*
- *VCWizards*

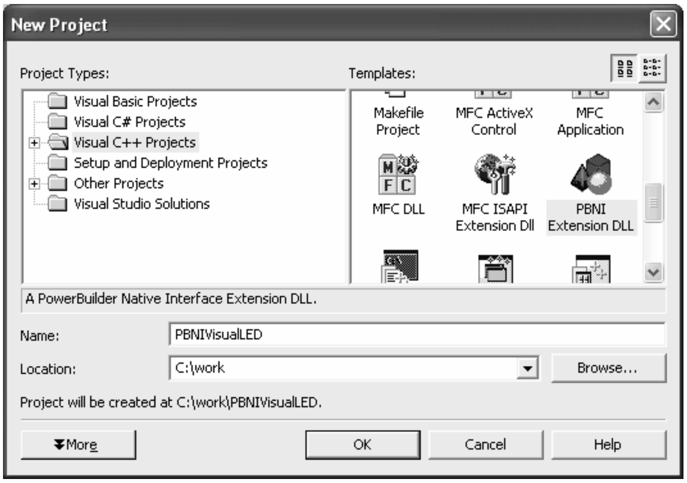
If Microsoft Visual Studio .NET 2002 or 2003 is already installed on your computer, the setup program also installs the appropriate files into your Visual Studio installation.

Table A-1: Where wizard files are installed

Visual Studio version	Files copied	Destination
Visual Studio .NET 2003	*VCProjects 7.1* *VCWizards*	*..\Microsoft Visual Studio .NET 2003\Vc7\VCProjects* *..\Microsoft Visual Studio .NET 2003\Vc7\VCWizards*
Visual Studio .NET 2002	*VCProjects 7.0* *VCWizards*	*..\Microsoft Visual Studio .NET\Vc7\VCProjects* *..\Microsoft Visual Studio .NET Vc7\VCWizards*

If Visual Studio .NET is not already installed when you install PowerBuilder, see the *install.txt* file in the *PBNI\wizards\VCWizards\PBNIWizard* directory for how to install the wizard later.

To check whether the wizard is installed in Visual Studio .NET, select File>New>Project from the menu bar , select Visual C++ Projects, and scroll the Templates pane to see the PBNI wizard.



A PowerBuilder Native Interface Extension DLL.

Name: PBNIVisualLED

Location: C:\work

Project will be created at C:\work\PBNIVisualLED.

Generating a PBNI project

The PBNI Application Wizard lets you choose whether to create a visual or nonvisual extension, whether to include support for Unicode and global functions, and whether to generate a header file.

❖ **To create a new PBNI project:**

1. Start Visual Studio .NET, select File>New>Project, select Visual C++ Projects, and scroll the Templates pane to see the PBNI wizard.
2. Select PBNI Extension DLL, enter a name and location for the project, and click OK.
3. Click Application Settings if you want to create a visual extension or change any other settings.

   The default is to create a nonvisual extension with Unicode support.
4. Click Finish.

   See the *ReadMe.txt* file created by the wizard for a description of the generated source and header files.

Setting project options

If the project does not build correctly, you might need to set the path for the PBNI *include* files.

❖ **To set project options for PBNI library and include files:**

1. In Visual Studio, select Tools>Options.
2. Select Projects>VC++ Directories.
3. Select Include Files from the Show Directories For drop-down list and click the New icon. Then click the browse button, browse to the location of the *PowerBuilder 10.5\SDK\PBNI\include* directory, and click OK.
4. Click OK to close the Options dialog box.

By default, the project is compiled for Unicode character sets. You can change this setting in the wizard. If you want to change it to compile for ASCII (SBCS) character sets after you have created the project, you can remove the _UNICODE preprocessor option.

❖ **To compile for ASCII character sets:**

1. Select Project>*ProjectName* Properties.
2. Expand C/C++ and select Preprocessor.
3. Edit the Preprocessor Definitions to remove _UNICODE and UNICODE.

Building and using the PBX

When you have finished coding the project, build the project from the Build menu to create a DLL with the extension *.pbx*. By default, the extension is created in the *Debug* directory.

Then, you can import the PBX into a PBL in your PowerBuilder target and use it as described in "Using the extension" on page 26.

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