Customizing and Extending PowerDesigner

SAP® Sybase® PowerDesigner® 16.5 SP03

Windows

Contents

CHAPTER 1 PowerDesigner Resource Files

The SAP® Sybase® PowerDesigner® modeling environment is powered by XML-format resource files, which define the objects available in each model along with the methods for generating and reverse-engineering them. You can view, copy, and edit the provided resource files and create your own in order to customize and extend the behavior of the environment.

The following types of resource files, based on or extending the PowerDesigner public metamodel are provided:

- *Definition file*: customize the metamodel to define the objects available for a specific DBMS or language:
  - *DBMS definition files* (.xdb) - define a specific DBMS in the PDM (see *Chapter 4, DBMS Definition Files* on page 121).
  - *Process, object, and XML language definition files* (.xpl, .xol, and .xsl) – define a specific language in the BPM, OOM, or XSM (see *Chapter 3, Object, Process, and XML Language Definition Files* on page 109).
- *Extension files* (.xem) – extend the standard definitions of target languages to, for example, specify a persistence framework or server in an OOM. You can create or attach one or more XEMs to a model (see *Chapter 2, Extension Files* on page 9).
- *Report templates* (.rtp) - specify the structure of a report. Editable within the Report Template Editor (see *Core Features Guide > Storing, Sharing and Reporting on Models > Reports*).
- *Report language files* (.xrl) – translate the headings and other standard text in a report (see *Chapter 6, Translating Reports with Report Language Files* on page 289).
- *Impact and lineage analysis rule sets* (.rul) - specify the rules defined for generating impact and lineage analyses (see *Core Features Guide > Linking and Synchronizing Models > Impact and Lineage Analysis*).
- *Object permission profiles* (.ppf) - customize the PowerDesigner interface to hide models, objects, and properties (see *Core Features Guide > Administering PowerDesigner > Customizing the PowerDesigner Interface > Using Profiles to Control the PowerDesigner Interface*).
- *User profiles* (.upf) - store preferences for model options, general options, display preferences, etc (see *Core Features Guide > Modeling with PowerDesigner > Customizing Your Modeling Environment > User Profiles*).
- *Model category sets* (.mcc) - customize the New Model dialog to guide model creation (see *Core Features Guide > Administering PowerDesigner > Customizing the PowerDesigner Interface > Customizing the New Model Dialog*).
- *Conversion tables* (.csv) - define conversions between the name and code of an object (see *Core Features Guide > Modeling with PowerDesigner > Objects > Naming Conventions*).

You can review all the available resource files from the lists of resource files, available by selecting **Tools** > **Resources** > ***type***.

The following tools are available on each resource file list:

Tool	Description
📋	Properties - Opens the resource file in the Resource Editor.
📄	New - Creates a new resource file using an existing file as a model (see *Creating and Copying Resource Files* on page 6).
💾	Save - Saves the selected resource file.
💾	Save All - Saves all the resource files in the list.
📁	Path - Specifies the directories that PowerDesigenr should search to populate the list (see *Specifying Directories to Search for Resource Files* on page 6).
🔍	Compare - Selects two resource files for comparison.
➡	Merge - Selects two resource files for merging.
➡	Check In - [if the repository is installed] Checks the selected resource file into the repository. For information about storing your resource files in the repository, see *Core Features Guide > Administering PowerDesigner > Deploying an Enterprise Glossary and Library*.
↩	Update from Repository - [if the repository is installed] Checks out a version of the selected file from the repository to your local machine.
🔍	Compare with Repository - [if the repository is installed] Compares the selected file with a resource file stored in the repository.

Opening Resource Files in the Editor

When working with a BPM, PDM, OOM, or XSM, you can open the definition file that controls the objects available in your model in the Resource Editor for viewing and editing. You can also open and edit any extension files currently attached to or embedded in your model or access the appropriate list of resource files and open any PowerDesigner resource file.

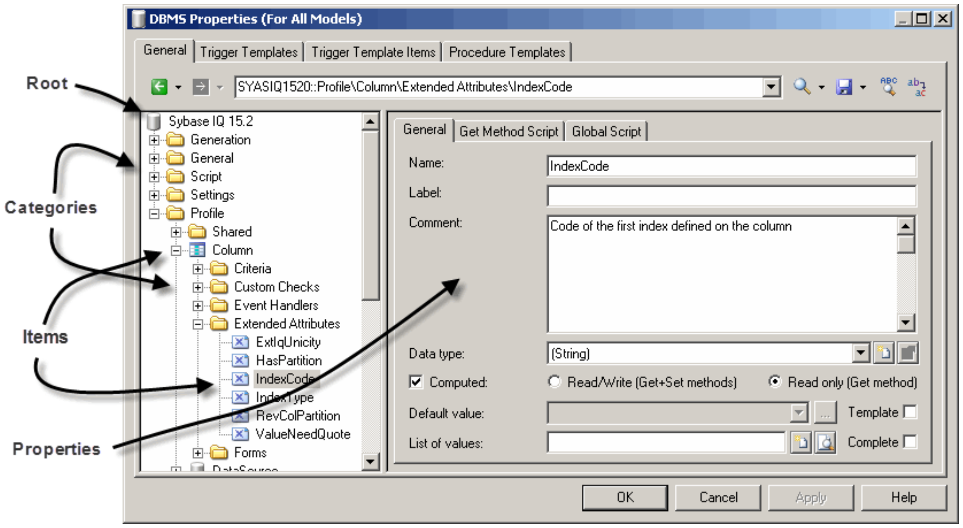
To open the definition file currently used by your model:

- In a PDM, select **Database** > **Edit Current DBMS**.
- In a BPM, select **Language** > **Edit Current Process Language**.
- In an OOM, select **Language** > **Edit Current Object Language**.
- In an XSM, select **Language** > **Edit Current Language**.

To open any extension file currently attached to your model, double-click its entry inside the **Extensions** category in the Browser.

To open any other resource file, select **Tools** > **Resources** > *Type* to open the relevant resource file list, select a file in the list, and then click the **Properties** tool.

In each case, the file opens in the Resource Editor, in which you can review and edit the structure of the resource. The left-hand pane shows a tree view of the entries contained within the resource file, and the right-hand pane displays the properties of the currently-selected element:



Name: IndexCode
Label:
Comment: Code of the first index defined on the column
Data type: (String)
Computed: ✓ Read/Write (Get+Set methods) [● Read only (Get method)]
Default value:
Template
List of values:
Complete

Note: You should never modify the resource files shipped with PowerDesigner. If you want to modify a file, create a copy using the **New** tool (see *Creating and Copying Resource Files* on page 6).

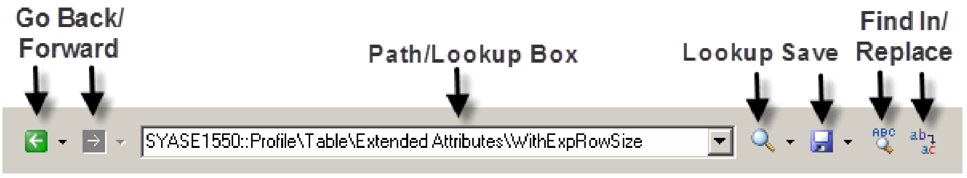
Each entry is a part of the definition of a resource file, and entries are organized into logical categories. For example, the Script category in a DBMS language file collects together all the entries relating to database generation and reverse engineering.

You can drag and drop categories or entries in the tree view of the resource editor and also between two resource editors of the same type (for example two XOL editors).

Note: Some resource files are delivered with "Not Certified" in their names. Sybase® will perform all possible validation checks, however we do not maintain specific environments to fully certify these resource files. We will support them by accepting bug reports and providing fixes as per standard policy, with the exception that there will be no final environmental validation of the fix. You are invited to assist us by testing fixes and reporting any continuing inconsistencies.

Navigating and Searching in Resource Files

The tools at the top of the Resource Editor help you to navigate through and search in the resource file.



Tool	Description
	Back (**Alt+Left**) - Go to the previous visited entry or category. Click the down arrow to directly select from your history.
	Forward (**Alt+Right**) - Go to the next visited entry or category. Click the down arrow to directly select from your history.
	Lookup (**Enter**) - Go to the item named in the text box to the left of the tool. If more than one item is found, they are listed in a results dialog and you should double-click on the desired item or select it and click **OK** to go to it. Click the down arrow to set lookup options: • [extension type] - select the type of extension to search, for example you can search only stereotypes • Allow wildcard - Enables the use of the characters `*` to match any string and `?` to match any single character. For example, type `is*` to retrieve all extensions called `is...`. • Match case - Search with case sensitivity.
	Save (**Ctrl+Shift+S**) – Save the current resource file. Click the down arrow to save the current resource file under a new name.
	Find In Items (**Ctrl+Shift+F**) - Search for text in entries.
	Replace In Items (**Ctrl+Shift+H**) - Search for and replace text in entries.

Note: To jump to the definition of a template from a reference in another template (see *Templates (Profile)* on page 86) or other extension, place your cursor between the percent signs and press **F12**. If an extension overrides another item, right-click it and select **Go to super-definition** to go to the overriden item.

Editing Resource Files

You can add items in the resource editor by right-click a category or an entry in the tree view.

The following editing options are available:

Edit option	Description
New	Adds a user-defined entry or category .
Add items...	Opens a selection dialog box to allow you select one or more of the predefined metamodel categories or entries to add to the present node. You cannot edit the names of these items but you can change their comments and values by selecting their node.
Remove	Deletes the selected category or entry.
Restore Comment	Restores the default comment for the selected category or entry.
Restore value	Restores the default value for the selected entry.

Note: You can rename a category or an entry directly from the resource file tree by selecting it and pressing the **F2** key.

Saving Changes

If you make changes to a resource file and then click **OK** to close the resource editor without having clicked the **Save** tool, the changes are saved in memory, the editor is closed and you return to the list of resource files. When you click **Close** in the list of resource files, a confirmation box is displayed asking you if you really want to save the modified resource file. If you click **Yes**, the changes are saved in the resource file itself. If you click **No**, the changes are kept in memory until you close the PowerDesigner session.

The next time you open any model that uses the customized resource file, the model will take modifications into account. However, if you have previously modified the same options directly in the model, the values in the resource file do not change these options.

Sharing and Embedding Resource Files

Resource files can be shared and referenced by multiple models or copied to and embedded in a single model. Any modifications that you make to a shared resource are available to all models using the resource, while modifications to an embedded resource are available only to the model in which it is embedded. Embedded resource files are saved as part of their model and not as a separate file.

Note: You should never modify the original extensions shipped with PowerDesigner. To create a copy of the file to modify, open the List of Extensions, click the **New** tool, specify a name for the new file, and then select the .xem that you want to modify in the **Copy from** field.

The **File Name** field displays the location of the resource file you are modifying is defined. This field is empty if the resource file is embedded.

Creating and Copying Resource Files

You can create a new resource file in the appropriate resource file list. To create a copy of an existing resource file, select it in the **Copy from** field of the **New...** dialog.

Warning! Since each resource file has a unique id, you should only copy resource files within PowerDesigner, and not in Windows Explorer.

1. Select **Tools > Resources >** ***Type*** to open the appropriate resource file list.
2. Click the **New** tool, enter a name for the new file and select an existing file to copy. Select the `<Default template>` item to create a minimally completed resource file.
3. Click **OK** to create the new resource file, and then specify a filename and click **Save** to open it in the Resource Editor.

   Note: You can create an extension file directly in your model from the List of Extensions. For more information, see *Creating an Extension File* on page 10.

Specifying Directories to Search for Resource Files

Use the **Path** tool in the resource list toolbar to specify directories to search to populate the list. If you plan to modify the standard resource files or create your own, you must store these files in a directory outside the PowerDesigner installation directory.

By default, only the directory inside the `Program Files` folder containing the standard resource files appears in the list, but PowerDesigner does not allow you to save modifications there, and will propose an alternative location if you try to do so, adding the selected directory to the list. You can add additional directories as necessary.

Note: If you have created or modified resource files inside `Program Files` before 16.5, when this rule was introduced, your files may no longer be available as Windows Vista or Windows 7 actually store them in a virtual mirror at, for example, `C:\Users\`*`username`*`\AppData\Local\VirtualStore\Program Files\Sybase\PowerDesigner 16\Resource Files\DBMS`. To restore these files to your lists, optionally move them to a more convenient path, and add their location to your list using the **Path** tool.

The first directory in the list is the default location, which is proposed whenever you save a file. The root of the library belonging to your most recent repository connection is searched recursively before the directories in the list (see *Core Features Guide > Administering PowerDesigner > Deploying an Enterprise Glossary and Library*), .

Note: In rare cases, when seeking resource files to resolve broken references in models, the directories in the list are scanned in order, and the first matching instance of the required resource is used.

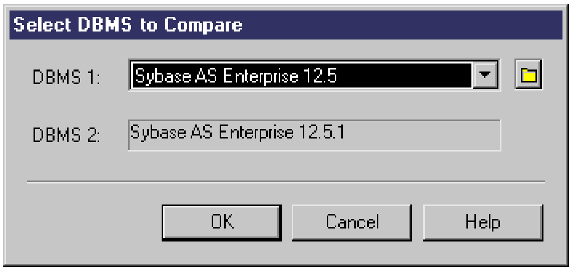
Comparing Resource Files

You can select two resource files and compare them to highlight the differences between them.

1. Select **Tools > Resources >** ***Type*** to open the appropriate resource file list.
2. Select the first resource file you want to compare in the list, and then click the **Compare** tool to open a selection dialog.

   The selected file is displayed in the second comparison field.
3. Select the other resource file to compare in the first comparison field.

   If the resource file you want to compare is not in the list, click the **Select Path** tool and browse to its directory.



DBMS 1: Sybase AS Enterprise 12.5

DBMS 2: Sybase AS Enterprise 12.5.1

4. Click **OK** to open the **Compare...** dialog, which allows you to review all the differences between the files.

   For detailed information about this window, see *Core Features Guide > Modeling with PowerDesigner > Comparing and Merging Models*.
5. Review the differences and then click **Close** to close the comparison window and return to the list.

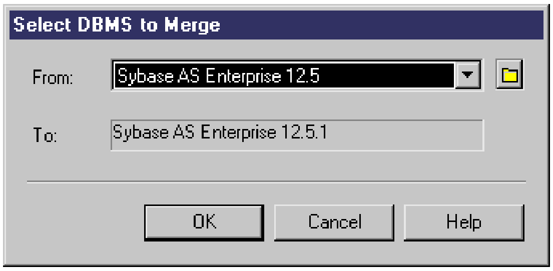
Merging Resource Files

You can select two resource files of the same kind and merge them. Merge is performed from left to right, the resource file in the right pane is compared to the resource file in the left pane, differences are highlighted and merge actions are proposed in the right hand resource file.

1. Select **Tools** > **Resources** > ***Type*** to open the appropriate resource file list.
2. Select the resource file in which you want to make merge changes in the list, and then click the **Merge** tool to open a selection dialog.

   The selected file is displayed in the **To** field.
3. Select the resource file from which you want to merge in the **From** field.

   If the resource file you want to merge is not in the list, click the **Select Path** tool and browse to its directory.



From: Sybase AS Enterprise 12.5

To: Sybase AS Enterprise 12.5.1

4. Click **OK** to open the **Merge...** dialog, which allows you to review all the merge actions before you complete them.

   For detailed information about this window, see *Core Features Guide > Modeling with PowerDesigner > Comparing and Merging Models*.
5. Select or reject the proposed merge actions as necessary, and then click **OK** to perform the merge.

CHAPTER 2 Extension Files

Extensions files (`*.xem`) allow you to customize and extend the PowerDesigner metamodel to support your exact modeling needs. You can define additional properties for existing objects or specify entirely new types of objects, modify the PowerDesigner interface (reorganizing and adding property sheet tabs, Toolbox tools and menu items), and define additional generation targets and options.

Extension files have an `.xem` extension and are located in `*install_dir*/Resource Files/Extended Model Definitions`.

Lists of extension files by model type are available by selecting **Tools > Resources > Extensions > *model type***. For information about the tools available in resource file lists, see *Chapter 1, PowerDesigner Resource Files* on page 1.

Note: Extensions, such as the Excel Import extension, which can be attached to any model type, are available in the list at **Tools** > **Resources** > **Extensions** > **All Model Types**.

Each extension file contains two first-level categories:

- *Generation* - used to develop or complement the default PowerDesigner object generation (for BPM, OOM, and XSM models) or for separate generation. For more information, see *Generation Category* on page 114.
- *Profile* - used for extending the metaclasses in the PowerDesigner metamodel. You can:
  - Create or sub-classify new kinds of objects:
    - Metaclasses – drawn from the metamodel as a basis for extension.
    - Stereotypes [for metaclasses and stereotypes only] – sub-classify metaclasses by stereotype.
    - Criteria – sub-classify metaclasses by evaluating conditions.
  - Add new properties and collections to objects and display them:
    - Extended attributes – to add metadata.
    - Extended collections and compositions – to enable manual linking between objects.
    - Calculated collections – to automate linking between objects.
    - Dependency matrices – to show dependencies between two types of objects.
    - Forms – to modify property sheets and add custom dialogs.
    - Custom symbols – to change the appearance of objects in diagrams.
  - Add constraints and validation rules to objects:
    - Custom checks – to test the validity of your models on demand
    - Event handlers – to perform validation or invoke methods automatically.
  - Execute commands on objects:

    - Methods – VBScripts to be invoked by menus or form buttons.
    - Menus [for metaclasses and stereotypes only] – to add commands to PowerDesigner menus.
- Generate objects in new ways:
    - Templates – to extract text from object properties.
    - Generated Files - to assemble templates for preview and generation of files
    - Transformations – to automate changes to objects at generation or on demand.
- Map correspondences between different metamodels:
    - Object generations - to define mappings between different modules in the PowerDesigner metamodel for model-to-model generation.
    - XML imports - to define mappings between an XML schema and a PowerDesigner module to import XML files as models.

Note: Since you can attach several resource files to a model (for example, a target language and one or more extension files) you can create conflicts, where multiple extensions with identical names (for example, two different stereotype definitions) are defined on the same metaclass in separate resource files. In case of such conflicts, the extension file extension usually prevails. When two XEMs are in conflict, priority is given to the one highest in the List of Extensions.

Creating an Extension File

You can create an extension file directly in your model or from the appropriate list of extension files.

Note: Extensions, such as the Excel Import extension, which can be attached to any model type, can only be created from the **All Model Types** extension list. For information about creating an extension file from a list of extension files, see *Creating and Copying Resource Files* on page 6.

1. Open your model, and then select **Model > Extensions** to open the List of Extensions.
2. Click the **Add a Row** tool and enter a name for the new extension file.
3. Click the **Properties** tool to open the new extension file in the Resource Editor, and create any appropriate extensions.
4. When you have finished, click **OK** to save your changes and return to the List of Extensions.

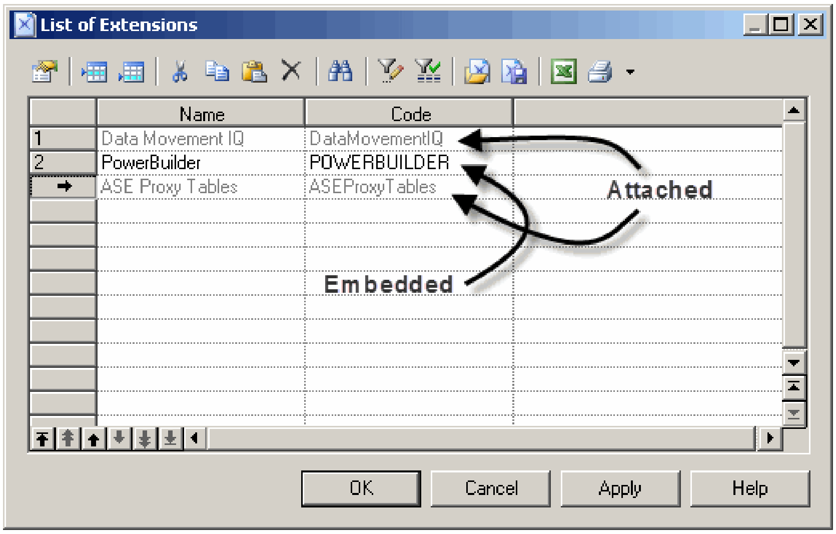
   The new XEM is initially embedded in your model, and cannot be shared with any other model. For information about exporting your extensions and making them available for sharing, see *Exporting an Embedded Extension File for Sharing* on page 12.

Attaching Extensions to a Model

Extensions can be stored in `*.xem` files that you can attach to one or more models. You can attach one or more extension files to a model at creation time by clicking the **Select Extensions** button on the New Model dialog. You can subsequently attach extension files to your model at any time from the List of Extensions.

1. Select **Model** > **Extensions** to open the List of Extensions, which contains extensions attached to the model.
2. Click the **Attach an Extension** tool to open the Select Extensions dialog.
3. Review the different sorts of extensions available by clicking the sub-tabs and select one or more to attach to your model.

   By default, PowerDesigner creates a link in the model to the specified file. To copy the contents of the extension file and save it in your model file, click the **Embed Resource in Model** button in the toolbar. Embedding a file in this way enables you to make changes specific to your model without affecting any other models that reference the shared resource.
4. Click **OK** to return to the List of Extensions.



	Name	Code
1	Data Movement IQ	DataMovementIQ
2	PowerBuilder	POWERBUILDER
→	ASE Proxy Tables	ASEProxyTables

Extension files listed in grey are attached to the model, while those in black are embedded in the model.

Note: If you embed an extension file in the model, the name and code of the extension may be modified in order to make it respect the naming conventions of the Other Objects category in the Model Options dialog.

Exporting an Embedded Extension File for Sharing

If you export an XEM created in a model, it becomes available in the List of Extensions, and can be shared with other models. When you export an XEM, the original remains embedded in the model.

1. Select **Model** > **Extensions** to open the List of Extensions, which contains extensions attached to the model.
2. Select an embedded extension in the list and click the **Export an Extension** tool.
3. Enter a name and select a directory to which to save the extension file and click **Save**.

Note: For the extension to be available for attaching to other models, you must save it to a directory that is listed by the **Path** tool in the appropriate extension list (see *Specifying Directories to Search for Resource Files* on page 6).

Extension File Properties

All extension files have the same basic category structure.

The root node of each file contains the following properties:

Property	Description
Name / Code	Specify the name and code of the extension file, which must be unique in a model.
File Name	[read-only] Specifies the path to the extension file. If the XEM has been copied to your model, this field is empty.
Family / Sub-family	Restricts the availability of the XEM to a particular target family and subfamily. For example, when an XEM has the family Java, it is available only for use with targets in the Java object language family. EJB 2.0 is a sub-family of Java.
Auto-attach	Specifies that the XEM will be automatically attached to new models with a target belonging to the specified family.
Category	Groups XEMs by type for generation and in the Select Extensions dialog. Extensions having the same category cannot be generated simultaneously. If you do not specify a category, the XEM is displayed in the General Purpose category and is treated as a generation target.

Property	Description
Enable Trace Mode	Lets you preview the templates used during generation (see *Templates (Profile)* on page 86). Before starting the generation, click the **Preview** page of the relevant object, and click the **Refresh** tool to display the templates. When you double-click on a trace line from the **Preview** page, the Resource Editor opens to the corresponding template definition.
Complement language generation	[BPM, OOM, XSM extensions] Specifies that any generated files (see *Generated Files (Profile)* on page 87) that you define in the extension will be generated when you select **Language > Generate...** in addition to the files that are generated by default. If you give a generated file in your extension the same name as one defined in the language definition file (see *Chapter 3, Object, Process, and XML Language Definition Files* on page 109), then the file in your extension will override the one in the language definition file. To enable an independent generation of files, you must deselect this option, select the **Enable selection in file generation** option for at least one metaclass (see *Metaclasses (Profile)* on page 31), and add at least one generated file to the metaclass (see *Generating Your Files in a Standard or Extended Generation* on page 91). **Note:** PowerBuilder® does not support XEMs for complementary generation.
Comment	Provides a descriptive comment for the XEM.

The following categories are also available:

- Generation - Contains Generation commands, options, and tasks to define and activate a generation process (see *Generation Category* on page 114).
- Transformation Profile - Groups transformations for application at model generation time or on demand (see *Transformations (Profile)* on page 94).

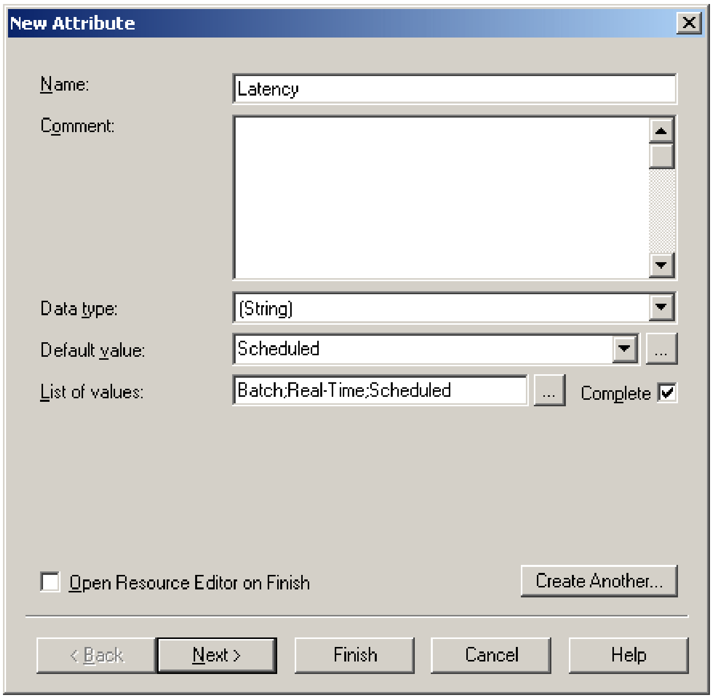
Example: Adding a New Attribute from a Property Sheet

In this example, we will quickly add a new attribute directly from the property sheet of an object. PowerDesigner will manage the creation of the extension file and creation of all the necessary extensions.

1. Click on the **Property Sheet Menu** button at the bottom-left of the property sheet, to the right of the **More/Less** button, and select **New Attribute**.
2. In the New Attribute dialog, enter `Latency` in the **Name** field, select `String` for the data type.
3. Click the ellipsis button to the right of the **List of values** field, enter the following list of predefined values, and then click **OK**:

- Batch
- Real-Time
- Scheduled

4. [optional] Select `Scheduled` in the **Default value** field.
5. [optional] Click **Next** to specify the property sheet page where you want the new attribute to appear. Here, we'll leave the default, so its inserted on the **General** tab.



New Attribute

Name: Latency

Comment:

Data type: (String)

Default value: Scheduled

List of values: Batch;Real-Time;Scheduled

Complete [✓]

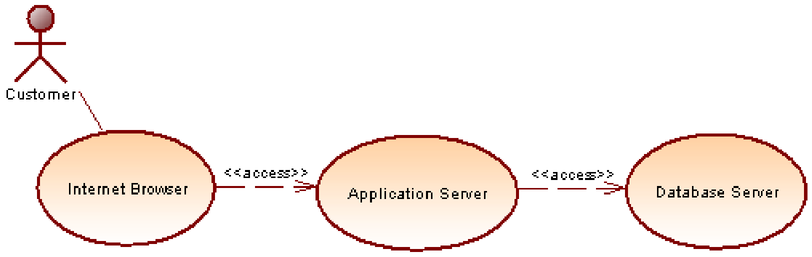
[ ] Open Resource Editor on Finish

Example: Creating Robustness Diagram Extensions

In this example, we will recreate the Robustness extension file delivered with PowerDesigner to extend the OOM communication diagram to enable robustness analysis. Robustness diagrams sit between use case and sequence diagram analysis, and allow you to bridge the gap between what the system has to do, and how it is actually going to accomplish it.

In order to support the robustness diagram, we will need to define new objects by applying stereotypes to a metaclass, specify custom tools and symbols for them, as well as defining custom checks for instance links and producing a file to output a description of messages exchanged between objects.

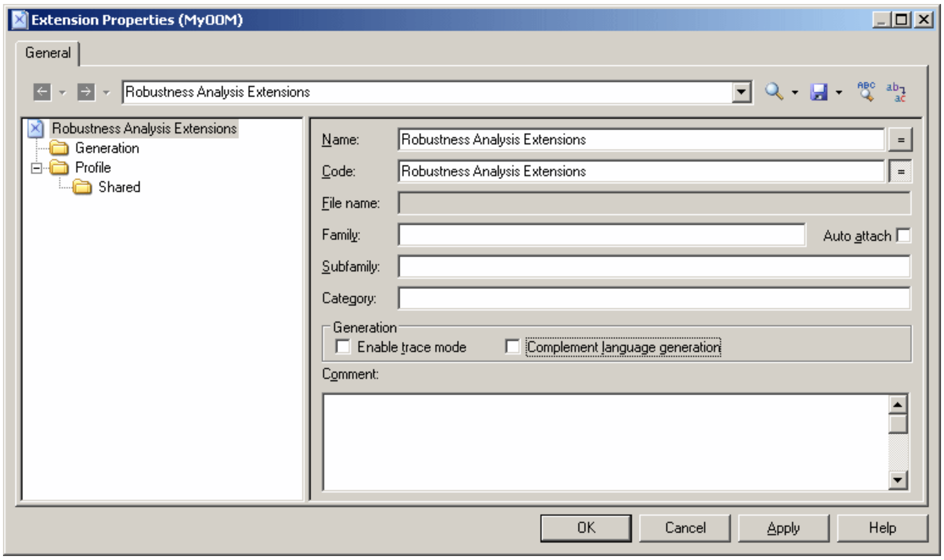
Creating the robustness extensions will enable us to verify use cases like the following, which represents a basic Web transaction:



A customer wants to know the value of his stocks in order to decide to sell or not, and sends a stock value query from his Internet Browser, which is transferred from his browser to the database server via the application server.

The first step in defining extensions, is to create an extension file (.xem) to keep them in:

1. Create or open an OOM and select **Model > Extensions** to open the list of extensions attached to the model.
2. Click the **Add a Row** tool to create a new extension file, and then click the **Properties** tool to open it in the Resource Editor.
3. Enter `Robustness Analysis Extensions` in the **Name** field, and clear the **Complement language generation** check box, as these extensions do not belong to any object language family and will not be used to complement any object language generation.
4. Expand the Profile category, in which we will create the extensions:



Name: Robustness Analysis Extensions
Code: Robustness Analysis Extensions
File name:
Family:
Auto attach ☐
Subfamily:
Category:
Generation
☐ Enable trace mode
☐ Complement language generation
Comment:

For detailed information about creating extension files, see *Creating an Extension File* on page 10.

Creating New Types of Objects with Stereotypes

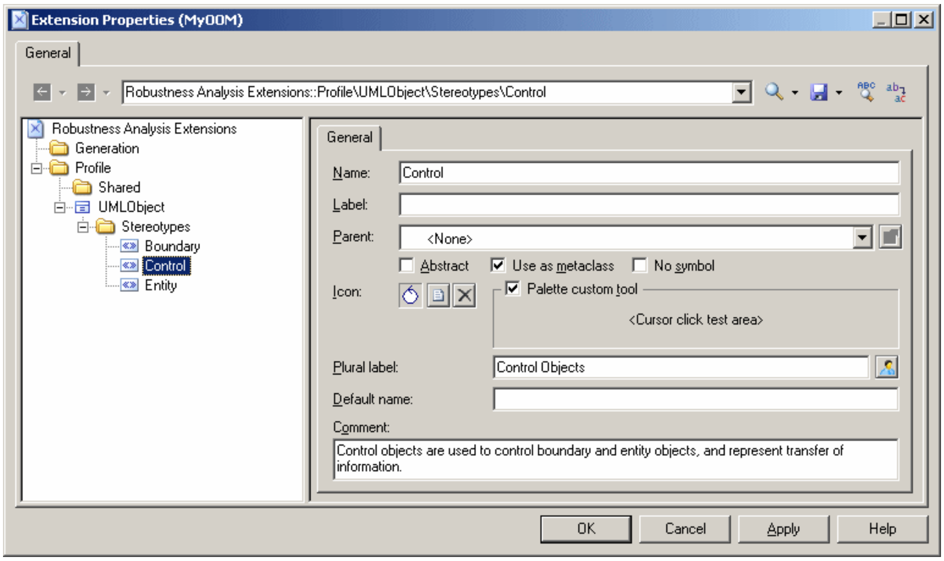
To implement robustness analysis in PowerDesigner, we need to create three new types of objects (boundary, entity, and control objects), which we will define in the Profile category by extending the `UMLObject` metaclass through stereotypes.

1. Right-click the Profile category and select **Add Metaclasses** to open the Metaclass Selection dialog.
2. Select `UMLObject` on the PdOOM tab and click **OK** to add this metaclass to the extension file.

   Note: Click the **Find in Metamodel Objects Help** tool to the right of the **Name** field (or click **Ctrl+F1**) to obtain information about this metaclass and see where it is situated in the PowerDesigner metamodel.

3. Right-click the `UMLObject` category and select **New > Stereotype** to create a stereotype to extend this metaclass.
4. Enter `Boundary` in the **Name** field, and `Boundary objects are used by actors when communicating with the system; they can be windows, screens, dialog boxes or menus.` in the **Comment** field.
5. Select the **Use as metaclass** check box to promote the object type in the interface so that it has its own object list and Browser category.
6. Click the **Select Icon** tool to open the PowerDesigner image library dialog, select the **Search Images** tab, enter `boundary` in the **Search for** field, and click the **Search** button.
7. Select the `Boundary.cur` image in the results, and click OK to assign it to represent boundary objects in the Browser and other interface elements. Click the **Toolbox custom tool** check box to create a tool with the same icon for creating the new object in the Toolbox.
8. Repeat these steps to create the following stereotypes and icons:

Stereo-type	Comment	Image file
Entity	Entity objects represent stored data like a database, database tables, or any kind of transient object such as a search result.	entity.cur
Control	Control objects are used to control boundary and entity objects, and represent transfer of information.	control.cur



Name: Control

Parent: <None>

[ ] Abstract [✓] Use as metaclass [ ] No symbol

[✓] Palette custom tool

Plural label: Control Objects

Comment: Control objects are used to control boundary and entity objects, and represent transfer of information.

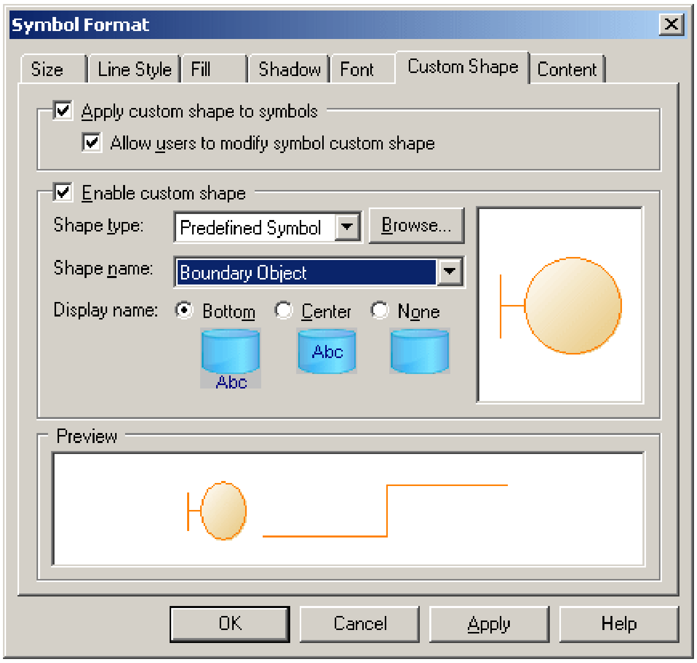
9. Click **Apply** to save your changes before continuing.

   For detailed information about creating stereotypes, see *Stereotypes (Profile)* on page 35.

Specifying Custom Symbols for Robustness Objects

We will specify diagram symbols for each of our new robustness diagram objects by adding custom symbols to our new stereotypes.

1. Right-click `Boundary` stereotype and select **New** > **Custom Symbol** to create a custom symbol under the stereotype.
2. Click the Modify button to open the Symbol Format dialog, and select the **Custom Shape** tab.
3. Select the **Enable custom shape** check box, and select Boundary Object in the **Shape name** list.



☑ Apply custom shape to symbols

☑ Allow users to modify symbol custom shape

☑ Enable custom shape

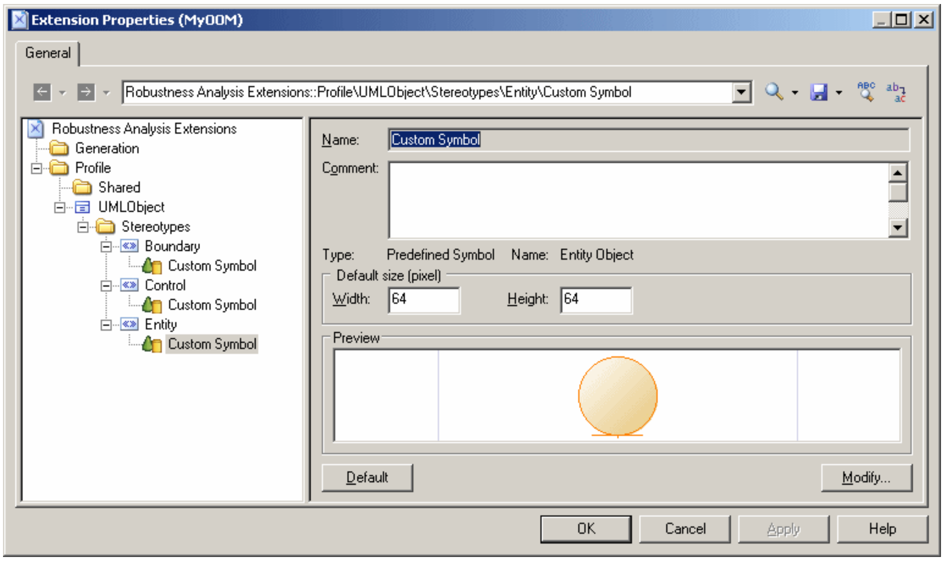
Shape type: Predefined Symbol Browse...

Shape name: Boundary Object

Display name: [✓ Bottom] Center None

4. Click **OK** to complete the definition of the custom symbol and return to the Resource Editor.
5. Repeat these steps for the other stereotypes:

Stereotype	Shape Name
Entity	Entity Object
Control	Control Object



Name: Custom Symbol
Comment:
Type: Predefined Symbol Name: Entity Object
Default size (pixel)
Width: 64 Height: 64
Preview

6. **Click Apply** to save your changes.

   For detailed information about creating custom symbols, see *Custom Symbols (Profile)* on page 71.

Example: Creating Custom Checks on Instance Links

We will now create three custom checks on the instance links that will connect the various robustness objects. These checks, which are written in VB, do not prevent users from creating diagrams not supported by the robustness methodology, but define rules that will be verified when you check your model.

1. Right-click the Profile category, select **Add Metaclasses** to open the Metaclass Selection dialog, select `InstanceLink` on the PdOOM tab and click **OK** to add it to the extension file.
2. Right-click the `InstanceLink` category and select **New** > **Custom Check** to create a check under the metaclass.
3. Enter the following values for the properties on the **General** tab:

Field	Value
Name	`Incorrect Actor Collaboration`
Comment	`This check verifies if actors are linked to boundary objects. Linking actors to control or entity objects is not allowed in the robustness analysis.`
Help message	`This check ensures that actors only communicate with boundary objects.`

Field	Value
Output message	`The following instance links are incorrect:`
Default severity	`Error`
Execute the check by default	[selected]

4. Select the **Check Script** tab and enter the following script in the text field:

```
Function %Check%(link)
   ' Default return is True
   %Check% = True

   ' The object must be an instance link
   If link is Nothing then
      Exit Function
   End if
   If not link.IsKindOf(PdOOM.cls_InstanceLink) then
      Exit Function
   End If

   ' Retrieve the link extremities
   Dim src, dst
   Set src = link.ObjectA
   Set dst = link.ObjectB

   ' Source is an Actor
   ' Call CompareObjectKind() global function defined in Global
Script pane
   If CompareObjectKind(src, PdOOM.Cls_Actor) Then
      ' Check if destination is an UML Object with "Boundary"
Stereotype
      If not CompareStereotype(dst, PdOOM.Cls_UMLObject,
"Boundary") Then
         %Check% = False
      End If
   ElseIf CompareObjectKind(dst, PdOOM.Cls_Actor) Then
     ' Check if source is an UML Object with "Boundary" Stereotype
      If not CompareStereotype(src, PdOOM.Cls_UMLObject,
"Boundary") Then
         %Check% = False
      End If
   End If
End Function
```

Note: For more information on VBS, see *Chapter 7, Scripting PowerDesigner* on page 307.

5. Select the **Global Script** tab (where you store functions and static attributes that may be reused among different functions) and enter the following script in the text field:

```
' This global function check if an object is of given kind
' or is a shortcut of an object of given kind
Function CompareObjectKind(Obj, Kind)
   ' Default return is false
   CompareObjectKind = False

   ' Check object
   If Obj is Nothing Then
      Exit Function
   End If
   ' Shortcut specific case, ask to it's target object
   If Obj.IsShortcut() Then
      CompareObjectKind = CompareObjectKind(Obj.TargetObject,
Kind)
      Exit Function
   End If
   If Obj.IsKindOf(Kind) Then
      ' Correct object kind
      CompareObjectKind = True
   End If
End Function

' This global function check if an object is of given kind
' and compare it's stereotype value
Function CompareStereotype(Obj, Kind, Value)
   ' Default return is false
   CompareStereotype = False

   ' Check object
   If Obj is Nothing then
      Exit Function
   End If
   if (not Obj.IsShortcut() and not
Obj.HasAttribute("Stereotype")) Then
      Exit Function
   End If
   ' Shortcut specific case, ask to it's target object
   If Obj.IsShortcut() Then
      CompareStereotype = CompareStereotype(Obj.TargetObject,
Kind, Value)
      Exit Function
   End If
   If Obj.IsKindOf(Kind) Then
      ' Correct object kind
      If Obj.Stereotype = Value Then
         ' Correct Stereotype value
         CompareStereotype = True
      End If
   End If
End Function

' This global function copy the standard attribute
' from source to target
Function Copy (src, trgt)
   trgt.name = src.name
   trgt.code  = src.code
   trgt.comment = src.comment
   trgt.description = src.description
   trgt.annotation = src.annotation
   Dim b, d
   for each b in src.AttachedRules
      trgt.AttachedRules.insert -1,b
   next
   for each d in src.RelatedDiagrams
      trgt.RelatedDiagrams.insert -1,d
   next
   output " "
   output trgt.Classname & " " & trgt.name & " has been created."
   output " "
End Function
```

6. Repeat these steps to create a second check by entering the following values:

Field	Value
Name	`Incorrect Boundary to Boundary Link`
Help message	`This check ensures that an instance link is not defined between two boundary objects.`
Output message	`The following links between boundary objects are incorrect:`
Default severity	`Error`
Execute the check by default	[selected]

Field	Value

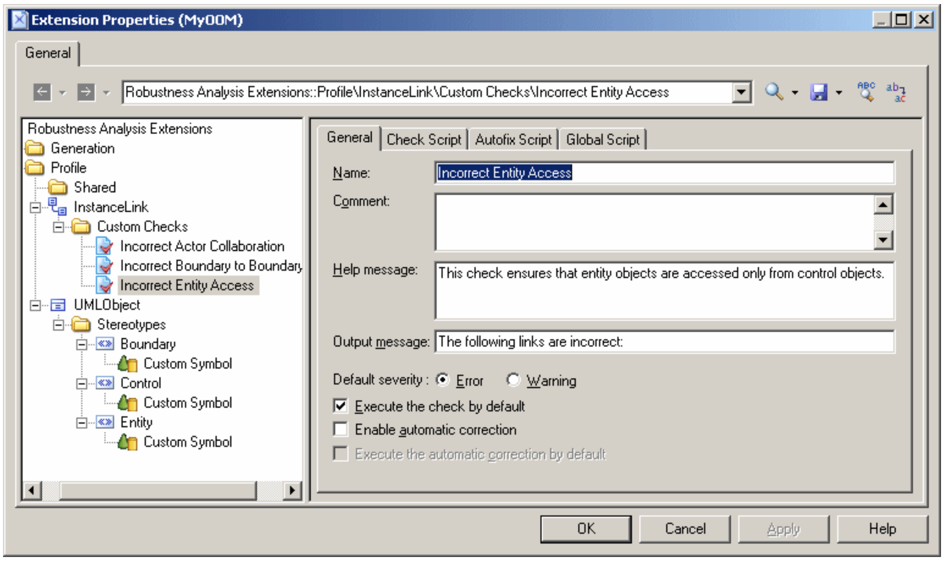
Check Script	`Function %Check%(link)`
	`   ' Default return is True`
	`   %Check% = True`
	
	`   ' The object must be an instance link`
	`   If link is Nothing then`
	`      Exit Function`
	`   End if`
	`   If not link.IsKindOf(PdOOM.cls_InstanceLink) then`
	`      Exit Function`
	`   End If`
	
	`   ' Retrieve the link extremities`
	`   Dim src, dst`
	`   Set src = link.ObjectA`
	`   Set dst = link.ObjectB`
	
	`   ' Error if both extremities are 'Boundary' objects`
	`   If CompareStereotype(src, PdOOM.Cls_UMLObject, "Boundary") Then`
	`      If CompareStereotype(dst, PdOOM.Cls_UMLObject, "Boundary") Then`
	`         %Check% = False`
	`      End If`
	`   End If`
	`End Function`

7. Repeat these steps to create a third check by entering the following values:

Field	Value
Name	`Incorrect Entity Access`
Help Message	`This check ensures that entity objects are accessed only from control objects.`
Output Message	`The following links are incorrect:`
Default Severity	`Error`
Execute the check by default	[selected]

Field	Value
Check Script	

```
Function %Check%(link)
   ' Default return is True
   %Check% = True

   ' The object must be an instance link
   If link is Nothing then
      Exit Function
   End if
   If not link.IsKindOf(PdOOM.cls_InstanceLink) then
      Exit Function
   End If

   ' Retrieve the link extremities
   Dim src, dst
   Set src = link.ObjectA
   Set dst = link.ObjectB

   ' Source is and UML Object with "Entity" stereotype?
   ' Call CompareStereotype() global function defined in
Global Script pane
   If CompareStereotype(src, PdOOM.Cls_UMLObject, "Enti-
ty") Then
      ' Check if destination is an UML Object with "Con-
trol" Stereotype
     If not CompareStereotype(dst, PdOOM.Cls_UMLObject,
"Control") Then
         %Check% = False
      End If
   ElseIf CompareStereotype(dst, PdOOM.Cls_UMLObject,
"Entity") Then
      ' Check if source is an UML Object with "Control"
Stereotype
     If not CompareStereotype(src, PdOOM.Cls_UMLObject,
"Control") Then
         %Check% = False
      End If
   End If
End Function
```



Name: Incorrect Entity Access

Comment:

Help message: This check ensures that entity objects are accessed only from control objects.

Output message: The following links are incorrect:

Default severity : [✓ Error] Warning

[✓] Execute the check by default

[ ] Enable automatic correction

[ ] Execute the automatic correction by default

8. Click **Apply** to save your changes before continuing.

   For detailed information about creating custom checks, see *Custom Checks (Profile)* on page 72.

Example: Defining Templates to Extract Message Descriptions

We are going to generate a textual description of the messages in the diagram, giving for each message, the names of the sender, message, and receiver. To do so, we will need to define PowerDesigner Generation Template Language (GTL) templates to extract the information and a generated file to contain and display the extracted information.

To generate this textual description, we will need to extract information from the `Message` metaclass (to extract the message sequence number, name, sender, and receiver) and the `CommunicationDiagram` (to gather all the messages from each diagram and sort them)

1. Right-click the Profile category, select **Add Metaclasses** to open the Metaclass Selection dialog, select `CommunicationDiagram` and `Message` on the PdOOM tab and click **OK** to add them to the extension file.
2. Right-click the `Message` category and select **New** > **Template** to create a template under the metaclass.
3. Enter `description` in the **Name** field, and then enter the following GTL code in the text area:

```
.set_value(_tabs, "", new)
.foreach_part(%SequenceNumber%, '.')
   .set_value(_tabs, "   %_tabs%")
.next
%_tabs%%SequenceNumber%) %Sender.ShortDescription% sends message
"%Name%" to %Receiver.ShortDescription%
```

The first line of the template initializes the `_tabs` variable, and the `foreach_part` macro calculates an appropriate amount of indentation by looping through each sequence number, and adding 3 spaces whenever a dot is found. The last line uses this variable to indent, format, and display information extracted for each message.

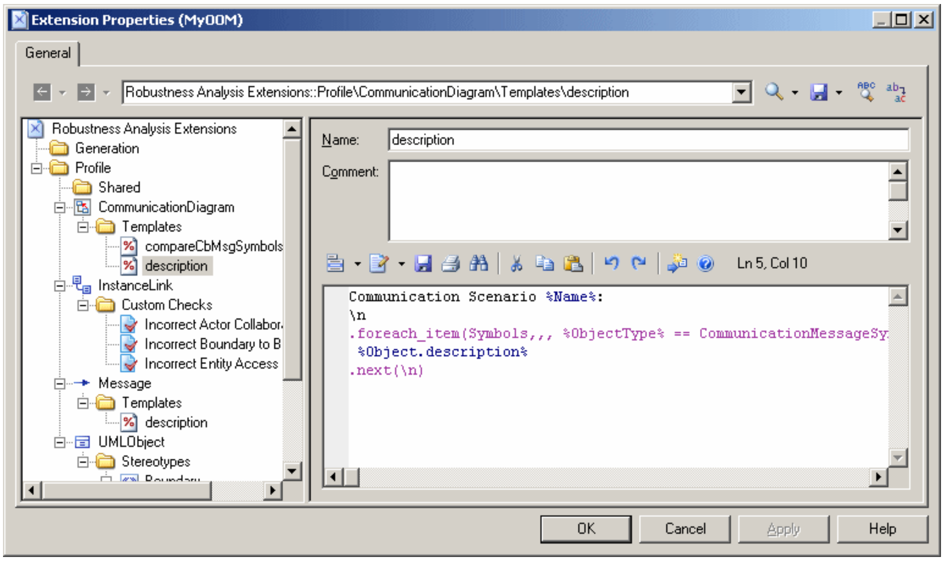
4. Right-click the `CommunicationDiagram` category and select **New** > **Template** to create a template under the metaclass.
5. Enter `compareCbMsgSymbols` in the **Name** field, and then enter the following GTL code in the text area:

```
.bool (%Item1.Object.SequenceNumber% >=
%Item2.Object.SequenceNumber%)
```

   This template resolves to a boolean value to determine if one message number is greater than another, and the result will be used in a second template.
6. Right-click the `CommunicationDiagram` category and select **New** > **Template** to create a second template, enter `description` in the **Name** field, and then enter the following GTL code in the text area:

```
Collaboration Scenario %Name%:
\n
.foreach_item(Symbols,,, %ObjectType% ==
CollaborationMessageSymbol, %compareCbMsgSymbols%)
  %Object.description%
.next(\n)
```

   The first line of this template generate the title of the scenario from the name of the communication diagram. Then the `.foreach_item` macro loops on each message symbol, and calls on the other templates to format and output the message information.


Extension Properties (MyOOM)

General

Robustness Analysis Extensions::Profile\CommunicationDiagram\Templates\description

- Robustness Analysis Extensions
  - Generation
  - Profile
    - Shared
    - CommunicationDiagram
      - Templates
        - compareCbMsgSymbols
        - description
    - InstanceLink
      - Custom Checks
        - Incorrect Actor Collabor
        - Incorrect Boundary to B
        - Incorrect Entity Access
    - Message
      - Templates
        - description
    - UMLObject
      - Stereotypes

Name: description

Comment:

Ln 5, Col 10

```
Communication Scenario %Name%:
\n
.foreach_item(Symbols,,, %ObjectType% == CommunicationMessageSy
 %Object.description%
.next(\n)
```

7. Click **Apply** to save your changes before continuing.

   For detailed information about templates and GTL, see *Templates (Profile)* on page 86 and *Chapter 5, Customizing Generation with GTL* on page 247.

Example: Creating a Generated File for the Message Information

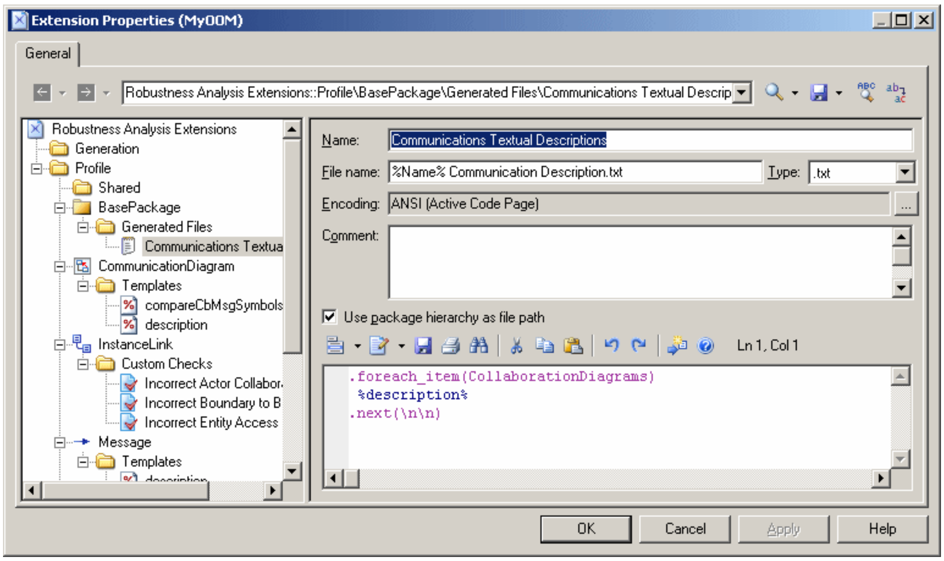
Having created templates to extract information about the messages in the model, we need to create a generated file to contain and display them on the **Preview** tab of the diagram property sheet. We will define the file on the `BasePackage` metaclass, which is the common class for all packages and models, and will have it loop through all the communication diagrams in the model to evaluate the template `description` defined on the `CommunicationDiagram` metaclass.

1. Right-click the Profile category, select **Add Metaclasses** to open the Metaclass Selection dialog, click the **Modify Metaclass Filter** tool, select `Show Abstract Modeling Metaclasses`, and click the PdCommon tab.
2. Select `BasePackage` and click **OK** to add it to the extension file.
3. Right-click the BasePackage category and select **New** > **Generated File** to create a file under the metaclass.
4. Enter the following values for the file properties:

Field	Value
Name	`Communications Textual Descriptions`
File name	`%Name% Communication Description.txt`
Encoding	`ANSI`
Use package hierarchy as file path	[unselected]

5. Enter the following code in the text box:

```
.foreach_item(CollaborationDiagrams)
 %description%
.next(\n\n)
```



Name: Communications Textual Descriptions

File name: %Name% Communication Description.txt Type: .txt

Encoding: ANSI (Active Code Page)

Comment:

[✓] Use package hierarchy as file path

```
.foreach_item(CollaborationDiagrams)
 %description%
.next(\n\n)
```

6. Click **Apply** to save your changes, and then **OK** to close the resource editor.
7. Click **OK** to close the List of Extensions.

   For detailed information about creating generated files, see *Generated Files (Profile)* on page 87.

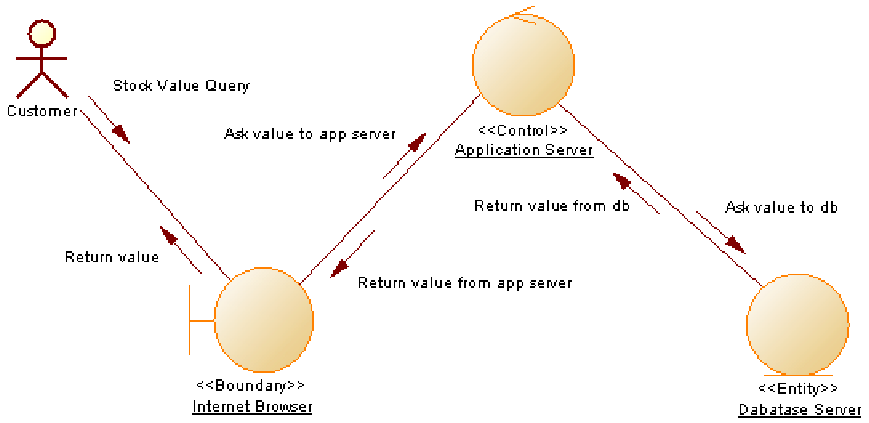
Example: Testing the Robustness Extensions

To test the extensions we have created, we will create a small robustness diagram to analyze our use case.

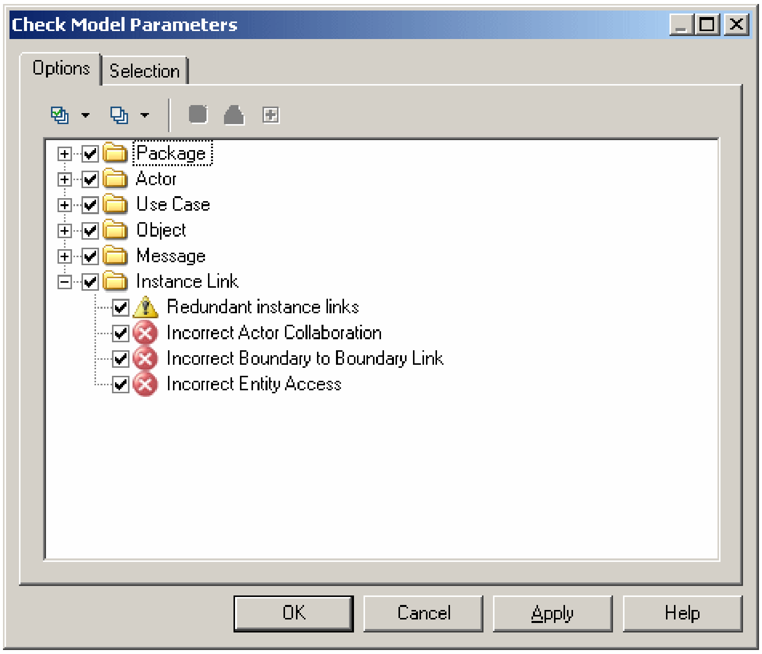
1. Right-click your model node in the Browser, and select **New** > **Communication Diagram**.

   In addition to the standard Toolbox, a custom toolbox is provided with tools you have defined to create boundary, control, and entity objects.
2. Drag the Customer actor from the Actors category in the Browser into the diagram to create a shortcut. Then create one each of the boundary, control and entity objects, and name them `Internet Browser`, `Application Server`, and `Database Server` respectively.
3. Use the Instance Link tool in the standard Toolbox to connect the Customer to the `Internet Browser` to the `Application Server`, to the `Database Server`.
4. Create the following messages on the **Messages** tabs of the instance links property sheets:

Direction	Message name	Sequence number
Customer - Internet Browser	Stock value query	1
Internet Browser - Application Server	Ask value to app server	2
Application Server - Database Server	Ask value to db	3
Database Server - Application Server	Return value from db	4
Application Server - Internet Browser	Return value from app server	5
Internet Browser - Customer	Return value	6

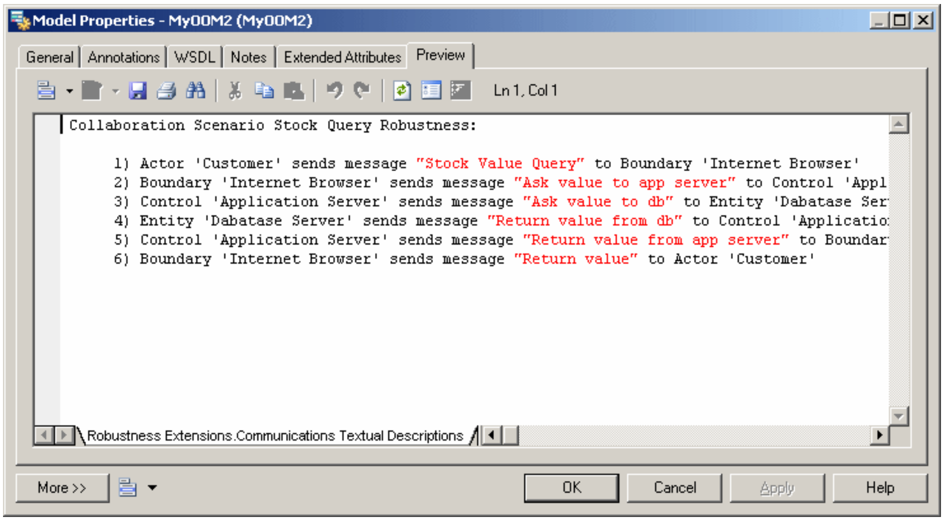


5. Select **Tools > Check Model** to display the Check Model Parameters dialog box, in which the custom checks we have created appear in the Instance Link category:



Click **OK** to test the validity of the instance links we have created.

6. Right-click the model node in the Browser and select **Properties** to open the model property sheet. Click the **Preview** tab to review messages sent for our use case:


Model Properties - MyOOM2 (MyOOM2)
General
Annotations
WSDL
Notes
Extended Attributes
Preview
Ln 1, Col 1
Robustness Extensions.Communications Textual Descriptions
More >>
OK
Cancel
Apply
Help

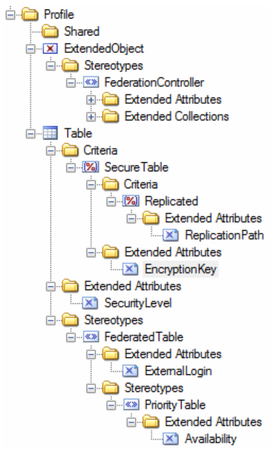
```
Collaboration Scenario Stock Query Robustness:

    1) Actor 'Customer' sends message "Stock Value Query" to Boundary 'Internet Browser'
    2) Boundary 'Internet Browser' sends message "Ask value to app server" to Control 'Appl
    3) Control 'Application Server' sends message "Ask value to db" to Entity 'Dabatase Ser
    4) Entity 'Dabatase Server' sends message "Return value from db" to Control 'Applicatio
    5) Control 'Application Server' sends message "Return value from app server" to Boundar
    6) Boundary 'Internet Browser' sends message "Return value" to Actor 'Customer'
```

Metaclasses (Profile)

Metaclasses are defined in the PowerDesigner metamodel and provide the basis for your extensions. You add a metaclass to the Profile category when you want to extend it in some way by modifying its behavior, adding new properties, changing its property sheet or symbol, or even excluding it from your models.

You can either make extensions to an existing type of object or create an entirely new kind of modeling object by adding the `ExtendedObject`, `ExtendedSubObject` or `ExtendedLink` metaclass (see *Extended Objects, Sub-Objects, and Links (Profile)* on page 34).

In the following example, the `FederationController` is an entirely new type of object created by adding the `ExtendedObject` metaclass and defining a stereotype on it. Various specializations of the `Table` metaclass are defined through criteria and stereotypes:



```
Profile
  Shared
  ExtendedObject
    Stereotypes
      FederationController
        Extended Attributes
        Extended Collections
  Table
    Criteria
      SecureTable
        Criteria
          Replicated
            Extended Attributes
              ReplicationPath
        Extended Attributes
          EncryptionKey
    Extended Attributes
      SecurityLevel
    Stereotypes
      FederatedTable
        Extended Attributes
          ExternalLogin
        Stereotypes
          PriorityTable
            Extended Attributes
              Availability
```

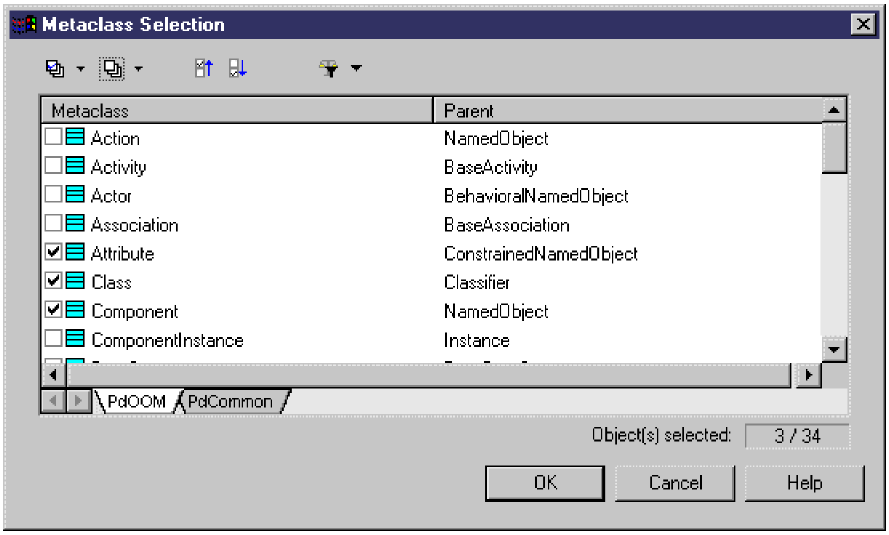
Extensions are inherited, so that any extensions made to a metaclass are available to its stereotyped children, and those that are subject to criteria. The various extended attributes defined under the table metaclass will be available to table instances according to the following rules:

- `SecurityLevel` - All tables.
- `EncryptionKey` - Tables for which the `SecureTable` criterion evaluates to true.
- `ReplicationPath` - Tables for which both the `SecureTable` and `Replicated` criteria evaluate to true.
- `ExternalLogin` - Tables bearing either the `FederatedTable` or `PriorityTable` stereotype.
- `Availability` - Tables bearing the `PriorityTable` stereotype.

For example, a table bearing the `FederatedTable` stereotype, and for which the `SecureTable` criteria evaluates to true, would display the `SecurityLevel`, `EncryptionKey`, and `ExternalLogin` attributes, while a table bearing the `PriorityTable` stereotype, and for which both the `SecureTable` and `Replicated` criteria evaluate to true, would display these attributes and, additionally, the `ReplicationPath` and `Availability` attributes.

1. Right-click the Profile category and select **Add Metaclasses**:

2. Select one or more metaclasses to add to the profile. The sub-tabs list metaclasses belonging to the present module (for example, the OOM), and standard metaclasses belonging to the PdCommon module.



Metaclass	Parent
☐ Action	NamedObject
☐ Activity	BaseActivity
☐ Actor	BehavioralNamedObject
☐ Association	BaseAssociation
☑ Attribute	ConstrainedNamedObject
☑ Class	Classifier
☑ Component	NamedObject
☐ ComponentInstance	Instance

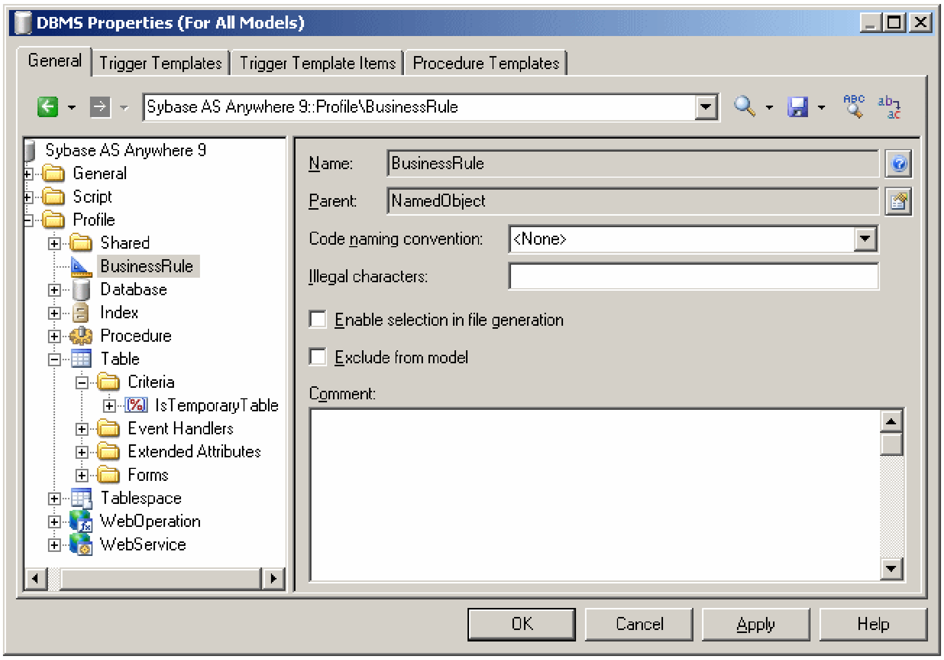
Object(s) selected: 3 / 34

[optional] Use the **Modify Metaclass Filter** tool to display:

- All metaclasses
- Concrete metaclasses - for object types that can be created in a model, such as `Class` or `Interface`.
- Abstract metaclasses -which are never instantiated but are used to define common extensions. For example, add the `Classifier` metaclass to your profile to define extensions that will be inherited by both classes and interfaces.

Note: For information about viewing and navigating among metaclasses in the metamodel, see *Chapter 8, The PowerDesigner Public Metamodel* on page 345.

3. Click **OK** to add the selected metaclasses to your profile:



Name: BusinessRule
Parent: NamedObject
Code naming convention: <None>
Illegal characters:
Enable selection in file generation
Exclude from model
Comment:

4. [optional] Enter the following properties as appropriate:

Property	Description
Name	[read-only] Specifies the name of the metaclass. Click the button to the right of this field to open the Metamodel Objects Help for the metaclass.
Parent	[read-only] Specifies the parent of the metaclass. Click the button to the right of this field to go to the parent. If the parent is not present in the profile, a message invites you to add it.
Code naming convention	[concrete metaclasses in target files] Specifies the default format to initialize the name to code conversion script for instances of the metaclass. The following formats are available: • `firstLowerWord` - First word in lowercase, then other first letters of other words in uppercase • `FirstUpperChar` - First character of all words in uppercase • `lower_case` - All words in lowercase and separated by an underscore • `UPPER_CASE` - All words in uppercase and separated by an underscore For more information on conversion scripts and naming conventions, see *Core Features Guide > Modeling with PowerDesigner > Objects > Naming Conventions*.

Property	Description
Illegal characters	[concrete metaclasses in target files] Specifies a list of illegal characters that may not be used in code generation for the metaclass. The list must be placed between double quotes, for example: `"/!=<>""'()"` When working with an OOM, this object-specific list overrides any values specified in the `IllegalChar` property for the object language (see *Settings Category: Object Language* on page 112).
Enable selection in file generation	Specifies that instances of the metaclass can be selected to generate files from on the **Selection** tab of the Generation dialog in an extended generation (see *Generating Your Files in a Standard or Extended Generation* on page 91).
Exclude from model	[concrete metaclasses only] Prevents the creation of instances of the metaclass and removes all references to the metaclass from the menus, Toolbox, property sheets and so on, to simplify the interface. For example, if you do not use business rules, select this check box for the `BusinessRule` metaclass to hide them in your models. When several resource files are attached to a model, the metaclass is excluded if at least one file excludes it and the others do not explicitly enable it. For models that already have instances of this metaclass, the objects will be preserved but it will not be possible to create new ones.
Comment	Documents the reason for the presence of the metaclass in this profile.

Extended Objects, Sub-Objects, and Links (Profile)

Extended objects, sub-objects, and links are special metaclasses that are designed to allow you to add completely new types of objects to your models, rather than basing them on existing PowerDesigner objects. These objects do not appear, by default, in models other than the free model unless you add them to an extension or other resource file.

- Extended objects – define new types of objects that can be created anywhere.
- Extended sub-objects – define new types of child objects that can only be created in the property sheet of their parent via an extended composition (see *Extended Collections and Compositions (Profile)* on page 48).
- Extended links – define new types of links between objects.

1. Right-click the **Profile** category, select **Add Metaclasses**, and click the **PdCommon** sub-tab in the dialog to display the list of objects common to all models.
2. Select one or more of `ExtendedLink`, `ExtendedSubObject`, and `ExtendedObject` and click **OK** to add them to your profile.

Note: To make the tools for creating extended objects and extended links available in the Toolbox of models other than the free model, you must add them via the customization dialog available at **Tools > Customize Menus and Tools**.

3. [optional] To create your own object add a stereotype (see *Stereotypes (Profile)* on page 35 and define appropriate extensions under the stereotype. To have your object appear in the PowerDesigner interface as a standard metaclass, with its own tool, Browser category and model list, select **Use as metaclass** in the stereotype definition (see *Creating New Metaclasses with Stereotypes* on page 37).
4. Click **Apply** to save the changes.

Stereotypes (Profile)

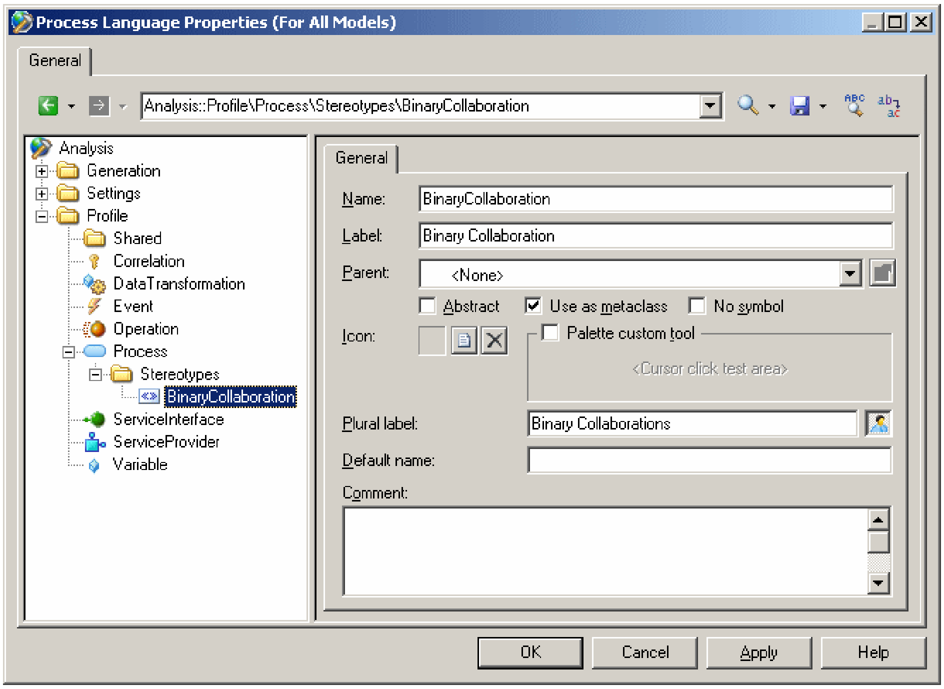
Stereotypes subclassify metaclasses so that extensions are applied to objects only if they bear the stereotype. Stereotypes can be promoted to the status of metaclasses with a specific list, Browser category and custom symbol and Toolbox tool.

Note: You can define more than one stereotype for a given metaclass, but you can only apply a single stereotype to each instance. Like other extensions, stereotypes support *inheritance*, so extensions to a parent stereotype are inherited by child stereotypes.

1. Right-click a metaclass, stereotype, or criterion in the Profile category and select **New > Stereotype**.
2. Enter the following properties as appropriate:

Property	Description
Name	Specifies the internal name of the stereotype, which is used for scripting.
Label	Specifies the display name of the stereotype, which will appear in the PowerDesigner interface.
Parent	Specifies a parent stereotype of the stereotype. You can select a stereotype defined in the same metaclass or in a parent metaclass. Click the **Properties** button to go to the parent stereotype in the tree and display its properties.
Abstract	Specifies that the stereotype cannot be applied to metaclass instances. The stereotype will not appear in the stereotype list in the object property sheet, and can only be used as a parent of other child stereotypes. Disables the **Use as metaclass** property.
Use as metaclass	Promotes the stereotype to the same status as standard PowerDesigner metaclasses, to give it its own list of objects, Browser category, and its own tab in multi-pane selection boxes such as those used for generation (see *Creating New Metaclasses with Stereotypes* on page 37).

Property	Description
No Symbol	[available when **Use as metaclass** is selected] Specifies that instances of the stereotyped metaclass cannot be displayed in a diagram and are visible only in the Browser. Disables the **Toolbox custom tool**.
Icon	Specifies an icon for stereotyped instances of the metaclass. Click the tools to the right of this field in order to browse for `.cur` or `.ico` files. **Note:** The icon is used to identify objects in the Browser and elsewhere in the interface, but not as a diagram symbol. To specify a custom diagram symbol, see *Custom Symbols (Profile)* on page 71.
Toolbox custom tool	[available for objects supporting symbols] Specifies a Toolbox tool to enable you to create objects in a diagram. If you do not select this option, users are only able to create objects bearing the stereotype from the Browser or **Model** menu. Custom tools appear in a separate Toolbox group named after the resource file in which they are defined. **Note:** If you have not specified an icon, the tool will use a hammer icon by default.
Plural label	[available when **Use as metaclass** is selected] Specifies the plural form of the display name that will appear in the PowerDesigner interface.
Default name	[available when **Use as metaclass** or **Toolbox Custom Tool** is selected] Specifies a default name for objects created. A counter will be automatically appended to the name specified to generate unique names. A default name can be useful when designing for a target language or application with strict naming conventions. Note that the default name does not prevail over model naming conventions, so if a name is not correct it is automatically modified.
Comment	Provides a description or additional information about the stereotype.



Analysis::Profile\Process\Stereotypes\BinaryCollaboration

- Analysis
  - Generation
  - Settings
  - Profile
    - Shared
    - Correlation
    - DataTransformation
    - Event
    - Operation
    - Process
      - Stereotypes
        - BinaryCollaboration
    - ServiceInterface
    - ServiceProvider
    - Variable

Name: BinaryCollaboration
Label: Binary Collaboration
Parent: <None>
[ ] Abstract [✓ Use as metaclass] [ ] No symbol
Icon:
[ ] Palette custom tool
<Cursor click test area>
Plural label: Binary Collaborations
Default name:
Comment:

Creating New Metaclasses with Stereotypes

You can use stereotypes to create new kinds of objects that behave like standard PowerDesigner metaclasses or to have objects with identical names but different stereotypes in the same namespace (a metaclass stereotype creates a sub-namespace in the current metaclass).

For examples, see *Creating New Types of Objects with Stereotypes* on page 16.

Note: Stereotypes defined on sub-objects (such as table columns or entity attributes), cannot be promoted to metaclass status.

1. Create a stereotype under the metaclass on which you want to base your new metaclass. If the new object type does not share characteristics with an existing metaclass, then use the `ExtendedObject` metaclass.

   Note: If the `ExtendedObject` or other metaclass is not visible, add it by right-clicking the Profile category, and selecting **Add Metaclass** (see *Metaclasses (Profile)* on page 31).

2. In the stereotype property page, select **Use as metaclass**.
3. [optional] Specify an icon and tool to create instances of the metaclass stereotype.
4. Click **Apply** to save the changes and then add extended attributes and other appropriate extensions under the stereotype.

In your model, the stereotypes has:

- A separate list in the **Model** menu after the parent metaclass list (and the parent metaclass list will not display objects with the metaclass stereotype). Objects created in the new list bear the new metaclass stereotype by default. If you change the stereotype, the object will be removed from the list the next time it is opened.
- A separate Browser folder and command under **New**, when you right-click the model or a package.
- Property sheet titles based on the metaclass label.
- Its own tab in multi-pane selection boxes such as those used for generation.

5. [optional: DBMS definition files] Add the new object to the `Script/Objects` and define appropriate SQL statements to enable its generation and reverse-engineering (see *Defining Generation and Reverse-Engineering of New Metaclasses* on page 135).

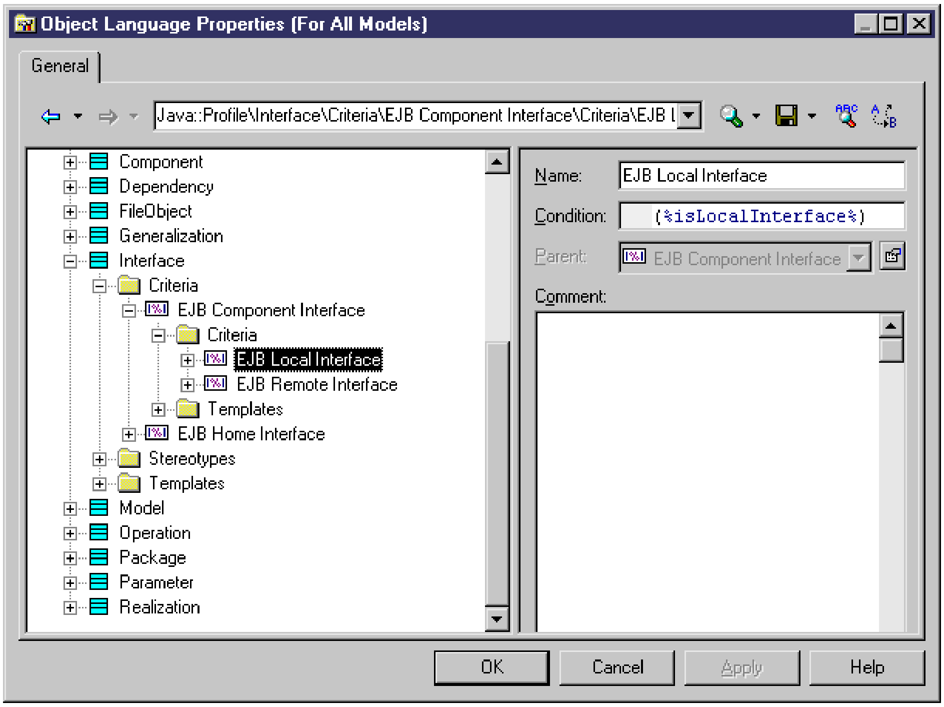
Criteria (Profile)

Criteria subclassify metaclasses so that extensions are applied to objects only if they satisfy conditions. You can test an object instance against multiple criteria, and for sub-criteria, its condition and any conditions specified by its parents must be met for its extensions to be applied to the instance.

1. Right-click a metaclass, stereotype, or criterion in the Profile category and select **New > Criterion**.
2. Enter the following properties as appropriate:

Property	Description
Name	Specifies the name of the criterion.
Condition	Specifies the condition which instances must meet in order to access the criterion extensions. You can use any expressions valid for the PowerDesigner GTL .if macro (see *.if Macro* on page 277). You can reference any extended attributes defined at the metaclass level in the condition, but not those defined under the criterion itself. For example, in a PDM, you can customize the symbols of fact tables by creating a criterion that will test the type of the table using the following condition: `(%DimensionalType% == "1")` `%DimensionalType%` is an attribute of the `BaseTable` object, which has a set of defined values, including `"1"`, which corresponds to `"fact"`. For more information, select **Help > Metamodel Objects Help**, and navigate to **Libraries > PdPDM > Abstract Classes > BaseTable**.
Parent	Specifies the parent criterion of the criterion. To move the criterion to under another parent, select the parent in the list. Click the **Properties** tool to open the parent and view its properties.

Property	Description
Comment	Specifies additional information about the criterion.



Java::Profile\Interface\Criteria\EJB Component Interface\Criteria\EJB L

Name: EJB Local Interface

Condition: (%isLocalInterface%)

Parent: EJB Component Interface

Comment:

3. Click **Apply** to save your changes.

Extended Attributes (Profile)

Extended attributes define additional metadata to capture for object instances. You can specify a default value, allow users to freely enter numeric, string, or other types of data (or select objects), provide an open or closed list of possible values, or calculate a value.

Note: Extended attributes are listed on a generic **Extended Attributes** tab in the object property sheet, unless you insert them into forms (see *Forms (Profile)* on page 55). If all the extended attributes are allocated to forms, the generic page will not be displayed.

1. Right-click a metaclass, stereotype, or criterion in the Profile category and select **New** > **Extended Attribute**.
2. Specify the following properties as appropriate:

Property	Description
Name	Specifies the internal name of the attribute, which can be used for scripting.
Label	Specifies the display name of the attribute, which will appear in the PowerDesigner interface.
Comment	Provides additional information about the extended attribute.
Data type	Specifies the form of the data to be held by the extended attribute. You can choose from: • Boolean - `TRUE` or `False`. • Color - `xxx xxx xxx` where `x` is an integer between 0-255. • Date or Time - your local format as specified in your Windows regional settings • File or Path - cannot contain `///` or any of the following characters: `?"<>|`. • Integer or Float - the appropriate local format. • Hex - a hexadecimal. • Font - `font name,font type,font size`. • Font Name or Font Style - a 1-50 character string. • Font Size - an integer between 1-400. • Object - an object of the correct type and, if appropriate, with the correct stereotype. When selecting this type you must specify an **Object type** and, if appropriate, an **Object stereotype**, and you can also specify an **Inverse collection name** (see *Linking Objects Through Extended Attributes* on page 48). • Password - no restrictions. • String (single line) or Text (multi-line) - no restrictions. Select the **Validate** check box to the right of the list to enforce validation of the values entered for the attribute. To create your own data type, click the **Create Extended Attribute Type** tool to the right of the field (see *Creating an Extended Attribute Type* on page 45).
Computed	Specifies that the extended attribute is calculated from other values using VBScript on the **Get Method Script**, **Set Method Script**, and **Global Script** tabs. When you select this checkbox, you must choose between: • Read/Write (Get+Set methods) • Read only (Get method) For example scripts, see *Calculated Attribute Scripts* on page 43.

Property	Description
Default value	[if not `computed`] Specifies a default value for the attribute. You can specify the value in any of the following ways: • Enter the value directly in the list. • [predefined data types] Click the Ellipsis button to open a dialog listing possible values. For example, if the data type is set to Color, the Ellipsis button opens a palette window. • [user-defined data types] Select a value from the list.
Template	[if not `computed`] Specifies that the value of the attribute is to be evaluated as a GTL template at generation time. For example, if the value of the attribute is set to `%Code%`, it will be generated as the value of the code attribute of the relevant object. By default (when this checkbox is not selected), the attribute is evaluated literally, and a value of `%Code%` will be generated as the string `%Code%`.

List of values	Specifies a list of possible values for the attribute in one of the following ways:
	• Enter a static list of semi-colon-delimited values directly in the field.
	• Use the tools to the right of the list to create or select a GTL template to generate the list dynamically.
	If the attribute type is `Object`, and you do not want to filter the list of available objects in any way, you can leave this field blank.
	To perform a simple filter of the list of objects, use the `.collection` macro (see *.object and .collection Macros* on page 280). In the following example, only tables with the `Generated` attribute set to true will be available for selection:
	`.collection(Model.Tables, %Generated%==true)`
	For more complex filtering, use the `foreach_item` macro (see *.foreach_item Macro* on page 273):
	`.foreach_item (Model.Tables)`
	`   .if %Generated%`
	`   .// (or more complex criteria)`
	`      %ObjectID%`
	`   .endif`
	`.next (\n)`
	If the attribute is based on an extended attribute type (see *Creating an Extended Attribute Type* on page 45), this field is unavailable since the values of the extended attribute type will be used.

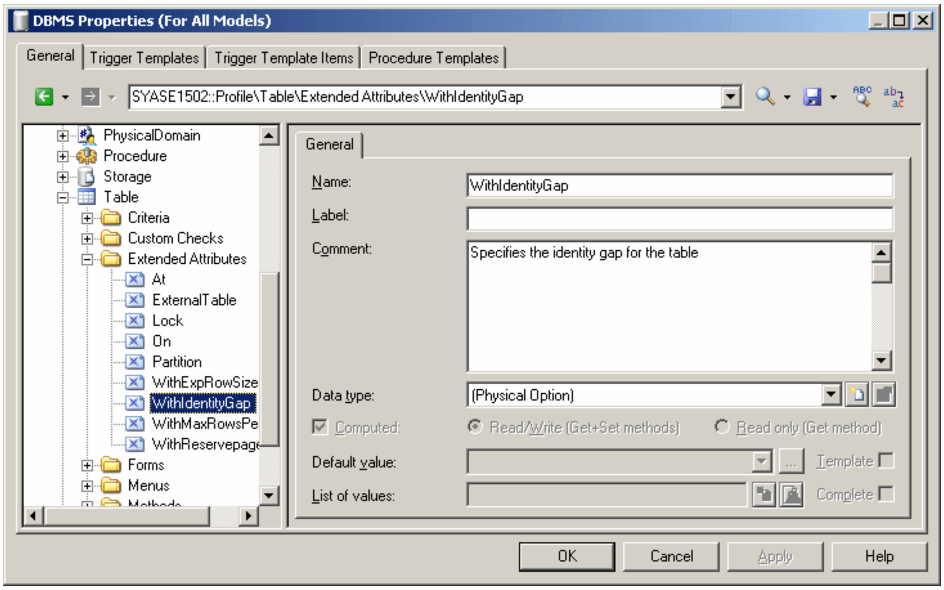
Complete	Specifies that all possible values for the attribute are defined in the **List of values**, and that the user may not enter any other value.

Property	Description
Edit method	[if not `Complete`] Specifies a method to override the default action associated with the tool to the right of the field. This method is often used to apply a filter defined in the **List of values** field in the object picker. In the following example, only tables with the `Generated` attribute set to true will be available for selection:

```
Sub %Method%(obj)

   Dim Mdl
   Set Mdl = obj.Model

   Dim Sel
   Set Sel = Mdl.CreateSelection

   If not (Sel is nothing) Then
      Dim table
      For Each table in Mdl.Tables
          if table.generated then
              Sel.Objects.Add table
          end if
      Next

      ' Display the object picker on the selection
      Dim selObj
      set selObj = Sel.ShowObjectPicker
      If Not (selObj is Nothing) Then
        obj.SetExtendedAttribute "Storage-For-Each",
selObj
       End If

      Sel.Delete
   End If

End Sub
```

Property	Description
Icon Set	Specifies a set of icons to display on object symbols in place of extended attribute values (see *Specifying Icons for Attribute Values* on page 46).
Text format	[for `Text` data types only] Specifies the language contained within the text attribute. If you select any value other than plain `Text`, then an editor toolbar and (where appropriate) syntax coloring are provided in the associated form fields.

Property	Description
Object type / stereotype / Inverse collection name	[for `Object` data types only] Specify the type of the object that the attribute contains (for example, User, Table, Class) and, optionally a stereotype that objects of this type must bear to be selectable. If the `computed` option is not selectd, you can also specify the name under which the links to the object will be listed on the **Dependencies** tab of the target object. An extended collection with the same name as the extended attribute, which handles these links, is automatically created for all non-computed extended attributes of the Object type, and is deleted when you delete the extended attribute, change its type, or select the **Computed** checkbox.
Physical option	[for [Physical Option] data types only] Specifies the physical option with which the attribute is associated. Click the ellipsis to the right of this field to select a physical option. For more information, see *Adding DBMS Physical Options to Your Forms* on page 211.



SYASE1502::Profile\Table\Extended Attributes\WithIdentityGap

Name: WithIdentityGap

Label:

Comment: Specifies the identity gap for the table

Data type: (Physical Option)

[✓] Computed: [● Read/Write (Get+Set methods)] ○ Read only (Get method)

Default value:

List of values:

3. Click **Apply** to save your changes.

Calculated Attribute Scripts

You can create extended attributes whose values depend on the values of other attributes. These can be read-only or read and write.

The following scripts provide a means for reading and writing the value from the standard **Name** attribute into a calculated extended attribute:

Get Script	Set Script

`Function %Get%(obj)`
`   %Get% = obj.GetAttri-`
`bute("Name")`
`End Function`
	`Sub %Set%(obj, value)`
	`   obj.SetAttribute "Name", val-`
	`ue`
	`End Sub`

The following scripts read the value of the computed `FileGroup` extended attribute from the `filegroup` physical option, and write back to the physical attribute:

Get Script	Set Script

`Function %Get%(obj)`
`%Get% = obj.GetPhysicalOption-`
`Value("on/<filegroup>")`
`End Function`
	`Sub %Set%(obj, value)`
	`obj.SetPhysicalOptionValue "on/`
	`<filegroup>", value`
	`End Sub`

The following script reads the value of the name of the database associated with the PDM into the read-only Database extended attribute defined on the table metaclass:

Get Script	Set Script

`Function %Get%(obj)`
`%Get% = obj.GetAttribute("Pa-`
`rent.Database.Name")`
`End Function`
	[none]

The following script evaluates the value of the `Number` attribute of a table to set the boolean `BigTable` extended attribute:

Get Script	Set Script

`Function %Get%(obj)`
`%Get% = obj.GetAttribute("Num-`
`ber") > 99999`
`  End Function`
 	
You can use the following syntax to more explicitly set the boolean:
 	
`Function %Get%(obj)`
`   Dim value`
`   If obj.GetAttribute("Number")`
`> 99999 then`
`      value = true`
`   Else`
`      value = false`
`   End if`
`   %Get% = value`
`  End Function`
	[none]

The following script evaluates the value of the `Number` attribute of a table to set a text `TableSize` extended attribute:

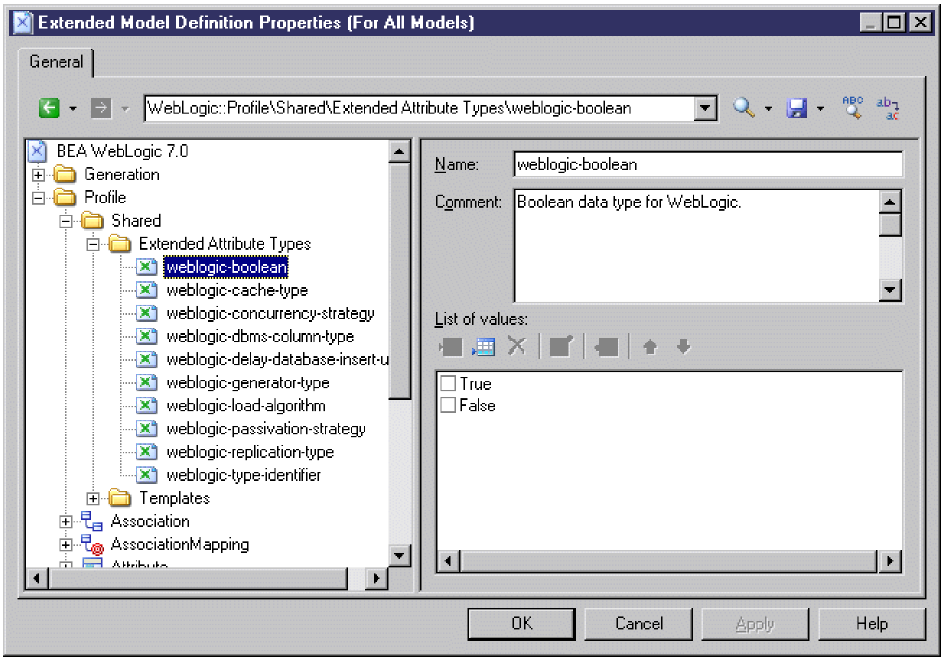
Get Script	Set Script

`Function %Get%(obj)`
`Dim value`
`   If obj.GetAttribute("Number") < 10000 then`
`      value = "Small"`
`   ElseIf ((obj.GetAttribute("Number") > 9999) and (obj.GetAttribute("Number") < 100000)) then`
`      value = "Medium"`
`   ElseIf ((obj.GetAttribute("Number") > 99999) and (obj.GetAttribute("Number") < 1000000)) then`
`      value = "Large"`
`   Else`
`      value = "Very Large"`
`   End if`
`   %Get% = value`
`End Function`
	[none]

Creating an Extended Attribute Type

You can create extended attribute types to define the data type and authorized values of extended attributes. Creating extended attribute types allows you to reuse the same list of values for several extended attributes without having to write code.

1. Right-click the `Profile\Shared` category and select **New > Extended Attribute Type**.
2. Enter the appropriate properties, including a list of values and a default value.


Extended Model Definition Properties (For All Models)
General
WebLogic::Profile\Shared\Extended Attribute Types\weblogic-boolean
BEA WebLogic 7.0
Generation
Profile
Shared
Extended Attribute Types
weblogic-boolean
weblogic-cache-type
weblogic-concurrency-strategy
weblogic-dbms-column-type
weblogic-delay-database-insert-u
weblogic-generator-type
weblogic-load-algorithm
weblogic-passivation-strategy
weblogic-replication-type
weblogic-type-identifier
Templates
Association
AssociationMapping
OK
Cancel
Apply
Help

Name: weblogic-boolean

Comment: Boolean data type for WebLogic.

List of values:

- [ ] True
- [ ] False

3. Click **Apply** to save your changes.

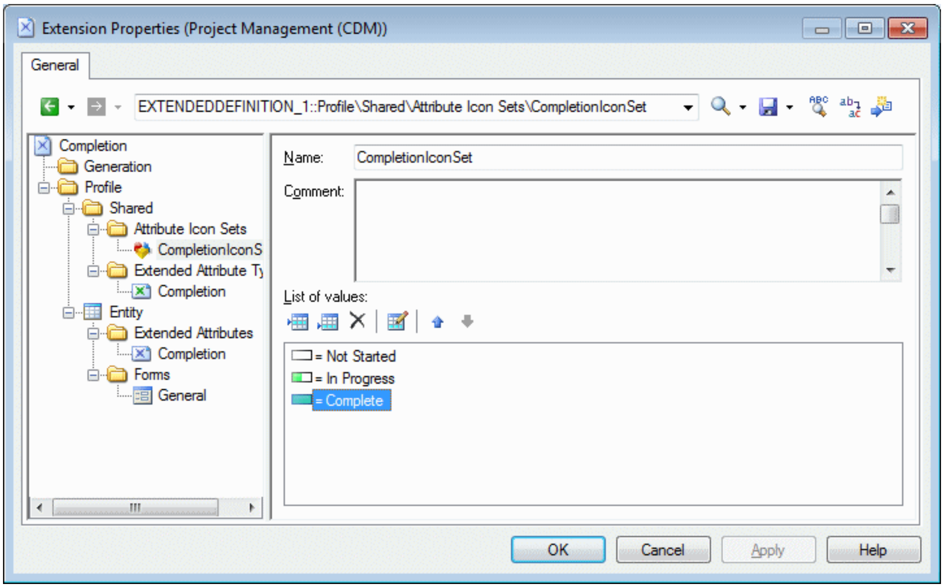
   The new shared type is available to any extended attribute in the **Data Type** field. You can also define a list of values for a given extended attribute directly in this field (see *Extended Attributes (Profile)* on page 39).

Specifying Icons for Attribute Values

You can specify icons to display on object symbols in place of extended attribute values by creating an attribute icon set with individual attribute value icons for each possible value.

1. Create an extended attribute (see *Extended Attributes (Profile)* on page 39).
2. Select a standard data type or an extended attribute type (see *Creating an Extended Attribute Type* on page 45).
3. If appropriate, specify a list of possible values and a default value.
4. Click the **Create** tool to the right of the **Icon set** list to create a new icon set

   A new icon set is created at **Profile** > **Shared** > **Attribute Icon Sets** initialized with the possible values and an empty icon which matches any value for which another icon has not been defined (=*).
5. For each value in the list, double-click it, and click the **Icon** tool to select an icon to represent this value on object symbols:



Name: CompletionIconSet

Comment:

List of values:

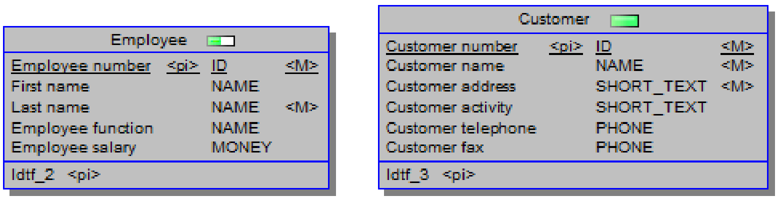
- = Not Started
- = In Progress
- = Complete

Note: By default, the **Filter operator** field is set to =, and each icon matches exactly one possible value. To have a single icon match multiple values, use the `Between` or another operator together with a suitable **Filter value**. For example, in an icon set paired with a `progress` attribute for which the user can enter any value between 0 and 100% progress, you could use three icons:

- Not Started - = `0`
- In Progress - `Between 1,99`
- Completed - = `100`

6. If appropriate, add the attribute to a form (see *Forms (Profile)* on page 55), to enable users to modify its value.
7. Click **OK** to save your changes and return to the model.
8. To enable the display of the icon on your object symbol, select **Tools > Display Preferences**, select your object type, and click the **Advanced** button to add your attribute to the symbol. For detailed information about working with display preferences, see *Core Features Guide > Modeling with PowerDesigner > Diagrams, Matrices, and Symbols > Display Preferences*.

   Your attribute is now displayed on object symbols. In the following example, the `Employee` entity is `In Progress`, while the `Customer` entity is `Completed`:



Linking Objects Through Extended Attributes

Specify the `[Object]` data type to allow users to select another object as the value of the attribute. You must specify an **Object type** (metaclass) to link to, and can optionally specify an **Object stereotype** to filter the objects available for selection and an **Inverse collection** name, which will be displayed on the **Dependencies** tab on the referenced object property sheet.

For example, under the Table metaclass, I create an extended attribute called `Owner`, select `[Object]` in the **Data type** field, and `User` in the **Object type** field. I name the inverse collection `Tables owned`. When I set the **Owner** property of a table, the table will be listed on the **Dependencies** tab of the user property sheet, under the inverse collection name of `Tables owned`.

Extended Collections and Compositions (Profile)

Extended collections define the possibility to associate an object instance with a group of other objects of the specified type. Extended compositions define a parent-child connection between an object instance and a group of sub-objects derived from the `ExtendedSubObject` metaclass.

For extended collections, the association between the parent and child objects is relatively weak, so that if you copy or move the parent object, the related objects are not copied or moved, but the connection is maintained (using shortcuts if necessary). For example, you could associate documents containing use case specifications with the different packages of a model by creating an extended collection under the `Package` metaclass and specifying `FileObject` as the target metaclass.

For extended compositions, the association is stronger. Sub-objects can only be created within the parent object and are moved, copied, and/or deleted along with their parent.

The collection or composition is displayed as a new tab in the object instance property sheet. The property sheets of objects referenced in a collection show the object instance owning the collection on their **Dependencies** tab.

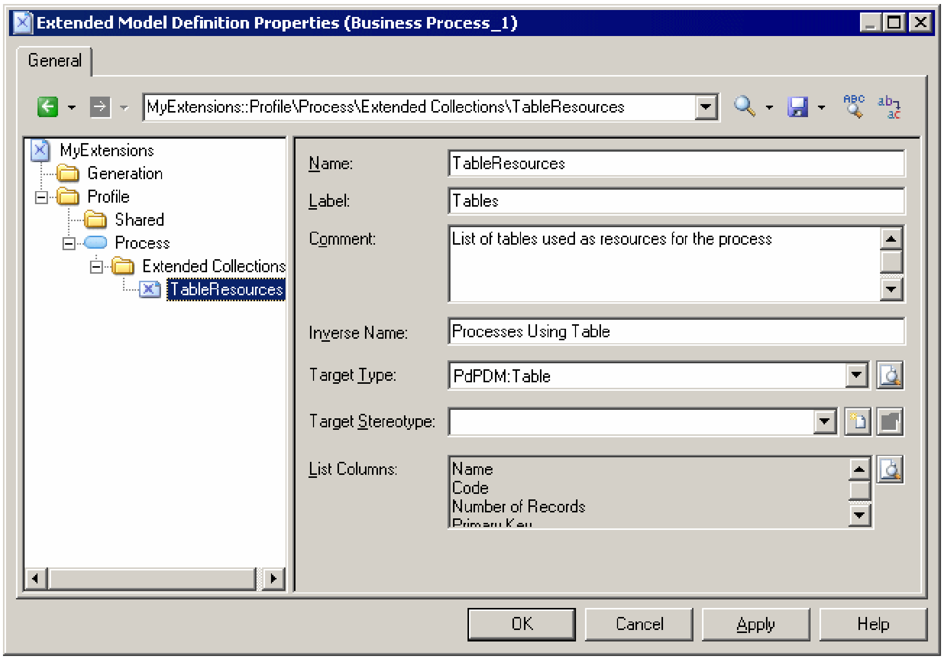
1. Right-click a metaclass, stereotype, or criterion in the Profile category and select **New** > **Extended Collection** or **Extended Composition**.

Note: If you define the collection or composition under a stereotype or criterion, its tab is displayed only if the metaclass instance bears the stereotype or meets the criterion.

2. Enter the following properties as appropriate:

Property	Description
Name	Specifies the name of the extended collection or composition.
Label	Specifies the display name of the collection, which will appear as the name of the tab associated with the collection in the parent object property sheet.
Comment	[optional] Describes the extended collection.
Inverse Name	[extended collection only] Specifies the name to appear in the **Dependencies** tab of the target metaclass. If you do not enter a value, an inverse name is automatically generated.
Target Type	Specifies the metaclass whose instances will appear in the collection. For extended collections, the list displays only metaclasses that can be directly instantiated in the current model or package, such as classes or tables, and not sub-objects such as class attributes or table columns. Click the **Select a Metaclass** tool to the right of this field to choose a metaclass from another type of model. For extended compositions, only the ExtendedSubObject is available, and you must specify a stereotype for it.
Target Stereotype	[required for extended compositions] Specifies a stereotype to filter the target type. You can select an existing stereotype from the list or click the **Create** tool to the right of this field to create a new one.
List Columns	Specifies the property columns that will be displayed by default in the parent object property sheet tab associated with the collection. Click the **Customize Default Columns** tool to the right of this field to add or remove columns.

3. Click **Apply** to save your changes.


Extended Model Definition Properties (Business Process_1)
General
MyExtensions::Profile\Process\Extended Collections\TableResources
MyExtensions
Generation
Profile
Shared
Process
Extended Collections
TableResources
OK
Cancel
Apply
Help

Name: TableResources
Label: Tables
Comment: List of tables used as resources for the process
Inverse Name: Processes Using Table
Target Type: PdPDM:Table
Target Stereotype:
List Columns: Name, Code, Number of Records, Primary Key

You can view the tab associated with the collection by opening the property sheet of a metaclass instance. The tab contains an **Add Objects** (and, if the metaclass belongs to the same type of model, **Create an Object**) tool, to populate the collection.

Note: When you open a model containing extended collections or compositions and associate it with a resource file that does not support them, the collections are still visible in the different property sheets in order to let you delete objects in the collections no longer supported.

Calculated Collections (Profile)

Calculated collections define a read-only connection between an object instance and a group of other objects of the specified type. The collection displays as a sub-tab on the **Dependencies** tab of the object property sheet. The logic of the collection is defined using VBScript.

For example, in an OOM, you may need to create a list of sequence diagrams using an operation, and can create a calculated collection on the operation metaclass that retrieves this information. In a BPM, you could create a calculated collection on the process metaclass that lists the CDM entities created from data associated with the process.

You can loop on calculated collections with GTL (see *Accessing Collections of Sub-Objects or Related Objects* on page 249) You can use calculated collections to fine-tune impact analysis to better evaluate the impact of a change. For example, in a model where columns and domains can diverge, you can create a calculated collection on the domain metaclass that lists all the columns that use the domain and have the same data type.

Note: Calculated collections, unlike extended collections (see *Extended Collections and Compositions (Profile)* on page 48) cannot be modified by the user.

1. Right-click a metaclass, stereotype, or criterion in the Profile category and select **New > Calculated Collection**.
2. Enter the following properties as appropriate:

Property	Description
Name	Specifies the name of the calculated collection for use in scripts.
Label	Specifies the display name of the collection, which will appear as the name of the tab associated with the collection in the parent object property sheet.
Comment	[optional] Describes the calculated collection.
Target Type	Specifies the metaclass whose instances will appear in the collection. The list displays only metaclasses that can be directly instantiated in the current model or package, such as classes or tables, and not sub-objects such as class attributes or table columns. Click the **Select a Metaclass** tool to the right of this field to choose a metaclass from another type of model.
Target Stereotype	[optional] Specifies a stereotype to filter the target type. You can select an existing stereotype from the list or enter a new one.
List Columns	Specifies the columns displayed by default on the collection property sheet tab.

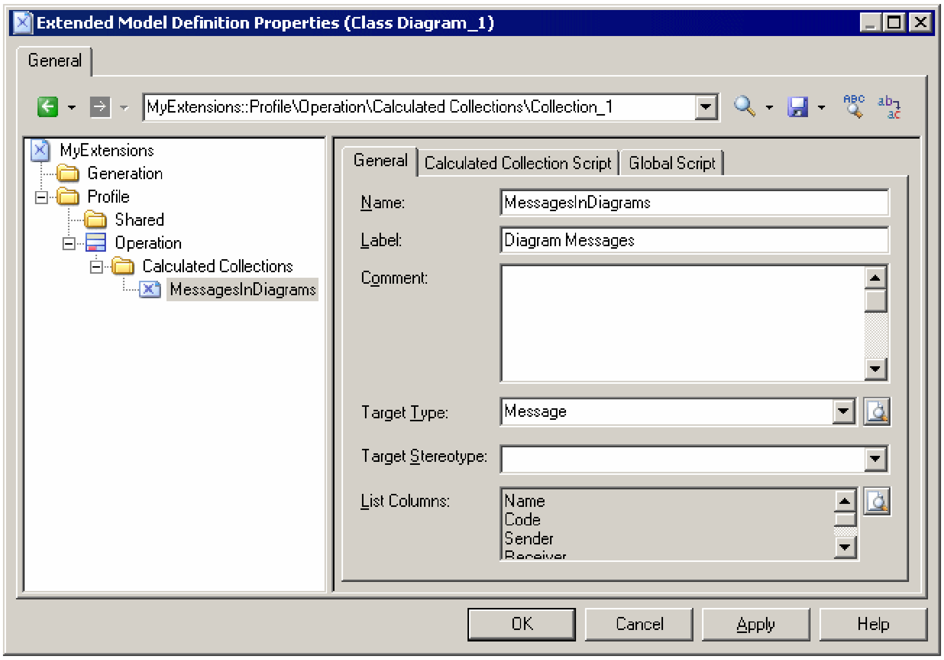
3. Click the **Calculated Collection Script** tab and enter a script that will calculate which objects will form the collection.

   The following script recreates the list on the **Outgoing References** sub-tab on a table's **Dependencies** tab:

```
Function %Collection%(obj, coll) ' Required
   dim r
   For each r in obj.outreferences
      coll.Add r                 ' Populates collection
   Next
   %Collection% = True           ' Required
End Function                     ' Required
```

Note: You can reuse functions on the **Global Script** tab (see *Global Script (Profile)* on page 106) but you should be aware that if you declare *global variables* they will not be reinitialized each time the collection is calculated, and will keep their value until you modify the resource file, or the PowerDesigner session ends. This may cause errors, especially when variables reference objects that can be modified or deleted. Make sure you reinitialize the global variable if you do not want to keep the value from a previous run.

4. Click **Apply** to save your changes.


Extended Model Definition Properties (Class Diagram_1)
General
MyExtensions::Profile\Operation\Calculated Collections\Collection_1
MyExtensions
Generation
Profile
Shared
Operation
Calculated Collections
MessagesInDiagrams
General
Calculated Collection Script
Global Script
OK
Cancel
Apply
Help

Name: MessagesInDiagrams
Label: Diagram Messages
Comment:
Target Type: Message
Target Stereotype:
List Columns: Name, Code, Sender, Receiver

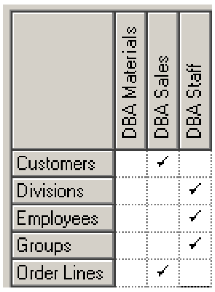
5. To view the collection, open the property sheet of a metaclass instance to the **Dependencies** tab and select the appropriate sub-tab.
6. [optional] Add the collection to your model reports. Calculated collections are automatically available in the new Report Editor as lists under the appropriate metaclass book. You can add calculated collections to a legacy report, by changing the collection of the appropriate metaclass book or list (see *Core Features Guide > Storing, Sharing and Reporting on Models > Reports > The Legacy Report Editor > Modifying the Collection of an Item*).

Dependency Matrices (Profile)

Dependency matrices allow you to review and create links between any kind of objects. You specify one metaclass for the matrix rows, and the same or another metaclass for the columns. The contents of the cells are then calculated from a collection or link object.

For example, you could create dependency matrices that show links between:

- OOM Classes and Classes – connected by Association link objects
- PDM Tables and Users – connected by the Owner collection

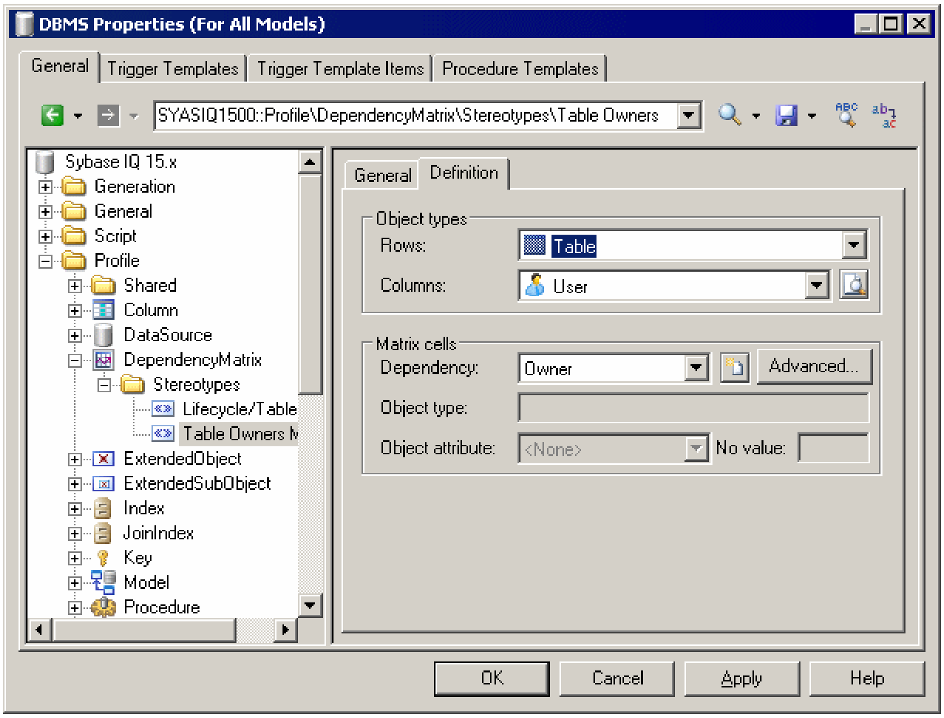


	DBA Materials	DBA Sales	DBA Staff
Customers		✓	
Divisions			✓
Employees			✓
Groups			✓
Order Lines		✓	

- PDM Tables and OOM Classes – connected by extended dependencies

1. Right-click the **Profile** category and select **Add Dependency Matrix** to add the `DependencyMatrix` metaclass to the profile and create a stereotype under it, in which you will define the matrix properties.
2. On the **General** tab, enter a name for the matrix (for example `Table Owners Matrix`) along with a label and plural label for use in the PowerDesigner interface, as well as a default name for the matrices that users will create based on this definition.
3. Click the **Definition** tab to specify the rows and columns of your matrix and how they are associated using the following properties.

Property	Description
Rows	Specifies the object type with which to populate your matrix rows.
Columns	Specifies the object type with which to populate your matrix columns. Click the **Select Metaclass** button to the right of the list to select a metaclass from another model type.
Matrix Cells	Specifies how the rows and columns of your matrix will be associated. You must specify a **Dependency** from the list, which includes all the collections and links available to the object. Click the **Create** button to the right of the list to create a new extended collection (see *Extended Collections and Compositions (Profile)* on page 48) connecting your objects, or the **Advanced** button to specify a complex dependency path (see *Specifying Advanced Dependencies* on page 54). For certain dependencies, the **Object type** on which the dependency is based will be displayed, and you can select an **Object attribute** to display in the matrix cells along with the **No value** symbol, which is displayed if that attribute is not set in any particular instance.


DBMS Properties (For All Models)

SYASIQ1500::Profile\DependencyMatrix\Stereotypes\Table Owners

Object types
Rows: Table
Columns: User

Matrix cells
Dependency: Owner
Object type:
Object attribute: <None>
No value:

4. Click **OK** to save your matrix and close the resource editor.

You can now create instances of the matrix in your model as follows:

- Select **View** > **Diagram** > **New Diagram** > **Matrix Name**.
- Right-click a diagram background and select **Diagram** > **New Diagram** > **Matrix Name**.
- Right-click the model in the browser and select **New** > **Matrix Name**.

Note: For information about using dependency matrices, see *Core Features Guide > Modeling with PowerDesigner > Diagrams, Matrices, and Symbols > Dependency Matrices*.

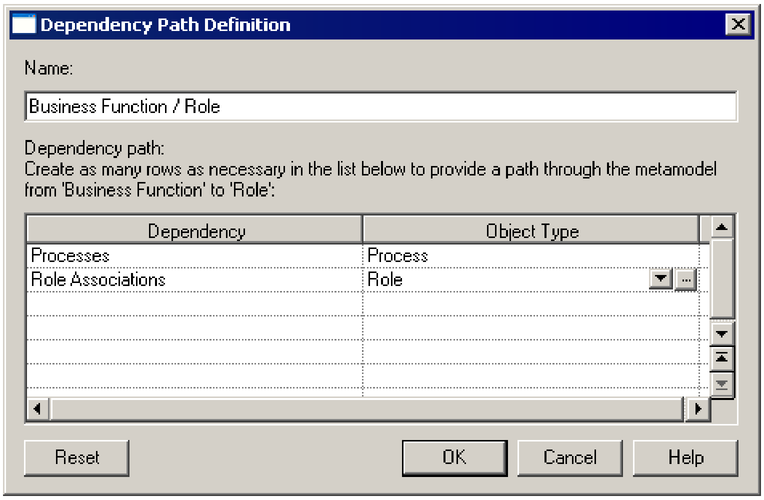
Specifying Advanced Dependencies

You can examine dependencies between two types of objects that are not directly associated with each other, using the Dependency Path Definition dialog, which is accessible by clicking the Advanced button on the Definition tab, and which allows you to specify a path passing through as many intermediate linking objects as necessary.

Each line in this dialog represents one step in a dependency path:

Property	Description
Name	Specifies a name for the dependency path. By default, this field is populated with the origin and destination object types.
Dependency	Specifies the dependency for this step in the path. The list is populated with all the possible dependencies for the previous object type.
Object Type	Specifies the specific object type that is linked to the previous object type by the selected dependency. This field is autopopulated if only one object type is available through the selected dependency.

In the following example, a path is identified between business functions and roles, by passing from the business function through the processes it contains, to the role linked to it by a role association:



Name:

Business Function / Role

Dependency path:
Create as many rows as necessary in the list below to provide a path through the metamodel from 'Business Function' to 'Role':

Dependency	Object Type
Processes	Process
Role Associations	Role

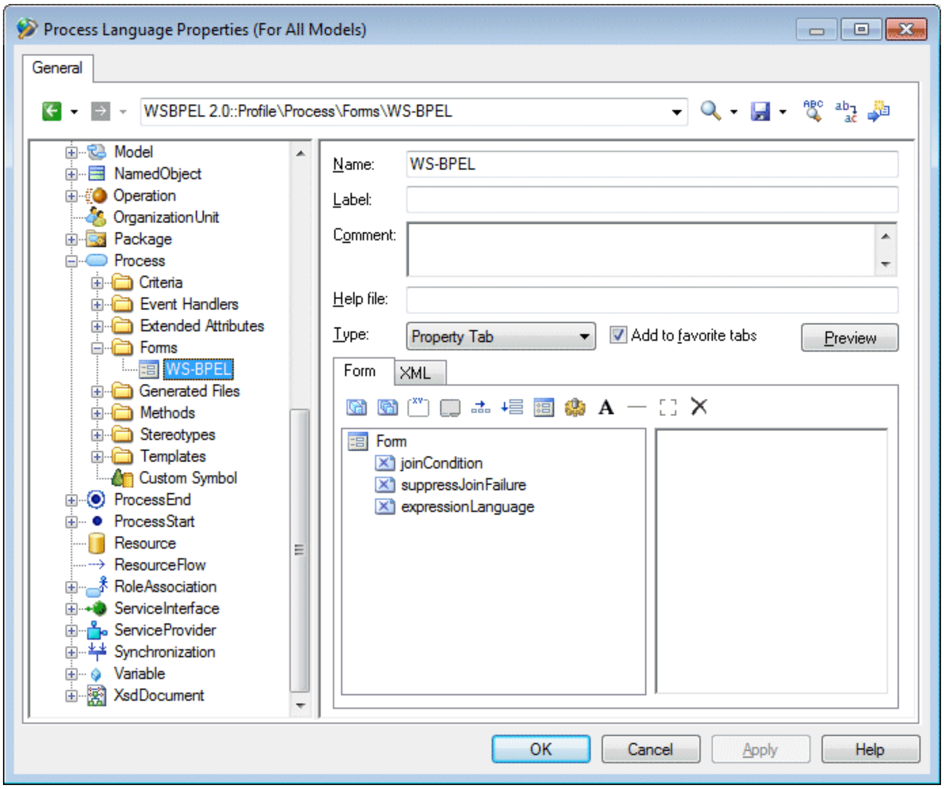
Forms (Profile)

Forms present standard and extended attributes and collections as property sheet tabs or can be used to create dialog boxes launched from menus or property sheet buttons.

Note: Unless you add them to a form, extended attributes are listed alphabetically on the **Extended Attributes** tab of the object's property sheet. By creating your own form, you can make these attributes more visible and easy to use, by organizing them logically, grouping related ones, and emphasizing those that are most important. If you associate all of your extended attributes with a form, the **Extended Attributes** tab is not displayed.

1. Right-click a metaclass, stereotype, or criterion in the Profile category and select **New** > **Form**.

Note: If you define a property tab under a stereotype or criterion, it is displayed only when the metaclass instance bears the stereotype or meets the criterion.



Name: WS-BPEL
Label:
Comment:
Help file:
Type: Property Tab
[✓] Add to favorite tabs

2. Enter the appropriate following properties:

Property	Description
Name	Specifies the internal name of the form, which can be used for scripting.
Label	Specifies the display name of the form, which will display in the tab of the property tab or in the title bar of the dialog box.
Comment	Provides additional information about the form.

Proper-ty	Description

Help file	Enables the display of a Help button and specifies an action that will be performed when the button is clicked or F1 is pressed when in the context of the form.
	
	The action can be the display of a help file (.hlp, .chm or .html), and can specify a specific topic. For instance:
	`C:\PD1500\pddoc15.chm 26204`
	
	If no help file extension is found, the string will be treated as a shell command to execute. For instance, you could instruct PowerDesigner to open a simple text file:
	`notepad.exe C:\Temp\Readme.txt`

Type	Specifies the kind of form. You can choose from the following: • Dialog Box – creates a dialog box that can be launched from a menu or via a form button • Property Tab – creates a new tab in the property sheet of the metaclass, stereotype or criterion • Replace *<standard>* Tab – replaces a standard tab in the property sheet of the metaclass, stereotype or criterion. If your form is empty, it will be filled with the standard controls from the tab that you are replacing.
Add to fa-vorite tabs	[property tabs only] Specifies that the tab is displayed by default in the object prop-erty sheet.

3. Insert controls as necessary in your form using the toolbar on the **Form** tab (see *Adding Extended Attributes and Other Controls to Your Form* on page 57).
4. Click the **Preview** button to review the layout of your form and, when satisfied, click **Apply** to save your changes.

Adding Extended Attributes and Other Controls to Your Form

You insert controls into your form using the tools in the Form tab toolbar. You can reorder controls in the form control tree by dragging and dropping them. To place a control inside a container control (group box or horizontal or vertical layout), drop it onto the container. For example, if you want the extended attributes GUID, InputGUID, and OutputGUID to be displayed in a GUI group box, you should create a group box, name it GUI and drag and drop all three extended attributes under the GUI group box.

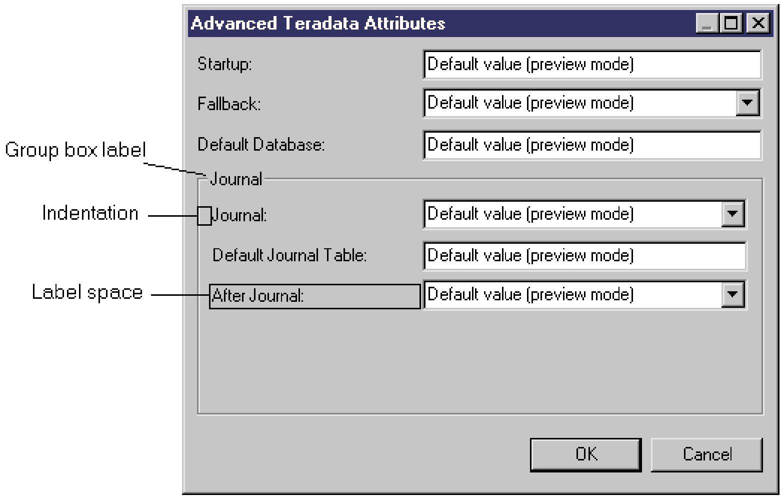
The following tools are available:

Tool	Description
	Add Attribute / Collection – opens a selection box in which you select standard or extended attributes or collections belonging to the metaclass to insert into the form. If you do not enter a label, the attribute or collection name is used as its form label. If you have entered a comment, it is displayed as a tooltip. The type of control associated with an attribute depends on its type: booleans are associated with check boxes, lists with combo boxes, text fields with multi-line edit boxes, and so on. Collections are displayed as standard grids with all the appropriate tools.
	Add Group Box - inserts a group box, intended to contain other controls within a named box.
	Add Tab Window - inserts a sub-tab layout, in which each child control appears, by default, in its own sub-tab. To place multiple controls on a single sub-tab, use a horizontal or vertical layout.
	Add Horizontal / Vertical Layout - inserts a horizontal or vertical layout. To arrange controls to display side by side, drag them onto a horizontal layout in the list. To arrange attributes to display one under the other, drag them onto a vertical layout in the list. Vertical and horizontal layouts are often used together to provide columns of controls.
	Include Another Form - inserts a form defined on this or another metaclass in the present form (see *Example: Including a Form in a Form* on page 65).
	Add Method Push Button - opens a selection box in which you select one or more methods belonging to the metaclass to associate with the form via buttons. Clicking the button invokes the method. If you do not enter a label, the method name is used as the button label. If you have entered a comment, it is displayed as a tooltip.
	Add Edit / Multi-Line Edit Field [dialog boxes only] inserts an edit or multi-line edit field.
	Add Combo Box / List Box / Check Box [dialog boxes only] - inserts a combo box, list box, or check box.
A	**Add Text / Separator Line / Spacer** - inserts the appropriate decorative control. The separator line is vertical when its parent control is a vertical layout.
	Delete – deletes the currently selected control.

Select a control to specify properties to control its format and contents:

Property	Definition
Name	Internal name of the control. This name must be unique within the form. The name can be used in scripts to get and set dialog box control values (see *Example: Opening a Dialog Box from a Menu* on page 84).

Property	Definition
Label	Specifies a label for the control on the form. If this field is left blank, the name of the control is used. If you enter a space, then no label is displayed. You can insert line breaks with `\n`. To create keyboard shortcuts to navigate among controls, prefix the letter that will serve as the shortcut with an ampersand. If you do not specify a shortcut key, PowerDesigner will choose one by default. To display an ampersand in a label, you must escape it with a second ampersand (for example: `&Johnson && Son` will display as **Johnson & Son**.
Attribute	[included forms] Specifies the object on which the form to be included is defined. The list is populated with all attributes of type `object` and the following objects: • <None> - the present metaclass • Generation Origin - for example, the CDM entity from which a PDM table was generated • Model - the parent model • Parent - the immediate parent object for sub-objects (for example, the table containing a column • Parent Folder - the immediate parent object for composite objects (for example BPM processes that contain other processes) • Parent Package - the immediate parent package
Form name	[included forms] Specifies the name of the form that will be included. You can: • Select a standard property sheet tab name from the list. • Enter the name of a custom form defined in the extension file. • Enter the name of a GTL template to generate XML to define the form.
Indentation	[container controls] Specifies the space in pixels between the left margin of the container (form, group box, or horizontal or vertical layout) and the beginning of the labels of its child controls.

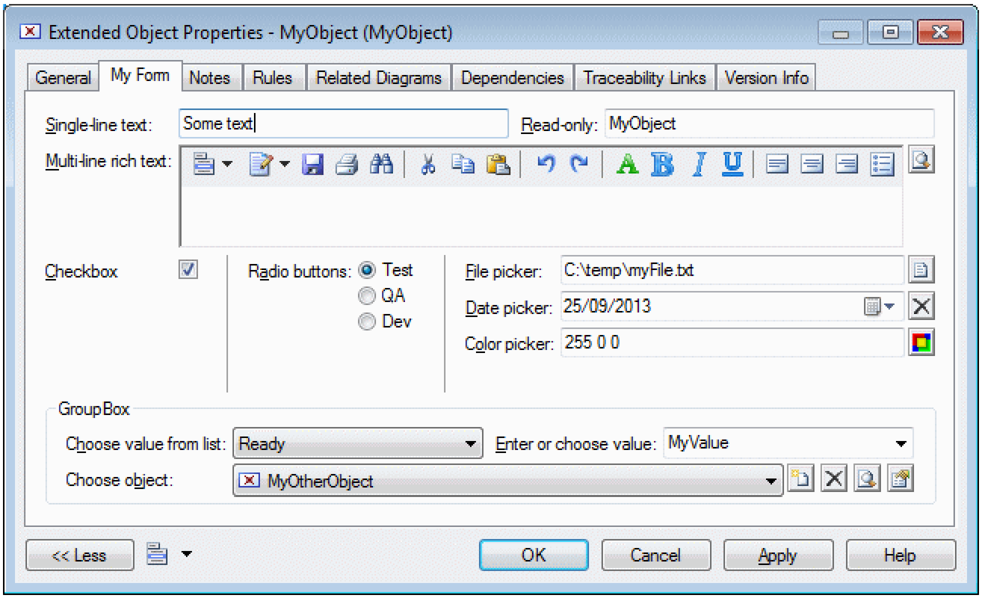
Property	Definition
Label space	[container controls] Specifies the space in pixels reserved for displaying the labels of child controls between the indentation of the container and the control fields. To align controls with the controls in a previous container, enter a negative value. For example, if you have two group boxes, and want all controls in both to be aligned identically, set an appropriate indentation in the first group box and set the indentation of the second group box to `-1`. If a child control label is larger than the specified value, the label space property is ignored; to display this label, you need to type a number of pixels greater than 50.  Group box label Indentation Label space Advanced Teradata Attributes Startup: Fallback: Default Database: Journal Journal: Default Journal Table: After Journal: Default value (preview mode) OK Cancel
Show control as label	[group boxes] Use the first control contained within the group box as its label.
Show Hidden Attribute	[extended attributes] Displays controls that are not valid for a particular form (because they do not bear the relevant stereotype, or do not meet the criteria) as greyed. If this option is not set, irrelevant options are hidden.
Value	[dialog box entry fields] Specifies a default value for the control. For extended attributes, default values must be specified in the attribute's properties (see *Extended Attributes (Profile)* on page 39).
List of Values	[combo and list boxes] Specifies a list of possible values for the control. For extended attributes, lists of values must be specified in the attribute's properties (see *Extended Attributes (Profile)* on page 39).
Exclusive	[combo boxes] Specifies that only the values defined in the **List of values** can be entered in the combo box.

Property	Definition
Minimum Size (chars)	Specifies the minimum width (in characters) to which the control may be reduced when the window is resized.
Minimum Line Number	Specifies the minimum number of lines to which a multiline control may be reduced when the window is resized.
Horizontal / Vertical Resize	Specifies that the control may be resized horizontally or, for multiline controls, vertically, when the property sheet or dialog is resized.
Read-Only	[included forms and dialog box entry fields] Specifies that the control is read-only, and will be greyed in the form.
Left Text	[booleans] Places the label text to the left of the checkbox.
Display	[booleans and methods] Specifies the form in which the boolean options or method button are displayed. For booleans, you can choose between a check box or vertical or horizontal radio buttons, while for methods, you can choose from a range of standard icons or **Text**, which prints the text specified in the **Label** field on the button.
Width/ Height	[spacers] Specify the width and height, in pixels, of the spacer.

Example: Creating Common Form Controls

In this example, we will give instructions for creating each of the most common controls for presenting attributes on your forms.

The following form contains many of the most commonly-used controls for presenting attributes in your forms:



Single-line text: Some text
Read-only: MyObject
Multi-line rich text:
Checkbox ✓
Radio buttons: [✓ Test] QA Dev
File picker: C:\temp\myFile.txt
Date picker: 25/09/2013
Color picker: 255 0 0
GroupBox
Choose value from list: Ready
Enter or choose value: MyValue
Choose object: MyOtherObject

To create a control, you must create an extended attribute (see *Extended Attributes (Profile)* on page 39) and then add it to the form (see *Adding Extended Attributes and Other Controls to Your Form* on page 57). You can organize your controls by using horizontal and vertical layouts, dividers, spacers, free text and groupboxes. PowerDesigner will automatically add appropriate supplementary tools to your controls, such as the **Create**, **Delete**, **Select**, and **Propeties** tools to the right of an object control.

To create the controls shown:

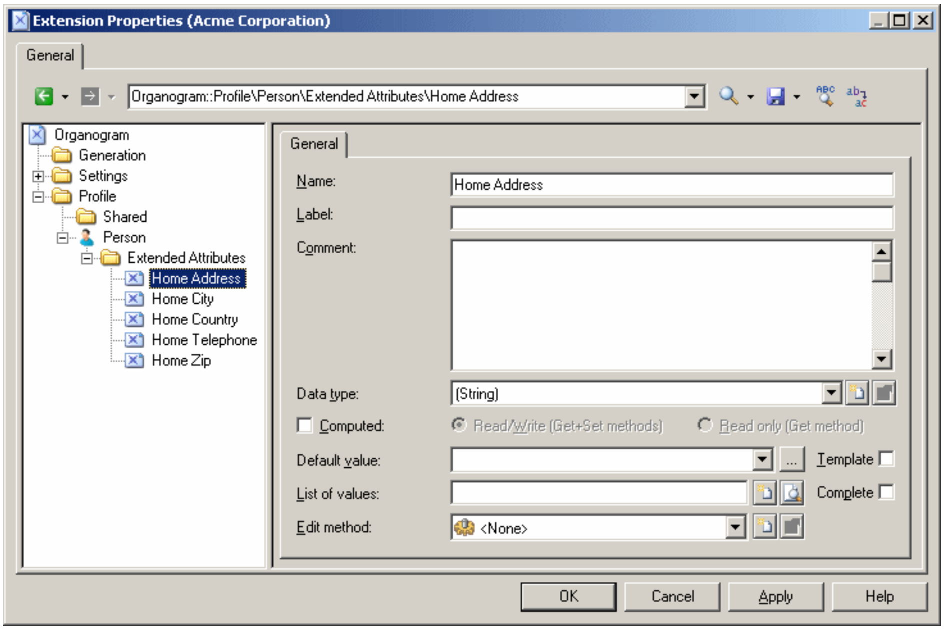
Control	Requires
Single-line text	Select the `String`, `Password` (masks entered values), or `Float`, `Hex`, or `Integer` data type for your attribute.
Read-only	Select any data type, check the **Computed** and **Read only (Get method)** options and enter the necessary script to calculate the value that will be displayed.
Multi-line rich text	Select the `Text` data type and the `RTF` text format. You can select a number of other text formats to display various types of code or plain text.
Checkbox	Select the `Boolean` data type. Use the **Default value** field to specify whether the checkbox should be selected or not by default.
Radio Buttons	Select any appropriate data type, enter a list of values, and select the **Complete** option. When adding your attribute to the form, select either horizontal or vertical radio buttons from the **Display** option.
File, Date, or Color Picker	Select the `File`, `Date`, or `Color` data type.

Control	Requires
Choose value from list or Enter or choose value	Select any appropriate data type and enter a list of values to allow the user to select a value from the list or enter their own value. Select the **Complete** option to force the user to select from the list.
Choose object	Select the `Object` data type and then select an object type and optionally an object stereotype (see *Linking Objects Through Extended Attributes* on page 48).

Example: Creating a Property Sheet Tab

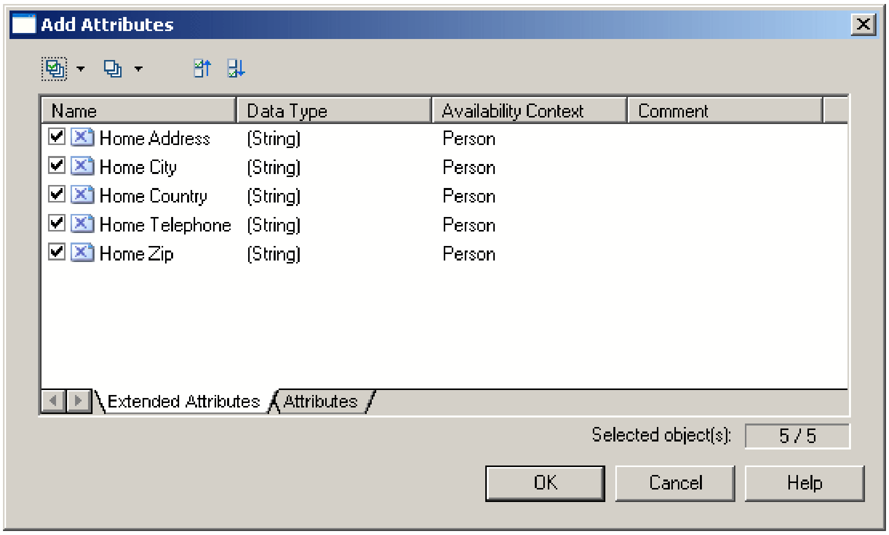
In this example, we will create a new property tab for the EAM Person metaclass to display extended attributes we define to store personal information.

1. Create a new extension file (see *Creating an Extension File* on page 10) in an EAM, add the `Person` metaclass (see *Metaclasses (Profile)* on page 31), and define five extended attributes (see *Extended Attributes (Profile)* on page 39) to contain home contact details:



Name: Home Address
Label:
Comment:
Data type: (String)
Computed: ☐ ● Read/Write (Get+Set methods) ○ Read only (Get method)
Default value: Template ☐
List of values: Complete ☐
Edit method: <None>

2. Right-click the `Person` metaclass and select **New > Form**, enter `Personal Details` in the **Name** field, select `Property Tab` in the **Type** list, and click the **Add Attribute** tool to select all the new extended attributes for inclusion in the form:


Add Attributes

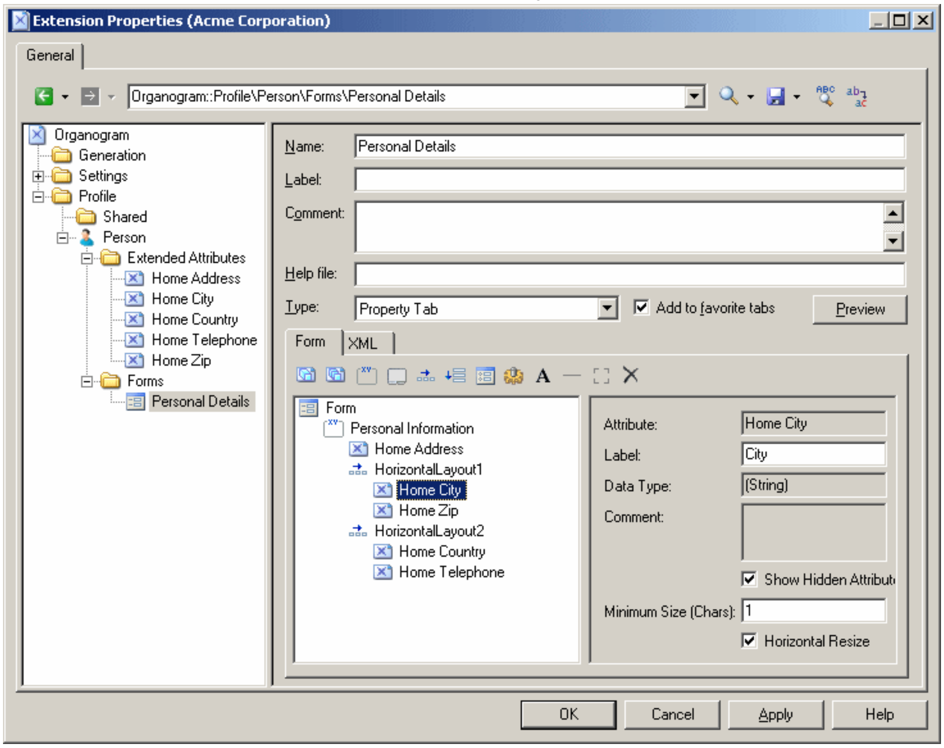
Name	Data Type	Availability Context	Comment
☑ Home Address	(String)	Person	
☑ Home City	(String)	Person	
☑ Home Country	(String)	Person	
☑ Home Telephone	(String)	Person	
☑ Home Zip	(String)	Person	

Extended Attributes / Attributes

Selected object(s): 5 / 5

OK Cancel Help

3. Click **OK** to add the attributes to the form, and arrange them in a group box, using horizontal layouts to align them neatly. Here, I'm using the **Label** field to overide the default name of the attribute in the form for brevity:


Extension Properties (Acme Corporation)

General

Organogram::Profile\Person\Forms\Personal Details

```
Organogram
  Generation
  Settings
  Profile
    Shared
    Person
      Extended Attributes
        Home Address
        Home City
        Home Country
        Home Telephone
        Home Zip
      Forms
        Personal Details
```

Name: Personal Details

Label:

Comment:

Help file:

Type: Property Tab ☑ Add to favorite tabs Preview

Form XML

```
Form
  Personal Information
    Home Address
    HorizontalLayout1
      Home City
      Home Zip
    HorizontalLayout2
      Home Country
      Home Telephone
```

Attribute: Home City

Label: City

Data Type: (String)

Comment:

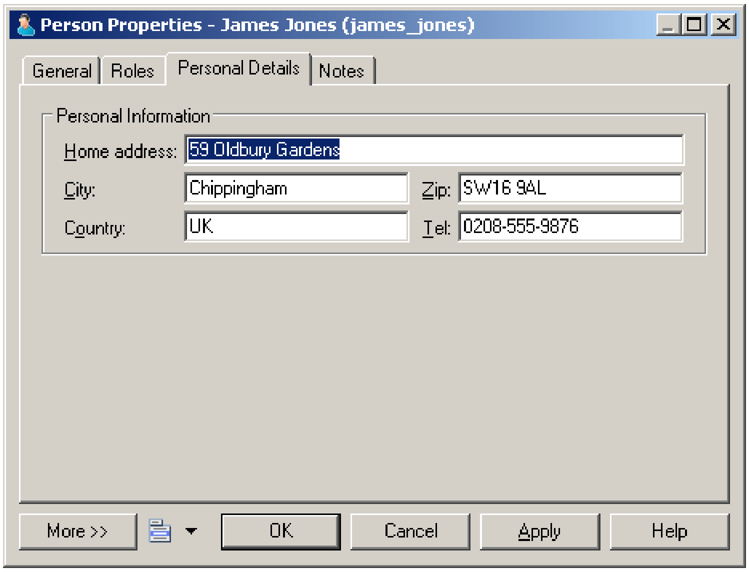
☑ Show Hidden Attribut

Minimum Size (Chars): 1

☑ Horizontal Resize

OK Cancel Apply Help

4. Click **OK** to save your changes and return to the model. When you next open the property sheet of a person, a new **Personal Details** tab is available containing the extended attributes:



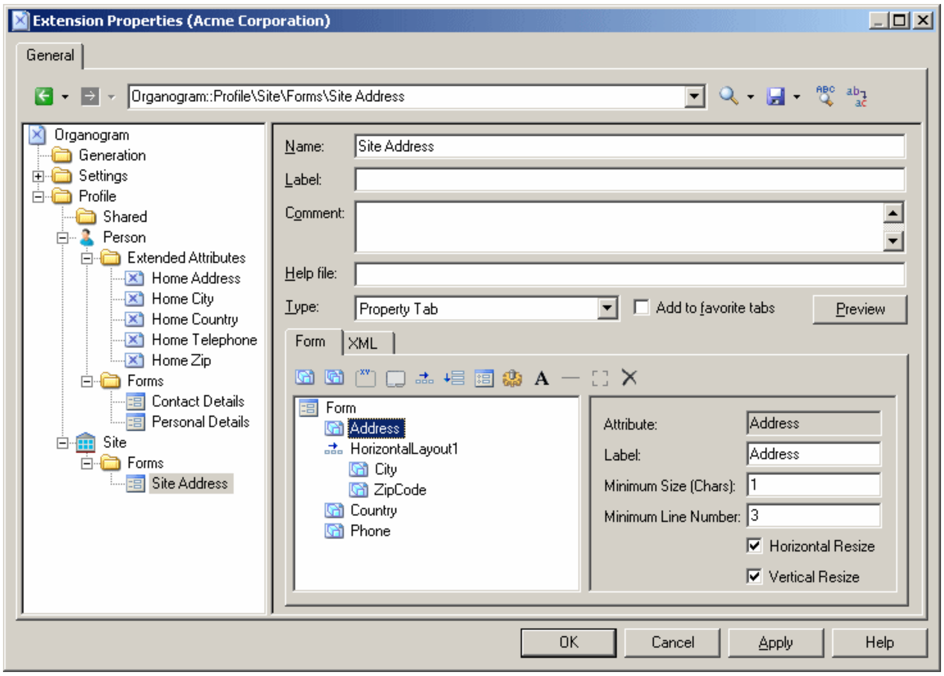
Home address:	59 Oldbury Gardens		
City:	Chippingham	Zip:	SW16 9AL
Country:	UK	Tel:	0208-555-9876

Example: Including a Form in a Form

In this example, we will replace the General tab of the EAM Person metaclass by a form which includes properties from the person and from the site to which she is assigned by including a form defined on the Site metaclass as a read-only control in a form defined on the Person metaclass.

This example builds on the extension file created in *Example: Creating a Property Sheet Tab* on page 63.

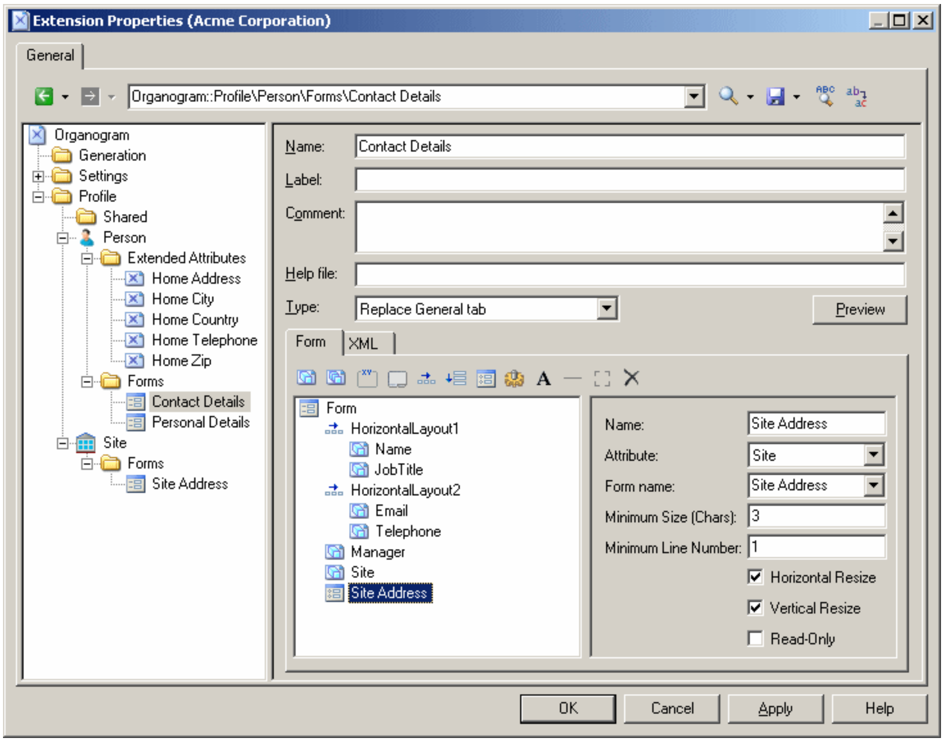
1. Add the `Site` metaclass and create a form called `Site Address`. Select `Property Tab` from the **Type** list and unselect the **Add to favorite tabs** option (as we do not want this form, which duplicates standard site properties displayed in site property sheets).
2. Populate the form with standard attributes to display the complete address of the site:



Name: Site Address
Label:
Comment:
Help file:
Type: Property Tab

Attribute: Address
Label: Address
Minimum Size (Chars): 1
Minimum Line Number: 3
[✓] Horizontal Resize
[✓] Vertical Resize

3. Create a form under the `Person` metaclass, select `Replace General tab` from the **Type** list, and change the name to `Contact Details`.
4. Delete unwanted attributes from the list, and arrange the remaining attributes you want to display, including the `Site` attribute (which is of type `Object`, and which will enable us to pull in the appropriate properties from the associated site form) using horizontal and vertical layouts.
5. Click the **Include Another Form** tool, select `Site` in the **Attribute** field, and enter `Site Address` in the **Form name** field. Select the **Read-Only** check box to prevent editing of the included form from the person's property sheet:

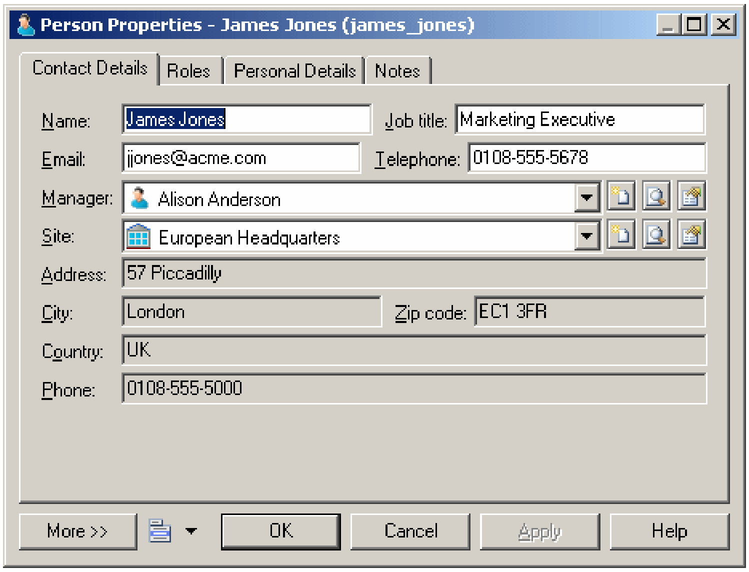


Name: Contact Details
Label:
Comment:
Help file:
Type: Replace General tab

Form
- HorizontalLayout1
  - Name
  - JobTitle
- HorizontalLayout2
  - Email
  - Telephone
- Manager
- Site
- Site Address

Name: Site Address
Attribute: Site
Form name: Site Address
Minimum Size (Chars): 3
Minimum Line Number: 1
[✓] Horizontal Resize
[✓] Vertical Resize
[ ] Read-Only

6. Click **OK** to save the extensions, and return to your model. When you next open the property sheet of a person, the **General** tab is replaced by the custom **Contact Details** tab, and when the person is assigned to a site, the site's address details are displayed as read-only in the lower part of the form:


Person Properties - James Jones (james_jones)

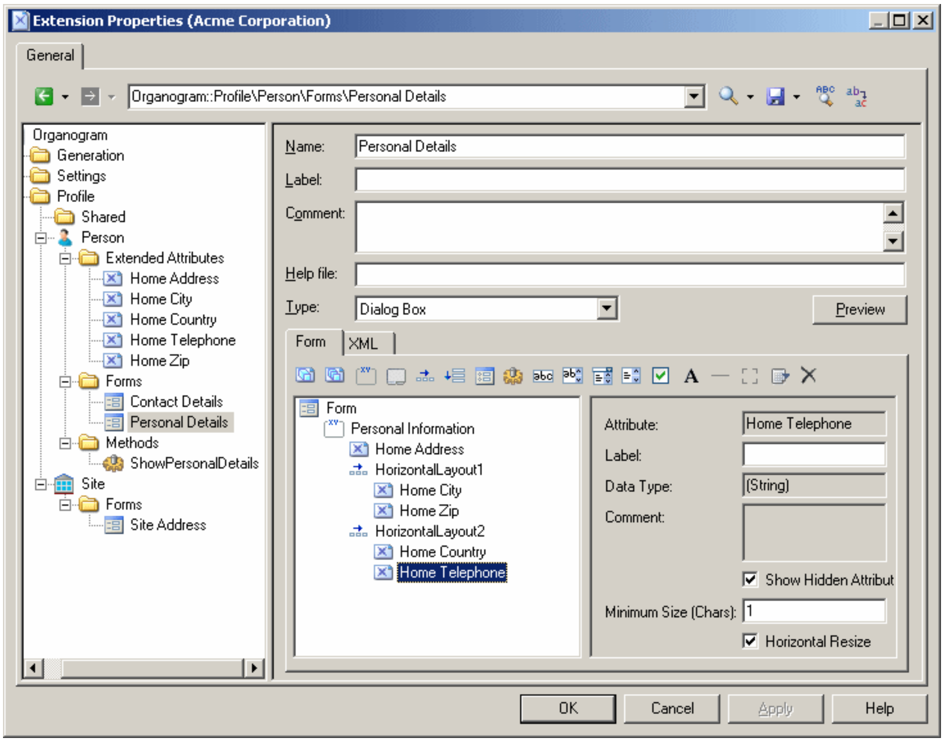
Name:	James Jones	Job title:	Marketing Executive
Email:	jjones@acme.com	Telephone:	0108-555-5678
Manager:	Alison Anderson		
Site:	European Headquarters		
Address:	57 Piccadilly		
City:	London	Zip code:	EC1 3FR
Country:	UK		
Phone:	0108-555-5000		

Example: Opening a Dialog from a Property Sheet

In this example, we will add a button to a property sheet tab, to open a dialog box, allowing you to enter additional personal details for a person.

This example builds on the extension file developed in *Example: Including a Form in a Form* on page 65.

1. Open the `Personal Details` form under the `Person` metaclass, and select `Dialog Box` in the **Type** field, to transform it from a property sheet tab into an independent dialog:



Organogram::Profile\Person\Forms\Personal Details

Organogram
Generation
Settings
Profile
Shared
Person
Extended Attributes
Home Address
Home City
Home Country
Home Telephone
Home Zip
Forms
Contact Details
Personal Details
Methods
ShowPersonalDetails
Site
Forms
Site Address

Name: Personal Details
Label:
Comment:
Help file:
Type: Dialog Box

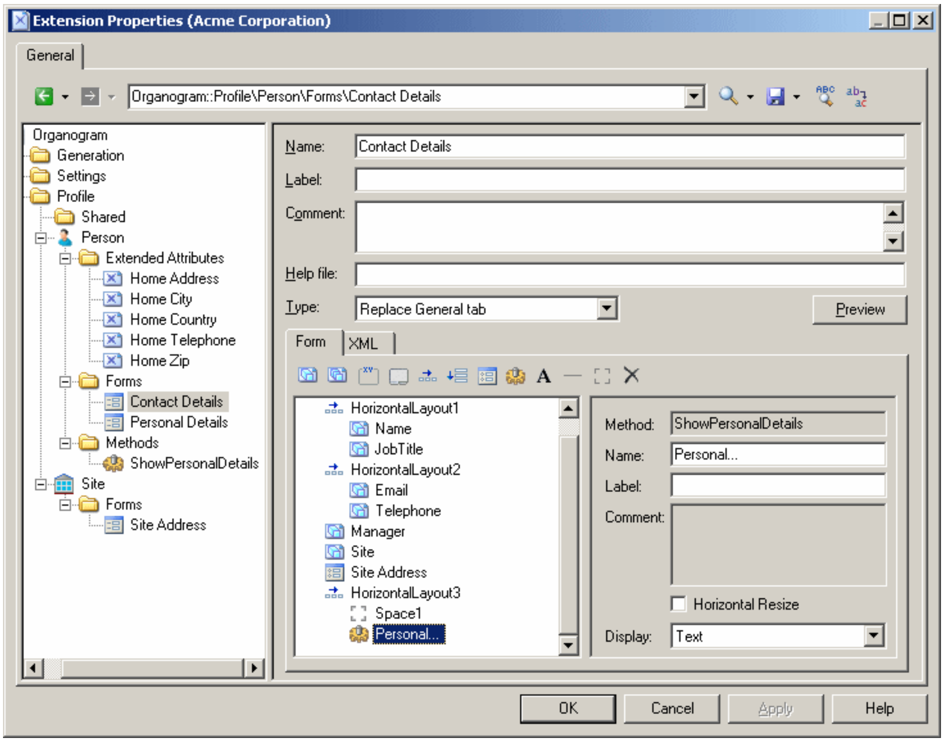
Form
Personal Information
Home Address
HorizontalLayout1
Home City
Home Zip
HorizontalLayout2
Home Country
Home Telephone

Attribute: Home Telephone
Label:
Data Type: (String)
Comment:
[✓] Show Hidden Attribut
Minimum Size (Chars): 1
[✓] Horizontal Resize

2. Right-click the Person metaclass and select **New** > **Method**. Enter the name `ShowPersonalDetails`, and then click the **Method Script** tab and enter the following script:

```
Sub %Method%(obj)
 ' Show custom dialog for advanced extended attributes
 Dim dlg
 Set dlg = obj.CreateCustomDialog("%CurrentTargetCode%.Personal
Details")
 If not dlg is Nothing Then
  dlg.ShowDialog()
 End If
End Sub
```

3. Select the `Contact Details` form, and click the **Add Method Push Button** tool, select the `ShowPersonalDetails` method, and then click **OK** to add it to the form. Here, I use a horizontal layout and spacer to align the button with the right edge of the form:



Organogram::Profile\Person\Forms\Contact Details

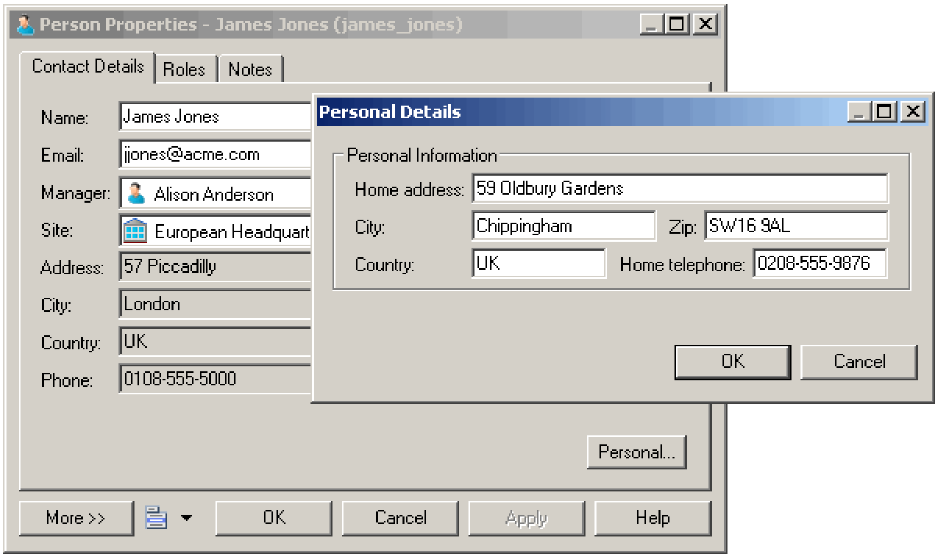
- Organogram
  - Generation
  - Settings
  - Profile
    - Shared
    - Person
      - Extended Attributes
        - Home Address
        - Home City
        - Home Country
        - Home Telephone
        - Home Zip
      - Forms
        - Contact Details
        - Personal Details
      - Methods
        - ShowPersonalDetails
    - Site
      - Forms
        - Site Address

Name: Contact Details
Label:
Comment:
Help file:
Type: Replace General tab

- HorizontalLayout1
  - Name
  - JobTitle
- HorizontalLayout2
  - Email
  - Telephone
- Manager
- Site
- Site Address
- HorizontalLayout3
  - Space1
  - Personal...

Method: ShowPersonalDetails
Name: Personal...
Label:
Comment:
Horizontal Resize
Display: Text

4. Enter `Personal...` in the **Label** field, and then click **OK** to save your changes and return to the model. Now when you open the property sheet of a person, the **Contact Details** tab contains a **Personal...** button which opens the **Personal Information** dialog:



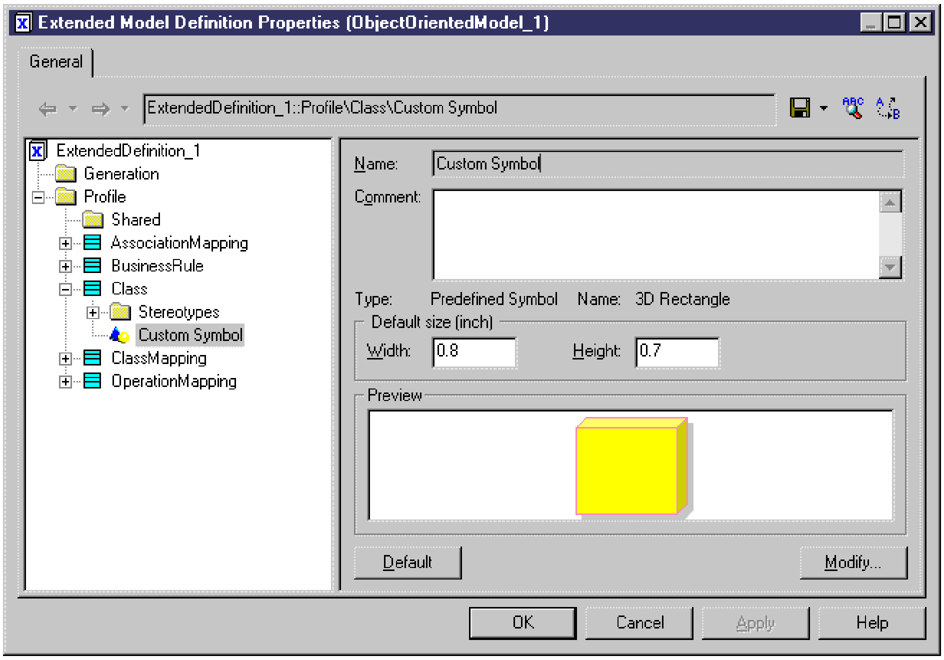
Name: James Jones
Email: jjones@acme.com
Manager: Alison Anderson
Site: European Headquart
Address: 57 Piccadilly
City: London
Country: UK
Phone: 0108-555-5000

Personal Information
Home address: 59 Oldbury Gardens
City: Chippingham
Zip: SW16 9AL
Country: UK
Home telephone: 0208-555-9876

Custom Symbols (Profile)

Custom symbols modify the appearance of object symbols in diagrams along with the content displayed on them. You can choose to enforce certain aspects of the symbol format and content, while allowing users some liberty to change others.

1. Right-click a metaclass, stereotype, or criterion in the Profile category and select **New > Custom Symbol**.



Name: Custom Symbol
Comment:
Type: Predefined Symbol Name: 3D Rectangle
Default size (inch)
Width: 0.8 Height: 0.7
Preview

2. Specify a default **Width** and **Height** for the symbol and then click the **Modify** button to open the Symbol Format dialog, and set appropriate properties on the various tabs.

Note: If you customize the line style and arrows of a link symbol (such as a PDM reference), your styles will override those selected in the Display Preferences dialog, and may cause confusion and inconsistency in the model. To ensure coherence in a model governed by a notation, select `Notation` for the **Style** and **Arrows** properties on the **Line Style** tab.

For more information on the Symbol Format dialog (including the custom symbol options that let you control the default format options for the symbol, and whether users can edit them, on a per-tab basis) see *Core Features Guide > Modeling with PowerDesigner > Diagrams, Matrices, and Symbols > Symbols > Symbol Format Properties*.

3. Click **OK** to return to the resource editor and view your changes in the **Preview** field.

4. Click **Apply** to save your changes.

Custom Checks (Profile)

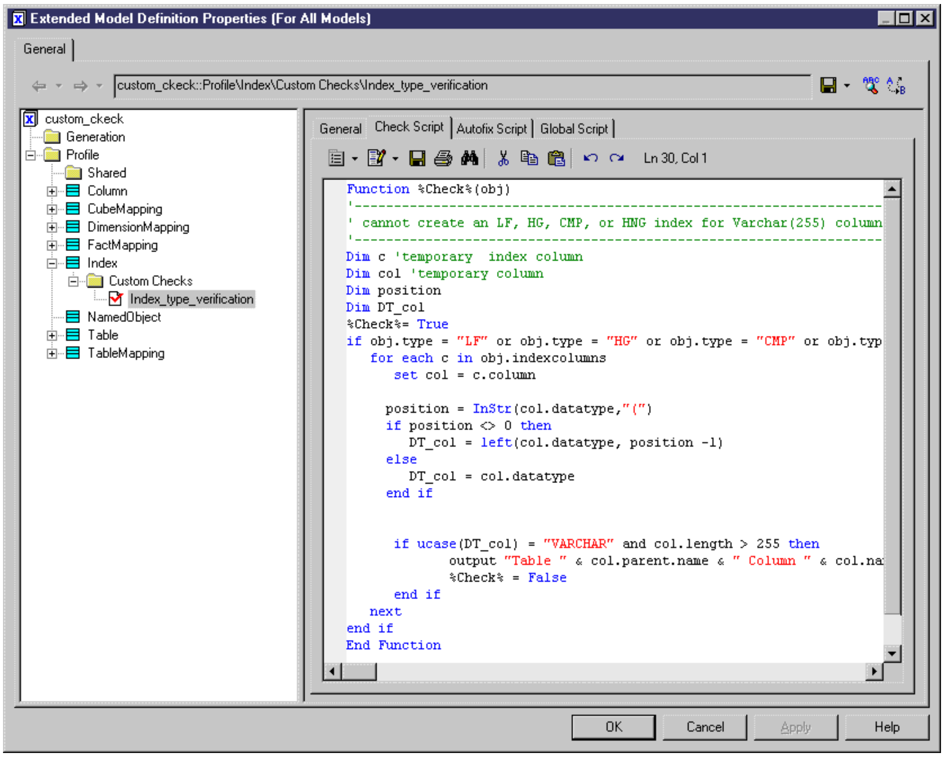
Custom checks define additional rules to validate the content of your models. The logic of the check is defined using VBScript. Custom checks appear alongside standard checks in the **Check Model** dialog.

Custom checks appear with standard model checks in the **Check Model Parameters** dialog (see *Core Features Guide > Modeling with PowerDesigner > Objects > Checking Models*).

1. Right-click a metaclass, stereotype, or criterion in the Profile category and select **New > Custom Check**.
2. Enter the following properties as appropriate:

Parameter	Description
Name	Specifies the name of the custom check, which is displayed under the selected object category in the **Check Model Parameters** dialog. This name is also used (concatenated) in the check function name to uniquely identify it.
Comment	Provides a description of the custom check.
Help Message	Specifies text to display in the message box that opens when the user right-clicks the check and selects **Help**.
Output message	Specifies text to display in the **Output** window during check execution.
Default severity	Specifies whether the check is designated by default as an error (major problem that stops generation) or a warning (minor problem or just recommendation).
Execute the check by default	Specifies that the check is selected by default in the **Check Model Parameters** dialog.
Enable automatic correction	Specifies that an autofix is available for the check (see *Example: PDM Autofix* on page 74).
Execute the automatic correction by default	Specifies that the autofix is executed by default.

3. Click the **Check Script** tab and enter your script (see *Example: PDM Custom Check* on page 73. You can access shared library functions and static attributes defined for reuse in the resource file from the **Global Script** tab (see *Global Script (Profile)* on page 106).



```
Function %Check%(obj)
'-------------------------------------------------------------------
' cannot create an LF, HG, CMP, or HNG index for Varchar(255) column
'-------------------------------------------------------------------
Dim c 'temporary  index column
Dim col 'temporary column
Dim position
Dim DT_col
%Check%= True
if obj.type = "LF" or obj.type = "HG" or obj.type = "CMP" or obj.typ
   for each c in obj.indexcolumns
      set col = c.column

     position = InStr(col.datatype,"(")
     if position <> 0 then
        DT_col = left(col.datatype, position -1)
     else
        DT_col = col.datatype
     end if


      if ucase(DT_col) = "VARCHAR" and col.length > 255 then
             output "Table " & col.parent.name & " Column " & col.na
             %Check% = False
      end if
   next
end if
End Function
```

4. If you want to define an autofix, click the **Autofix Script** tab and enter your script (see *Example: PDM Autofix* on page 74.
5. Click **Apply** to save your changes.

All custom checks defined in any resource files attached to the model are merged and all the functions for all the custom checks are appended to build one single script. You custom checks are displayed in the **Check Model Parameters** dialog box alongside the standard model checks. If there are errors in your custom check scripts, the user will be prompted with the following options:

- Ignore- Skip the problematic script and continue with the other checks.
- Ignore All - Skip this and any future scripts with problems and continue with the other checks.
- Abort - Stop the model checking.
- Debug - Stop the model checking and open the Resource Editor on the script line with the problem.

Example: PDM Custom Check

You enter the script of the custom check in the **Check Script** tab using VBScript. In this example, we will write a script to verify that SAP® Sybase® IQ indexes of type HG, HNG, CMP, or LF are not linked with columns with a data type of VARCHAR with a length higher than 255.

The script is initialized with the following line, which must not be altered:

```
Function %Check%(obj)
```

At run-time the variable `%Check%` is replaced by concatenating the names of the resource file, metaclass, any stereotypes or criteria, and the name of the check itself from the **General** tab, with any spaces replaced by an underscore. The parameter `obj` contains the object being checked.

We begin by defining a certain number of variables after the default function definition:

```
Dim c 'temporary  index column
Dim col 'temporary column
Dim position
Dim DT_col
```

Next, we enter the function body, which starts by setting the `%Check%` to true (meaning that the object passes the test) and then iterates over each of the columns associated with the index and tests their datatype. If a column has a varchar longer than 255, the script outputs a message and sets the check to false (the object fails the test:

```
%Check%= True

if obj.type = "LF" or obj.type = "HG" or obj.type = "CMP" or obj.type
="HNG" then
 for each c in obj.indexcolumns
  set col = c.column

   position = InStr(col.datatype,"(")
   if position <> 0 then
    DT_col = left(col.datatype, position -1)
   else
    DT_col = col.datatype
   end if
if ucase(DT_col) = "VARCHAR" and col.length > 255 then
     output "Table " & col.parent.name & " Column " & col.name & " :
Data type is not compatible with Index " & obj.name & " type " &
obj.type
     %Check% = False
  end if
```

For more information about using VBScript in PowerDesigner, see *Chapter 7, Scripting PowerDesigner* on page 307.

Example: PDM Autofix

If the custom check you have defined supports an automatic correction, you enter its script on the **Autofix Script** tab using VBScript. In this example, we will write a script to fix a Sybase IQ index linked with columns with an invalid data type.

The script is initialized with the following line, which must not be altered:

```
Function %Fix%(obj, outmsg)
```

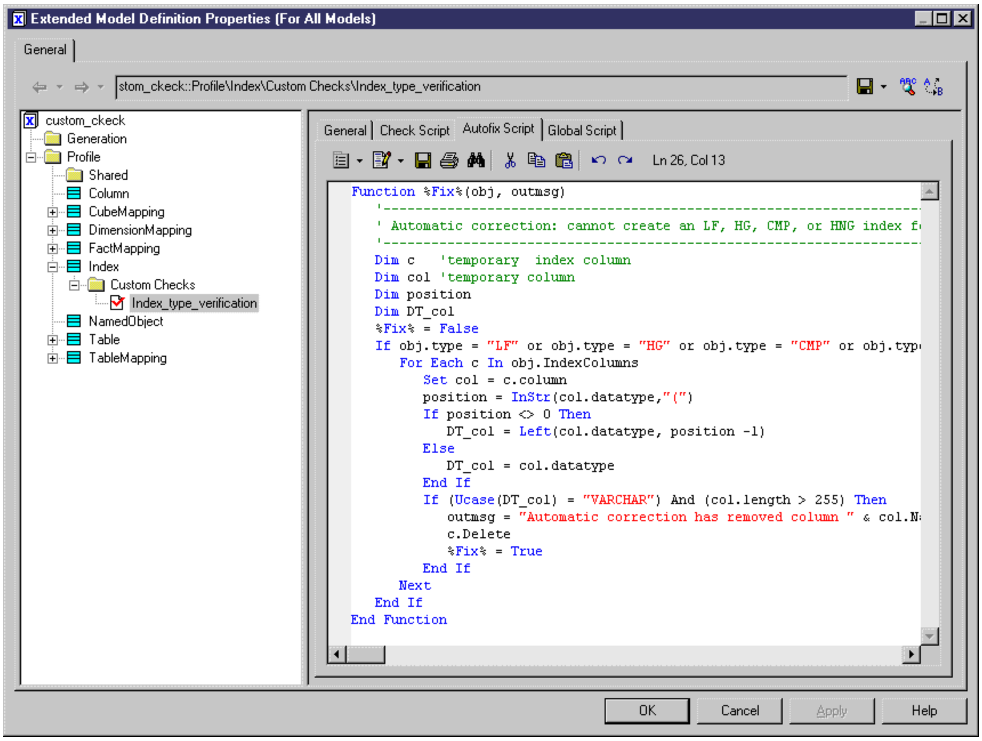
At run-time the variable `%Fix%` is replaced by the name of the fix. The parameter `obj` contains the object being checked and `outmsg`, the message to be output.

We begin by defining a certain number of variables after the default function definition:

```
Dim c 'temporary  index column
Dim col 'temporary column
Dim position
Dim DT_col
```

Next, we enter the function body, which starts by setting the `%Fix%` to false (meaning that it does nothing) and then iterates over each of the columns associated with the index and tests their datatype. If a column has a varchar longer than 255, the script outputs a message, deletes the column from the collection of columns associated with the index, and sets the fix to true (it has made a correction):

```
%Fix% = False
 If obj.type = "LF" or obj.type = "HG" or obj.type = "CMP" or obj.type
="HNG" Then
  For Each c In obj.IndexColumns
   Set col = c.column
   position = InStr(col.datatype,"(")
   If position <> 0 Then
    DT_col = Left(col.datatype, position -1)
   Else
    DT_col = col.datatype
   End If
   If (Ucase(DT_col) = "VARCHAR") And (col.length > 255) Then
    outmsg = "Automatic correction has removed column " & col.Name & "
from index."
    c.Delete
    %Fix% = True
   End If
  Next
 End If
```



```
Function %Fix%(obj, outmsg)
   '-----------------------------------------------------------------------
   ' Automatic correction: cannot create an LF, HG, CMP, or HNG index fo
   '-----------------------------------------------------------------------
   Dim c   'temporary  index column
   Dim col 'temporary column
   Dim position
   Dim DT_col
   %Fix% = False
   If obj.type = "LF" or obj.type = "HG" or obj.type = "CMP" or obj.typ
      For Each c In obj.IndexColumns
         Set col = c.column
         position = InStr(col.datatype,"(")
         If position <> 0 Then
            DT_col = Left(col.datatype, position -1)
         Else
            DT_col = col.datatype
         End If
         If (Ucase(DT_col) = "VARCHAR") And (col.length > 255) Then
            outmsg = "Automatic correction has removed column " & col.N
            c.Delete
            %Fix% = True
         End If
      Next
   End If
End Function
```

Event Handlers (Profile)

Event handlers define validation rules or other scripts to run when an event occurs on an object. The logic of the event handler is defined using VBScript. Criteria do not support event handlers.

1. Right-click a metaclass or stereotype in the Profile category and select **New** > **Event Handler** to open a selection box, listing the available types of event handlers:

Event handler	Description

CanCreate	Implements a validation rule to prevent objects from being created in an invalid context. For example, in a BPM for ebXML, a process with a Business Transactions stereotype can only be created under a process with a Binary Collaboration stereotype. The script of the CanCreate event handler associated with the Business Transaction process stereotype is the following:
	`Function %CanCreate%(parent)`
	`  if parent is Nothing or`
	`  parent.IsKindOf(PdBpm.Cls_Process) then`
	`  %CanCreate% = False`
	`  else`
	`  %CanCreate% = True`
	`  end if`
	`End Function`
	If the event handler returns True on a stereotype, then you can use the custom tool to create the stereotyped object and the stereotype is available in the Stereotype list on the object property sheet. If it returns True on a metaclass, then you can create the object from the Toolbox, from the Browser or in a list.
	Note: `CanCreate` event handlers are ignored during model import or reverse-engineering, since they could modify the model and make it diverge from the source.

Event handler	Description

Initialize	Instantiates objects with a predefined template. For example, in a BPM, a Business Transaction must be a composite process with a predefined sub-graph. The script of the Initialize event handler associated with the Business Transaction process stereotype contains all the functions needed to create the sub-graph. The following script fragment is from the Initialize event handler for a Business Transaction.
	`...`
	`' Search for an existing requesting activity`
	`     symbol`
	` Dim ReqSym`
	` Set ReqSym = Nothing`
	` If Not ReqBizAct is Nothing Then`
	`  If ReqBizAct.Symbols.Count > 0 Then`
	`   Set ReqSym = ReqBizAct.Symbols.Item(0)`
	`  End If`
	` End If`
	
	` ' Create a requesting activity if not found`
	` If ReqBizAct is Nothing Then`
	`   Set ReqBizAct =`
	`      BizTrans.Processes.CreateNew`
	`   ReqBizAct.Stereotype =`
	`     "RequestingBusinessActivity"`
	`   ReqBizAct.Name = "Request"`
	` End If`
	`...`
	If the event handler returns True on a stereotype, then the initialization script will be launched whenever the stereotype is assigned, either with a custom tool in the Toolbox, or from the object property sheet. If it returns True on a metaclass, then it will be launched when you create a new object from the Toolbox, from the Browser, in a list or in a property sheet. If it returns true on a model, then it will be launched when you assign a target (DBMS or object, process, or schema language) to the model at creation time, when you change the target of the model, or when you attach an extension to the model.

Event handler	Description

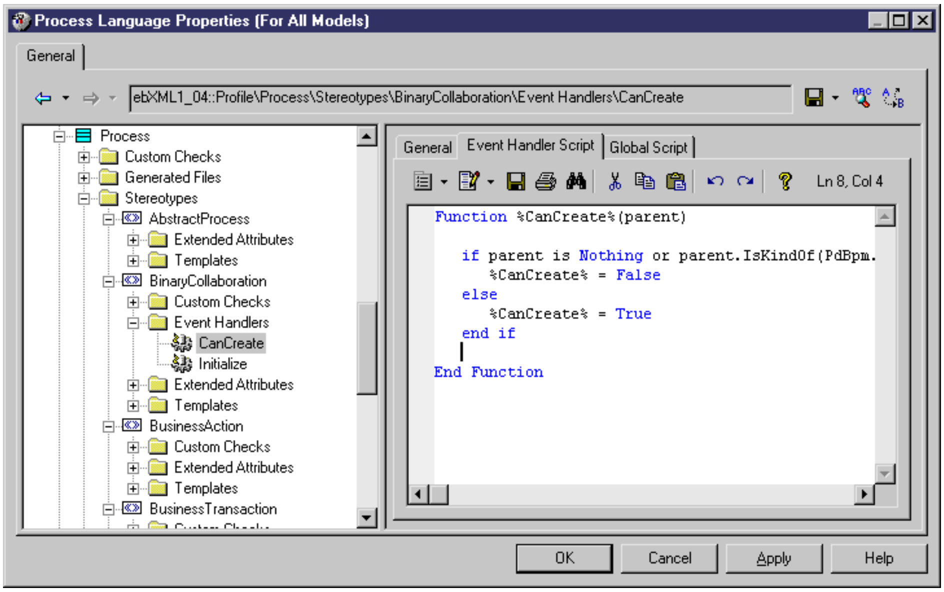
Validate	Validates changes to object properties or triggers cascade updates when you change tabs or click **OK** or **Apply** in an object property sheet. You can define an error message to appear when the condition is not satisfied by filling the message variable and setting the `%Validate%` variable to False.
	
	In this example, the event handler verifies that a comment is added to the definition of an object:
	`Function %Validate%(obj, ByRef message)`
	` if obj.comment = "" then`
	`  %Validate% = False`
	`  message = "Comment cannot be empty"`
	` else`
	`  %Validate% = True`
	` end if`
	`End Function`

CanLinkKind	[link objects] Validates the kind and stereotype of the objects that can be linked together as the source and destination extremities when you create a link with a Toolbox tool or modify link ends in a property sheet. The `sourceStereotype` and `destinationStereotype` parameters are optional.
	
	In this example, the source of the extended link must be a start object:
	`Function %CanLinkKind%(sourceKind, sourceStereo-`
	`type,`
	`                       destinationKind, destina-`
	`tionStereotype)`
	` if sourceKind = cls_Start Then`
	` %CanLinkKind% = True`
	` end if`
	`End Function`

OnModelOpen, OnModelSave, and OnModelClose	[models] Run immediately after a model is opened, saved, or closed.
OnLanguageChangeRequest, OnLanguageChanging, and OnLanguageChanged	[models] Run immediately: • Before the model's DBMS or language definition file is changed. If the event handler returns false, then the language change is canceled. • After the language change, but before any transformations are applied to objects to make them conform with the new language definition. • After the model's DBMS or language definition file is changed and the object transformations are applied.
OnNewFromTemplate	[models] Runs immediately after a model or a project is created from a model or project template.

Event handler	Description
BeforeDatabase-Generate, AfterDatabaseGenerate, BeforeDatabaseReverseEngineer, and AfterDatabaseReverseEngineer	[PDM models] Run immediately before or after generating or reverse-engineering a database (see *Adding Scripts Before or After Generation and Reverse Engineering* on page 135).
GetEstimatedSize	[PDM only] Runs when the Estimate Database Size mechanic is called (see *Modifying the Estimate Database Size Mechanism* on page 203).

2. Select one or more event handlers and click **OK** to add them.
3. Enter a name and comment to identify and document the event handler.
4. Click the **Event Handler Script** tab and enter a script to define the event handler. You can access shared library functions and static attributes defined for reuse in the resource file from the **Global Script** tab (see *Global Script (Profile)* on page 106).



```
Function %CanCreate%(parent)

   if parent is Nothing or parent.IsKindOf(PdBpm.
      %CanCreate% = False
   else
      %CanCreate% = True
   end if

End Function
```

5. Click **Apply** to save your changes.

Example: Setting Default Property Values

You can set a default value for most object properties via an `Initialize` event handler.

1. Add the appropriate metaclass to your profile (see *Metaclasses (Profile)* on page 31), and create an event handler of type `Initialize` under it.
2. Click the **Event Handler Script** tab and modify the script to specify default values for one or more properties in the form:

```
obj.PropertyName = Value
```

For example, the following script sets the stereotype of a CDM inheritance to `MyInheritance` and its **Generate children** property to the value of `Inherit only primary attributes`:

```
Function %Initialize%(obj)
    obj.Stereotype = "MyInheritance"
    obj.InheritAll = False
    %Initialize% = True
End Function
```

3. Click **OK** to save your changes and close the resource editor.

   From now on, when you create an inheritance in your model, these properties will be set to the specified default values.

Methods (Profile)

Methods are written in VBScript and perform actions on objects when they are invoked by other extensions, such as menu items or form buttons.

1. Right-click a metaclass, stereotype, or criterion in the Profile category and select **New > Method**.
2. Enter the following properties as appropriate:

Property	Description
Name	Specifies the name of the method.
Comment	Provides additional information about the method.

3. Click the **Method Script** tab, and enter the VBscript. If appropriate, you can reuse functions on the **Global Script** tab.

   For more information on defining a script and using the **Global Script** tab, see *Example: PDM Custom Check* on page 73 and *Global Script (Profile)* on page 106.

   The following example, created under the `Class` metaclass, converts classes into interfaces by copying basic class properties and operations, deleting the class (to avoid namespace problems), and creating the new interface.

```
Sub %Mthd%(obj)
 ' Convert class to interface

 ' Copy class basic properties
 Dim Folder, Intf, ClassName, ClassCode
 Set Folder = obj.Parent
 Set Intf = Folder.Interfaces.CreateNew
 ClassName = obj.Name
 ClassCode = obj.Code
 Intf.Comment = obj.Comment
 ' Copy class operations
 Dim Op
 For Each Op In obj.Operations
  ' ...
  Output Op.Name
 Next

 ' Destroy class
 obj.Delete

 ' Rename interface to saved name
 Intf.Name = ClassName
 Intf.Code = ClassCode
End Sub
```

Note: This script does not deal with other class properties, or with interface display, but a method can be used to launch a custom dialog box to ask for end-user input before performing its action (see *Example: Opening a Dialog Box from a Menu* on page 84).

4. Click **Apply** to save your changes.

Menus (Profile)

Menus specify commands to appear in the standard PowerDesigner **File**, **Tools**, and **Help** menus or in contextual menus.

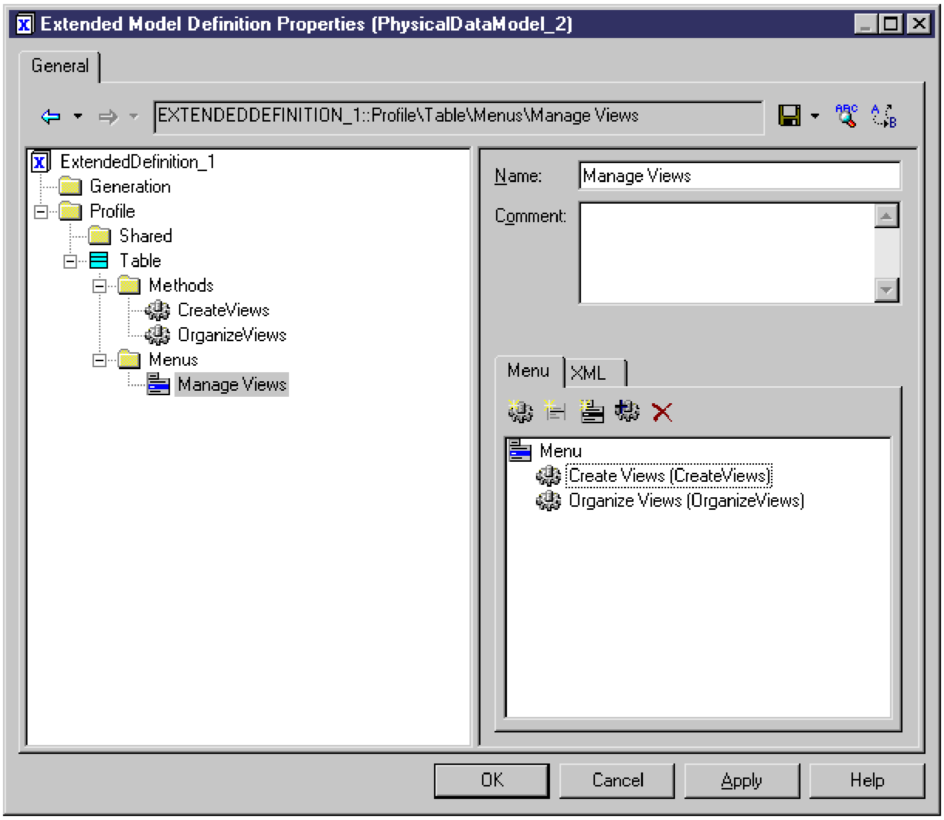
1. Right-click a metaclass, stereotype, or criterion in the Profile category and select **New > Menu**.
2. Enter the following properties as appropriate:

Property	Description
Name	Specifies the internal name of the menu. This name will not appear in the menu
Comment	Provides a description of the menu.
Location	[model and diagram only] Specifies where the menu will be displayed. You can choose between: • File > Export menu • Help menu • Object Contextual Menu • Tools menu Menus created on other metaclasses are only available on the contextual menu, and do not display a **Location** field.

3. Use the tools on the **Menu** sub-tab to create the items in your menu:

Tool	Function
⚙	Add Command - Opens a selection dialog listing methods (see *Methods (Profile)* on page 81) and transformations (see *Transformations (Profile)* on page 94) defined in the current metaclass and its parents to add to the menu as commands. Select one or more and click **OK**. The items are added to your menu in the format: `MenuEntry (Method/TransformationName)` You can modify the **MenuEntry** (and define a shortcut key by adding an ampersand before the shortkey letter) but you must not edit the **Method/TransformationName**. **Note:** If you modify the name of a method or transformation, you must update any commands using the method or transformation by hand, because the name is not automatically synchronized. You can use the **Replace in Items** tool to locate and update these commands.
☰	Add Separator -Creates a menu separator under the selected item.
☰	Add Submenu - Creates a submenu under the selected item.
✕	Delete - Deletes the selected item.

You can reorder items in the menu tree by dragging and dropping them. To place an item inside a submenu item, drop it onto the submenu.


Extended Model Definition Properties (PhysicalDataModel_2)
General
EXTENDEDDEFINITION_1::Profile\Table\Menus\Manage Views
ExtendedDefinition_1
Generation
Profile
Shared
Table
Methods
CreateViews
OrganizeViews
Menus
Manage Views
Name:
Manage Views
Comment:
Menu
XML
Menu
Create Views (CreateViews)
Organize Views (OrganizeViews)
OK
Cancel
Apply
Help

4. [optional] Click the **XML** sub-tab to review the XML generated from the **Menu** sub-tab.
5. Click **Apply** to save your changes.

Example: Opening a Dialog Box from a Menu

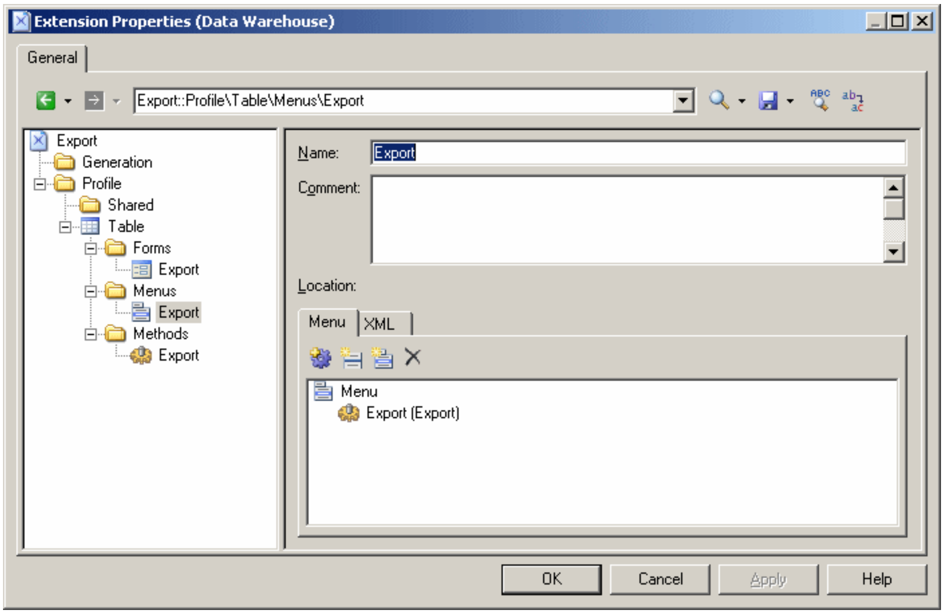
In this example, we will create a menu command to export object properties to an XML file via a dialog box.

1. Create a new extension file (see *Creating an Extension File* on page 10) in a PDM and add the `Table` metaclass (see *Metaclasses (Profile)* on page 31).
2. Right-click the `Table` metaclass and select **New** > **Form**. Enter `Export` in the **Name** field, and select `Dialog Box` from the **Type** list.
3. Click the **Edit Field** tool to add an edit field control, and call it `Filename`.
4. Right-click the `Table` metaclass and select **New** > **Method**. Enter `Export` in the **Name** field, click the **Method Script** tab and enter the following code:

```
Sub %Method%(obj)
' Exports an object to a file
' Create a dialog to input the export file name
Dim dlg
```

```
Set dlg = obj.CreateCustomDialog("%CurrentTargetCode%.Export")
    If not dlg is Nothing Then
    ' Initialize filename control value
    dlg.SetValue "Filename", "c:\temp\MyFile.xml"

    ' Show dialog
    If dlg.ShowDialog() Then
        ' Retrieve customer value for filename control
        Dim filename
        filename = dlg.GetValue("Filename")

        ' Process the export algorithm...
        ' (Actual export code not included in this example)

        Output "Exporting object " + obj.Name + " to file " +
filename
    End If

    ' Free dialog object
    dlg.Delete
    Set dlg = Nothing
End If
End Sub
```

5. Right-click the `Table` metaclass and select **New** > **Menu**. Enter `Export` in the **Name** field, and then click the **Add Command** tool and select the `Export` method:



Name: Export

Comment:

Menu
Export (Export)

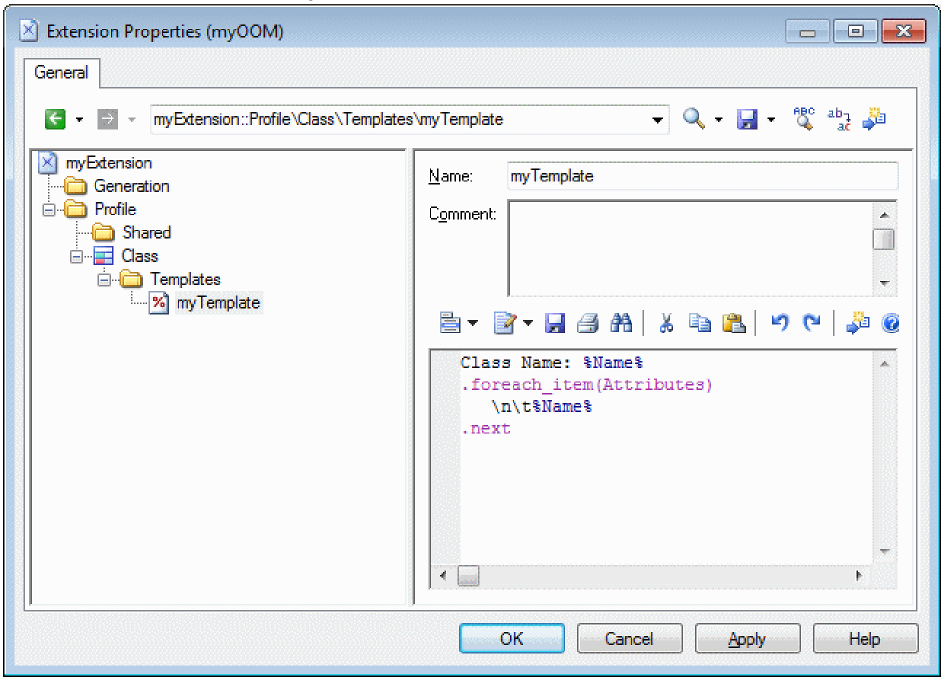
6. Click **OK** to save your changes and return to your model. When you next right-click a table in a diagram or the browser, the **Export** command is available in the contextual menu.

Templates (Profile)

GTL templates extract text from PowerDesigner property values for use in generated files or other contexts.

1. Right-click a metaclass, stereotype, or criterion in the Profile category (or the `Profile/Shared` category, if the template applies to all metaclasses) and select **New > Template**.
2. Enter a name for the template. You should not use spaces in the name and, by convention, templates are named in headless camelcase (for example `myTemplate`).
3. [optional] Enter a comment to explain the use of the template.
4. Enter GTL code (see *Chapter 5, Customizing Generation with GTL* on page 247) in the text box.

   In this example, `myTemplate` is defined on the `Class` metaclass, and will generate the name of the class followed by a list of its attributes:



Name: myTemplate

Comment:

```
Class Name: %Name%
.foreach_item(Attributes)
   \n\t%Name%
.next
```

Generated Files (Profile)

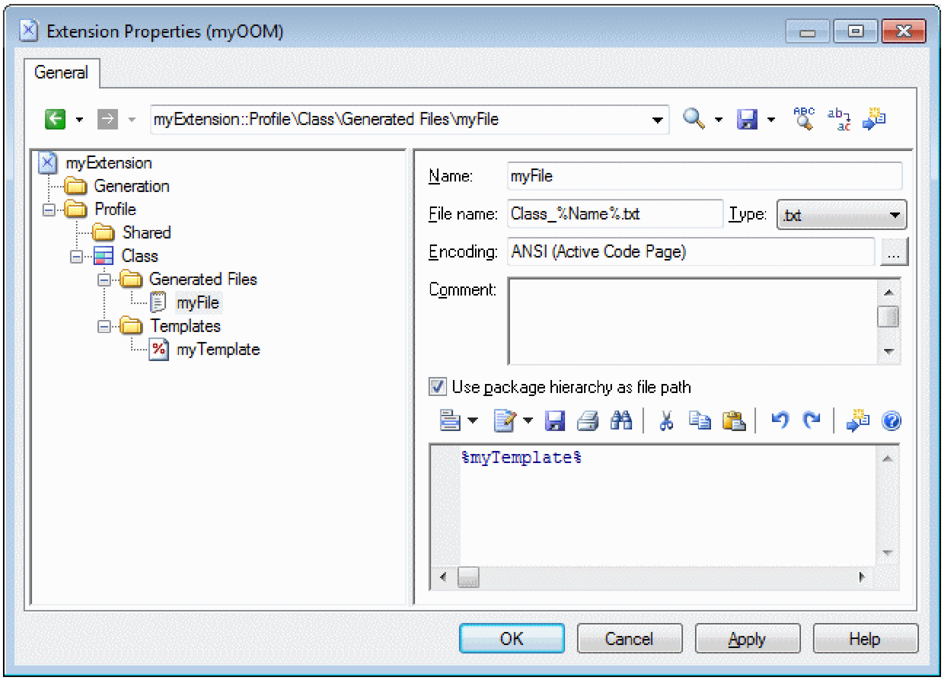
Generated files assemble GTL templates for generation as files or for previewing on the object property sheet **Preview** tab.

1. Right-click a metaclass, stereotype, or criterion in the Profile category and select **New > Generated File**.
   Only objects, such as tables or classes, support file generation, but you can still create generated files for sub-objects, such as columns and attributes, to preview code generated for them on their property sheet **Preview** tab.
2. Enter the following properties as appropriate:

Property	Description
Name	Specifies a name for the generated file item in the resource editor. If an extension attached to the model contains a generated file name identical to one defined in the main resource file, then only the extension generated file will be generated.
File Name	Specifies the name of the file that will be generated. This field can contain GTL variables. For example, to generate an XML file with the code of the object for its name, you would enter `%code%.xml`. If you leave this field empty, then no file will be generated, but you can view the code produced in the object's **Preview** tab. If this field contains a recognized extension, the code is displayed with the corresponding language editor and syntactic coloring.
Type	Specifies the type of file to provide appropriate syntax coloring in the Preview window.
Encoding	Specifies the encoding format for the file. Click the ellipsis tool to the right of the field to choose an alternate encoding from the Text Output Encoding Format dialog, where you can specify the following options: • Encoding - Encoding format of the generated file • Abort on character loss - Specifies to stop generation if characters cannot be identified and are to be lost in current encoding
Comment	Specifies additional information about the generated file.
Use package hierarchy as file path	Specifies that the package hierarchy should be used to generate a hierarchy of file directories.

3. Enter GTL code (see *Chapter 5, Customizing Generation with GTL* on page 247) or the name of a template to populate the file in the text zone.

   In the following example, a generated file is defined for OOM classes. A file will be generated for each class in the model with a name derived from the class `%Name%`, and containing the contents generated from the `%myTemplate%` template (see *Templates (Profile)* on page 86):

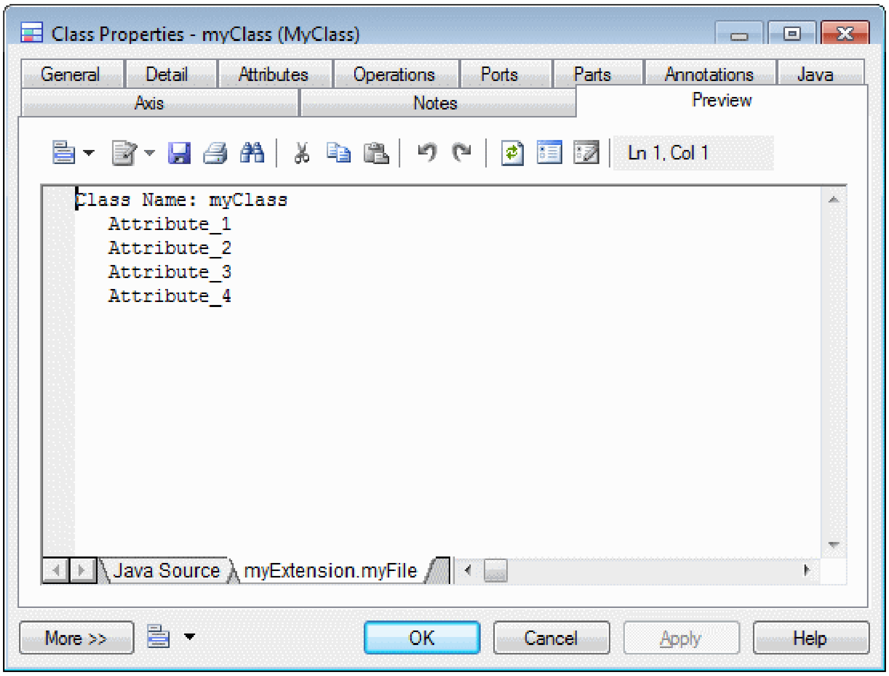


Name: myFile
File name: Class_%Name%.txt
Type: .txt
Encoding: ANSI (Active Code Page)
[✓] Use package hierarchy as file path

```
%myTemplate%
```

4. Click **OK** to save your changes and close the resource editor.

   The file is immediately available as a sub-tab on the **Preview** tab of the object property sheet:

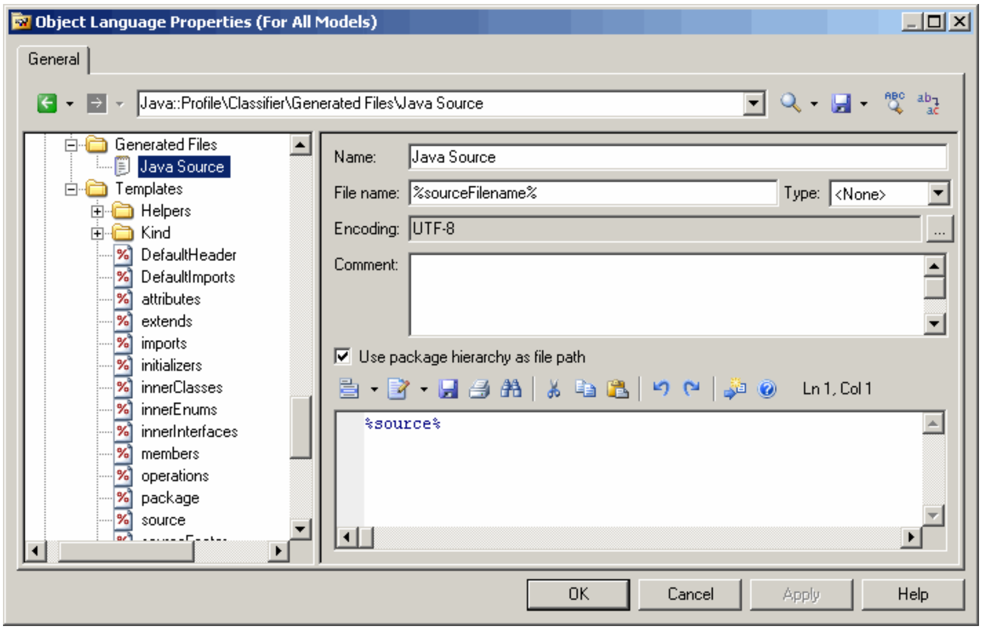


```
Class Name: myClass
   Attribute_1
   Attribute_2
   Attribute_3
   Attribute_4
```

Example: JavaGenerated File and Templates

Templates contain GTL code used to generate text fragments from PowerDesigner property values, while generated files are used to assemble templates for generation as files or for previewing on the object property sheet **Preview** tab.

In this example, a generated file called `Java Source` is defined for classifiers. A file will be generated for each classifier in the model with a name derived from the `%sourceFilename%` template specified in the **File name** field, and containing the contents generated from the `%source%` template:



Name: Java Source

File name: %sourceFilename% Type: <None>

Encoding: UTF-8

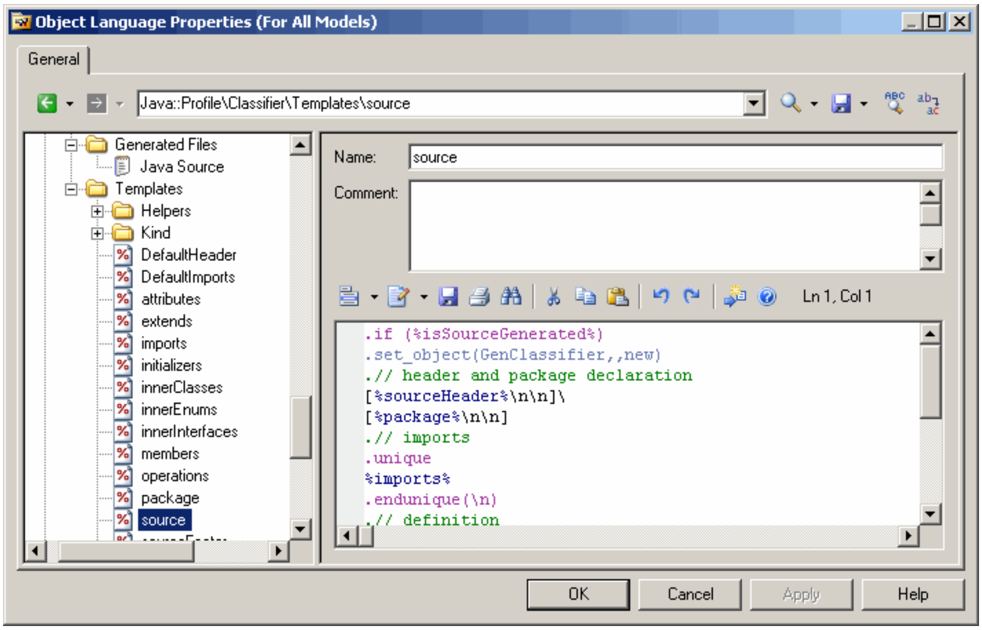
Comment:

☑ Use package hierarchy as file path

```
%source%
```

Note: If you position your cursor between the percent signs surrounding this or any other template name and press **F12**, you will either jump directly to the referenced template or, if several templates share the same name, to a **Results** dialog in which you select the template to navigate to.

The referenced template, `source`, contains GTL code, including references to further templates called `%isSourceGenerated%`, `%sourceHeader%`, `%package%`, and `%imports%`:



```
.if (%isSourceGenerated%)
.set_object(GenClassifier,,new)
.// header and package declaration
[%sourceHeader%\n\n]\
[%package%\n\n]
.// imports
.unique
%imports%
.endunique(\n)
.// definition
```

Generating Your Files in a Standard or Extended Generation

You can use generated files to extend the standard generation for objects from OOMs, BPMs, and XSMs or to create a separate extended generation for any type of model. For extended generations, you can define a custom menu command.

To extend the standard BPM, OOM, or XSM generation from the Resource Editor:

1. Select the **Complement language generation** property in the root of the extension file (see *Extension File Properties* on page 12) to have the extension file appear for selection on the **Generation** dialog **Targets** tab.
2. Define generated files as appropriate.
3. [optional] Define options in `Generation\Options` (see *Example: Adding a Generation Option* on page 115) to have them appear on the **Generation** dialog **Options** tab.
4. [optional] Define commands in `Generation\Commands` and reference these commands in tasks (see *Example: Adding a Generation Command and Task* on page 116) to have them appear on the **Generation** dialog **Tasks** tab.

Alternatively, to define separate file generations apart from the standard language generation for a PDM or any type of model and make them available via the **Tools** > **Extended Generation** command

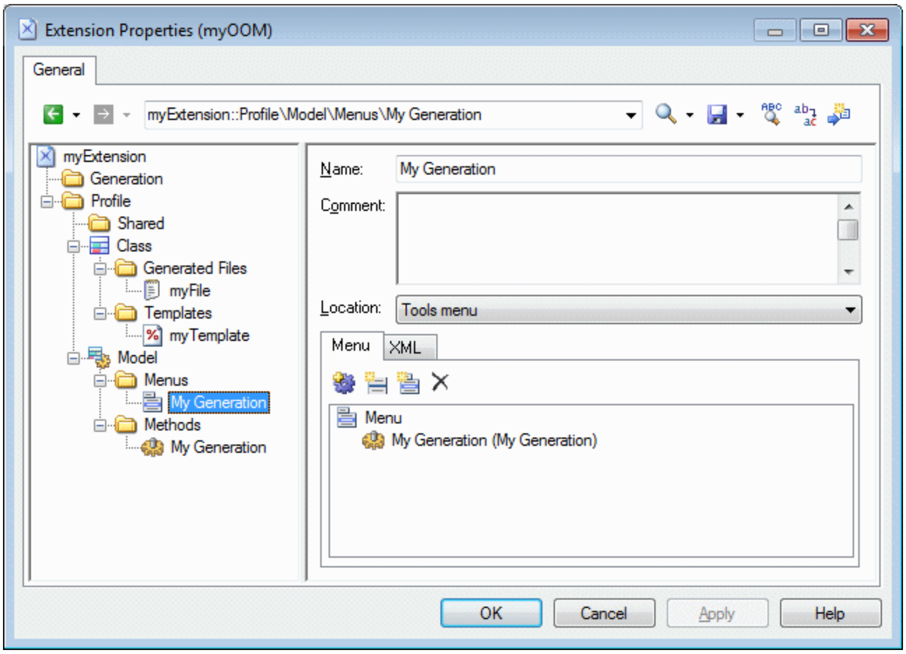
1. [OOM, BPM, and XSM only] Deselect the **Complement language generation** property in the root of the extension file (see *Extension File Properties* on page 12).

2. Add appropriate metaclasses to the profile category, and select the **Enable selection in file generation** option (see *Metaclasses (Profile)* on page 31) for those metaclasses from which you want to generate files.
3. Define generated files as appropriate under these metaclasses.

   The generation is immediately available on the **Targets** tab of the **Generation** dialog when you select **Tools > Extended Generation**.
4. [optional] Create a command in the **Tools** menu to directly access your extended generation in its own dialog:
   a. Create a method in `Profile\Model` with the name you want to give to your command, and enter the following code (where `extension` is the code of the extension file):

   ```
   Sub %Method%(obj)

    Dim selection ' as ObjectSelection

    ' Create a new selection
    set selection = obj.CreateSelection

    ' Add object of the active selection in the created selection
    selection.AddActiveSelectionObjects

    ' Generate scripts for specific target
    InteractiveMode = im_Dialog
    obj.GenerateFiles "", selection, "extension"

   End Sub
   ```

   For more information about methods, see *Methods (Profile)* on page 81.
   b. Create a menu in `Profile\Model` and select the `Tools menu` in the **Location** list (see *Menus (Profile)* on page 82).
   c. Add the method to the menu using the **Add Command** tool:

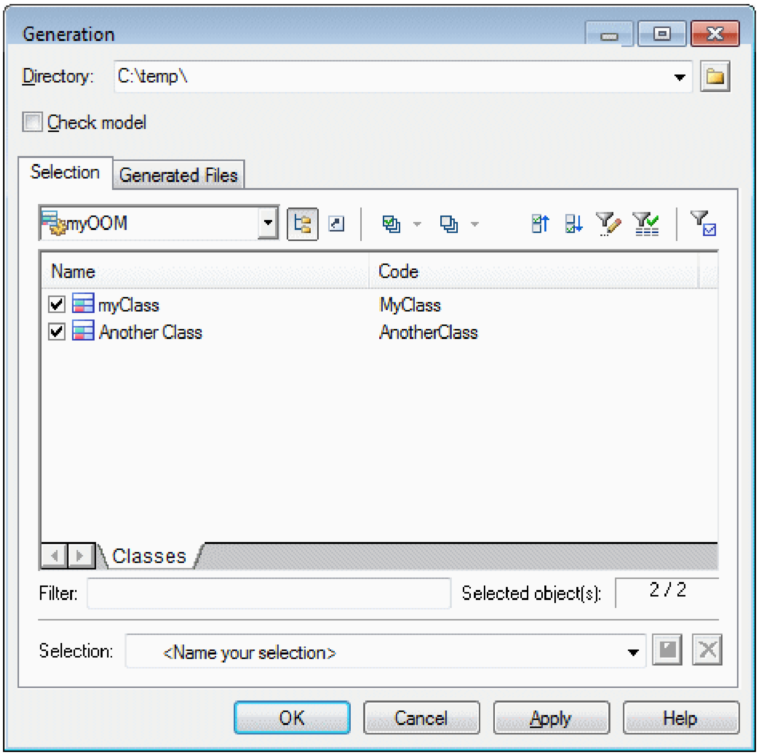


Name: My Generation

Comment:

Location: Tools menu

d. Select the command specified (for example, **Tools** > **My Generation**) to open a custom **Generation** dialog, which does not have a **Targets** tab:



Directory: C:\temp\

[ ] Check model

myOOM

Name	Code
✓ myClass	MyClass
✓ Another Class	AnotherClass

Classes

Filter:

Selected object(s): 2 / 2

Selection: <Name your selection>

Transformations (Profile)

Transformations define sets of actions to modify objects either before or after a model generation or on request. Transformations are commonly grouped together in transformation profiles.

Transformations can be used to:

- Implement *Model Driven Architecture (MDA)*, which uses UML modeling to describe an application at different levels of detail. PowerDesigner allows you to create an initial *platform-independent model (PIM)* (modeling the basic business logic and functionality) and refine it progressively in different models containing increasing levels of implementation and technology-dependent information through to a *platform-specific model* (PSM). You can define transformations that will generate a more refined version of a model, based on the desired target platform, and changes made to the PIM can be cascaded down to the generated models.
- Apply design patterns to your model objects.
- Modify objects for a special purpose. For example, you can create a transformation in an OOM that converts `<<control>>` classes into components.

- Modify objects in a reversible way for round-trip engineering. For example, if you generate a PDM from an OOM in order to create O/R mappings, and the source OOM contains components, you can pre-transform components into classes for easy mapping to PDM tables. When you update the source OOM from the generated PDM, you can use a post-transformation to recreate the components from the classes.

Transformations can be invoked on demand (select **Tools > Apply Transformations**), before or after model generation (see *Core Features Guide > Linking and Synchronizing Models > Generating Models and Model Objects*), or via a user-defined menu command (see *Menus (Profile)* on page 82).

1. Right-click a metaclass, stereotype, or criterion in the Profile category and select **New > Transformation**.
2. Enter an appropriate **Name** and, optionally, a **Comment** to explain its purpose.
3. On the **Transformation Script** tab, enter a VBscript to perform the transformation.

   In this example, which is created in an extension attached to a CDM under the `DataItem` metaclass, the script tests to see whether the data item has a list of values defined and, if this is the case (and a domain with this same list of values does not already exist in the CDM), creates a new domain with the list of values:

```
Sub %Transformation%(obj, trfm)

   Dim list
   list = obj.ListOfValues
   if not list = "" then
      output "transforming " & cstr(obj)

      ' Check if such a domain already exist
      Dim domn, found
      found = false
      for each domn in obj.Model.Domains
         if domn.ListOfValues = list then
            found = true
         end if
      next

      ' Create a new domain
      if not found then
         set domn = obj.Model.Domains.CreateNew()
         domn.SetNameAndCode obj.Name, obj.Code
         domn.ListOfValues = list
      end if
   end if

End Sub
```

   This transformation can be added to a transformation profile as a:

   - Pre-generation transformation - The transformation is called from the Generation Options dialog. The domains are created temporarily in the CDM before generation and then are generated to the target model (for example, to a PDM).

- Post-generation transformation - The transformation can be called from the Generation Options dialog (for a CDM-CDM generation). The domains are created in the target CDM after generation. Alternatively, the transformation can be called at any time by selecting **Tools > Apply Transformations** to create the domains in the existing model.

4. [optional] Review the **Global Script** tab (see *Global Script (Profile)* on page 106), which provides access to definitions shared by all VBscript functions defined in the profile, and the **Dependencies** tab, which lists the transformation profiles in which the transformation is used.

Transformation Profiles (Profile)

A transformation profile groups transformations together, and makes them available during model generation or by selecting **Tools > Apply Transformations**.

1. [if the Transformation Profiles category is not present] Right-click the root node, select **Add Items**, select `Transformation Profiles`, and click **OK** to create this folder.
2. Right click the `Transformation Profiles` folder, and select **New** to create a transformation profile.
3. Enter the following properties as appropriate:

Property	Description
Name / Comment	Specify the name of the transformation profile and provide an explanation of what it is intended to do.
Model Type / Family / Subfamily	[optional] Specify the type of model with which the transformation profile can be used during generation and (if the type supports a language definition file) the family and subfamily. If one or more of these fields is completed, the profile will only be displayed if the model to be generated conforms to them. For example, if you define the transformation in a PDM or PDM extension and specify `Object-Oriented Model` and `Java`, then the profile will only be available when you select to generate the PDM into a Java OOM.

4. Click the **Pre-generation** tab and click the **Add Transformations** tool to add transformations to perform prior to generation.

   These transformations are executed before generation on the objects in your source model. If objects are created by these transformations then they are automatically added to the list of objects to be generated. Any changes to existing objects or new objects created by these transformations are reversed after generation, so that your model returns to its previous state.

5. Click the **Post-generation** tab and click the **Add Transformations** tool to add transformations to perform after generation. Transformations added on this tab are also made available to apply outside of the context of a generation by selecting **Tools > Apply Transformations**.

   These transformations are executed on the objects generated in your target model.

6. Click **Apply** to save your changes.

Developing Transformation Scripts

Transformation scripts are written in VBScript using a certain number of special methods. Transformation scripts do not require as many checks as standard scripts, because they are always implemented in a new, empty, temporary model, which is merged with the generation target model.

Since a source object can be transformed and have several targets, you may have problems identifying the origin of an object, especially in the merge dialog box. The following mechanism is used to help identify the origin of an object:

- If the source object is transformed into a single object, the transformation is used as an internal identifier of the target object.
- If the source object is transformed into several objects, you can define a specific *tag* to identify the result of transformation. You should use only alphanumeric characters, and we recommend that you use a "stable" value such as a stereotype, which will not be modified during repetitive generations.

The following methods are available when writing a transformation script:

- `CopyObject(`**source** `[,`**tag**`])`

  Duplicates an existing object, sets a source for the duplicated object, and returns a copy of the new object.
- `SetSource(`**source, target** `[,`**tag**`])`

  Sets the source object of a generated object. It is recommended to always set the source object to keep track of the origin of a generated object.
- `GetSource(`**target** `[,`**tag**`])`

  Retrieves the source object of a generated object.
- `GetTarget(`**source** `[,`**tag**`])`

  Retrieves the target object of a source object.

Internal transformation objects are preserved when the transformations are used via the **Apply Transformations** or a custom menu command, so that they can be re-executed if you subsequently update (regenerate) the model. For example, you generate a CDM entity `A` to an OOM class `B` and then apply a transformation to class `B` in order to create class `C`. If you make changes to entity `A` and repeat the generation to update the OOM, class `B` is updated and the transformation is automatically reapplied to update class `C`.

XML Imports (Profile)

XML imports allow you to define mappings between an XML schema and the PowerDesigner metamodel (and any extensions) to enable the import of XML files complying with the schema. You can specify initialization and post-processing scripts to manage complexities in the import.

For an overview of creating, deploying, and using XML imports, see *Core Features Guide > Modeling with PowerDesigner > Objects > Importing Objects from XML Files*.

1. [if the `XML Imports` category is not present] Right-click the root node, select **Add Items**, select `XML Imports`, and click **OK** to create this folder.
2. Right click the `XML Imports` folder, and select **New** to create an XML import.
3. Enter the following properties as appropriate:

Property	Description
Name	Specifies the name of the import, which will be used as the name of the import command under **File > Import**.
First diagram	Specifies the first diagram that should be initialized in the model created from the imported file.
Create default symbols	Specifies to create symbols for the imported objects in the diagram.
File extension	Specifies the file extension that identifies XML documents that conform to the schema.
Comment	Provides an explanation of the import or other additional information.

4. Click the **Schema** tab and click the **Import** tool to copy the schema, with any imports and includes resolved, to the extension file for mapping.

   Warning! If the selected schema is too permissive and allows for too many possible object hierarchies it may not be possible to display it fully in the Mapping Editor. If you have an example XML data file to import, you can import this in place of the schema by clicking the **Import from Sample** tool and PowerDesigner will deduce a partial schema from it. Note that while a schema obtained in this way may successfully import the sample data file, other documents based on the same schema may not be complete if they contain other types of objects (or attributes or collections) that, though valid for the schema, were not in the first document.

   You can click the **View as Model** tool to open the schema as an XML schema model.
5. [optional] Click the **Extensions** tab and select extension files containing extensions to the standard PowerDesigner metamodel to provide additional metaclasses (see *Extended Objects, Sub-Objects, and Links (Profile)* on page 34), attributes (see *Extended Attributes (Profile)* on page 39), and collections (see *Extended Collections and Compositions (Profile)* on page 48) to map your XML schema to.

   Attaching extension files in this way allow you to reuse previously defined extensions in your imports or to share extensions between imports. You can also define extensions under the Profile category in the resource file containing the XML import definition, or create them dynamically when creating your import mappings.

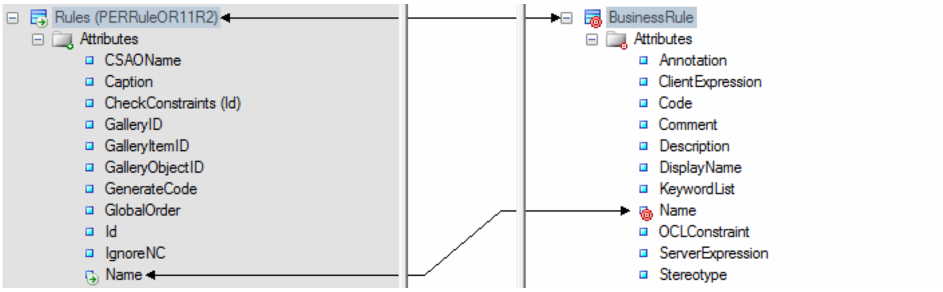
6. [optional] Click the **Initialization** tab and enter VBScript to run at model creation time before the importing of any objects. You can access shared library functions and static attributes defined for reuse in the resource file from the **Global Script** tab (see *Global Script (Profile)* on page 106).
7. [optional] Click the **Post-Process** tab and enter VBScript to run after all the objects have been imported.
8. Click the **General** tab and click the **Mappings** button to define mappings from the metaclasses identified in your XML schema to those in the PowerDesigner metamodel in the Mapping Editor (see *XML Import Mappings* on page 99).
9. Click **Apply** to save your changes.

XML Import Mappings

You control how elements defined in an XML schema are imported by mapping them and their attributes, compositions, and aggregations to objects in the PowerDesigner metamodel. The XML schema is analyzed and presented as a list of metaclasses on the left side of the Mapping Editor and the PowerDesigner metamodel (and any extensions) are displayed on the right side.

Note: It is not necessary to map all metaclasses (or all their contents), but only those with which you want to work. If the PowerDesigner metamodel does not contain appropriate metaclasses, attributes, compositions, or aggregations to map against, you can create them dynamically here or save any existing mappings, close the Mapping Editor, define or attach appropriate extensions, and then reopen the Mapping Editor to map to them.

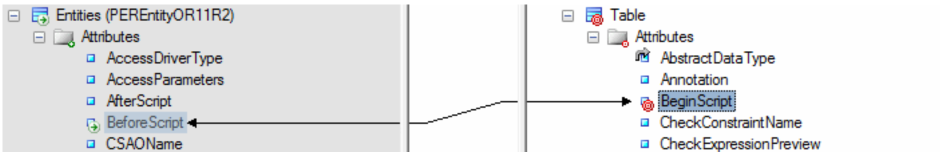
1. Drag and drop an external metaclass to a PowerDesigner metaclass to create an import mapping. Any external attributes and collections are automatically mapped to PowerDesigner attributes with which they share a name:



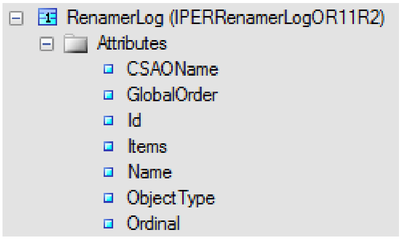
By default, the Mapping Editor lists the standard attributes and collections of metaclasses, which are normally displayed in object property sheets. To display all available properties, click the **Filter Properties** tool, and select `Show All Properties`. You can also filter the tree by using the **Filter Mappings** and **Filter Objects** tools.

Note: If no suitable metaclass exists, to create and map to a new extended metaclass based on the `ExtendedObject` metaclass, drag and drop the external metaclass onto the PowerDesigner metamodel root.

2. Drag and drop additional attributes under the metaclass to PowerDesigner attributes with compatible data types to create mappings for them. Attributes are contained in a folder under the metaclass and represent individual properties such as Name, Size, DimensionalType, which have boolean, textual, numeric, or object ID values:

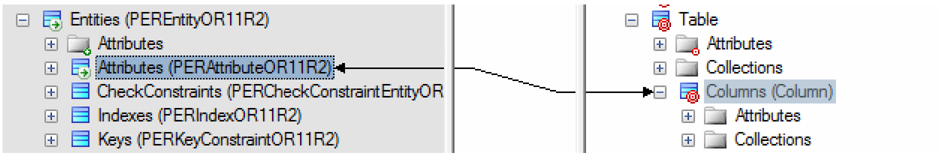


PowerDesigner identifies sub-object metaclasses in the schema that are limited to a single instance and displays a `1` overlay on their icons. Attributes under such metaclasses are treated as belonging to the parent metaclass and can be mapped to attributes under the PowerDesigner object with which the parent is mapped:



Note: If no suitable attribute exists, to create and map to a new extended attribute, drag and drop the external attribute onto the PowerDesigner metaclass to which its parent is mapped.

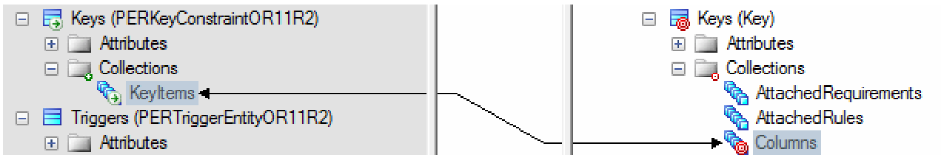
3. Drag and drop external sub-object metaclasses (compositions) under the metaclass to PowerDesigner compositions to create mappings between them:


Entities (PEREntityOR11R2)
Attributes
Attributes (PERAttributeOR11R2)
CheckConstraints (PERCheckConstraintEntityOR
Indexes (PERIndexOR11R2)
Keys (PERKeyConstraintOR11R2)
Table
Attributes
Collections
Columns (Column)
Attributes
Collections

Any attributes under the sub-object metaclass are automatically mapped to PowerDesigner attributes with which they share a name. Map other sub-object attributes as necessary.

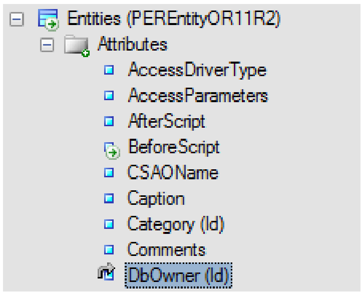
Note: In certain circumstances, it may be appropriate to map an external sub-object metaclass to a PowerDesigner object metaclass, and so such mappings are also permitted.

4. Drag and drop external collections (aggregations) under the metaclass to PowerDesigner collections to create mappings between them:

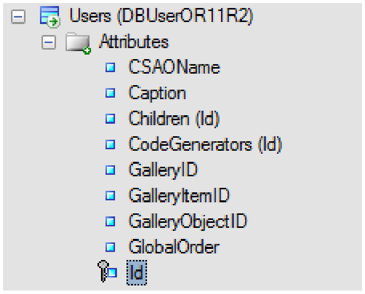


5. In certain schemas, it may be necessary to identify attributes as references and identifiers to link one metaclass to another through aggregation:

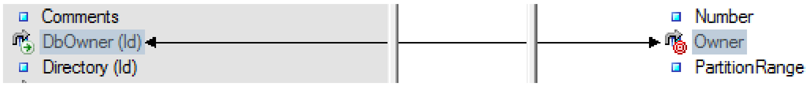
   a) Right-click an attribute and select **Declare as Object Reference** to specify that it acts as a pointer to another object. Such attributes often have a type of GUID, Token, or NCName (PowerDesigner automatically identifies attributes of type IDRef as references). A rounded arrow overlay is added to the attribute icon:



   b) Open the metaclass that the object reference points to, select its identifying attribute, right-click it, and select **Declare as Unique Identifier**. A key overlay is added to the attribute icon:



   c) The object reference attribute can now be mapped to a PowerDesigner attribute of type object (which also bears a rounded arrow overlay):



6. [optional] Select a metaclass and enter an initialization or post-processing script to modify the objects at or after creation (see *Metamodel Mapping Properties* on page 102).

7. [optional] Click the target model (root node) to display the global list of mappings in the **Mappings** pane at the bottom of the dialog and use the arrows at the bottom of the list to change the order in which objects are imported to ensure that dependencies are respected.

Note: To control the order in which attributes, compositions, and aggregations are imported within objects, select the target metaclass to display its mappings in the **Mappings** pane, and use the arrows at the bottom of the lists on the **Attribute Mappings**, **Collection Mappings**, and **Sub-Object Mappings** sub-tabs.

8. Click **Apply** to save your changes.

Metamodel Mapping Properties

Metamodel mappings are mappings between metamodel objects, which control how objects are imported or generated. Metamodel mappings are sub-objects of the PowerDesigner metamodel object on which they are defined.

To open a metamodel mapping property sheet, select the mapping from the list at the top of the Mapping Editor **Mappings** pane or parent object property sheet **Mapping** tab and click the **Properties** tool.

The tabs available on a particular mapping property sheet depend on the objects being mapped. The **General** tab contains the following properties:

Property	Description
Source object	Specifies the metamodel object being mapped to the target object.
Target object	Specifies the metamodel object being mapped from the source object. This object is the parent of the mapping itself.

Transforma-tion script	[metaattribute mappings] Specifies a script to set the value of the attribute. In the following example, from an XML import, the `notnullable` attribute is imported to the `Mandatory` attribute and, because the sense of the attributes is reversed, the boolean value imported is set to the opposite of the source value:
	`Sub %Set%(obj, sourceValue)`
	`   obj.SetAttribute "Mandatory", not sourceValue`
	`End Sub`
	In the following example, from an object generation, the `NumberID` attribute is generated to the `Comment` attribute and a text string is prepended to make clear the origin of the value:
	`Function %AdjustValue%(sourceValue, sourceObject, tar-`
	`getObject)`
	`   Dim targetValue`
	`   targetValue = "The original process NumberID is "`
	`+cstr(sourceValue)`
	`   %AdjustValue% = targetValue`
	`End Function`

The following tabs are also available for metaclass mappings:

- **Initialization** - Specifies a script to initialize the metaclass to be created. In the following example, the value of the Stereotype attribute is set to SimpleType:

  ```
  Sub %Initialize%(obj)
     obj.Stereotype = "SimpleType"
  End Sub
  ```
- **Attribute Mappings** - Lists the mappings of attributes under the metaclass. Select a mapping and click the **Properties** tool to open its property sheet. To control the order in which attributes are created, in order to respect dependencies between them, use the arrows at the bottom of the list.
- **Collection Mappings** - Lists the mappings of collections under the metaclass.
- **Post-Process** - Specifies a script to modify the metaclass after creation and execution of mappings. In the following example, the value of the **Code** attribute is copied to the **Name** attribute:

  ```
  Sub %PostProcess%(obj)
     ' Copy code into name
     obj.Name = obj.Code
  End Sub
  ```

Metamodel Object Properties

To view the properties of metaclasses, metaattributes, and metacollections displayed in the Mapping Editor, double-click the object node in the Mapping Editor or right-click the node and selecting **Properties**.

The **General** tab contains the following properties:

Property	Description
Parent	[metaattributes and metacollections] Specifies the metaclass to which the metaobject belongs.
Parent collection	[sub-objects/compositions] Specifies the name of the composition collection that contains the sub-objects under the parent object.
Name	Specifies the name of the metaclass in the PowerDesigner metamodel or XML schema.
Data type	[metaattributes] Specifies the data type of the attribute.
Identifier	[metaattributes] Specifies that the attribute is used to identify the metaclass for referencing by another metaclass.
Reference / Reference path	[metaattributes and metacollections] Specifies that the attribute or collection is used to point to another metaclass to form an aggregation.
Singleton	[metaclasses] Specifies that only one instance of the metaclass is possible under each parent object.

Property	Description
Comment	Provides additional information about the metaobject.

The following tabs are also available for metaclasses:

- **Attributes** - Lists the metaattributes belonging to the metaclass. Select an attribute in the list and click the **Properties** tool to open its property sheet.
- **Collections** - Lists the metacollections belonging to the metaclass. Select a collection in the list and click the **Properties** tool to open its property sheet.

Object Generations (Profile)

Object generations allow you to define mappings between one PowerDesigner model type and another based on the two metamodels (and any extensions) to enable the generation of one or more object types.

For an overview of creating, deploying, and using object generations, see *Core Features Guide > Linking and Synchronizing Models > Generating Models and Model Objects > Generating Model Objects > Defining Advanced Object Generations*.

1. [if the `Object Generations` category is not present] Right-click the root node, select **Add Items**, select `Object Generations`, and click **OK** to create this folder.
2. Right click the `Object Generations` folder, and select **New** to create an object generation.
3. Enter the following properties as appropriate:

Property	Description
Target model type	Specifies the type of model that will be created or updated by the generation.
Menu command name	Specifies the name of the command that will appear in the interface under **Tools > Generate Objects**. This field is initialized when you select a target model type.
Comment	Provides a description of the generation or other additional information.

4. [optional] Click the **Source Extensions** and/or **Target Extensions** tab and select extension files containing extended attributes, collections, or metaclasses to reference in your mappings.

   Attaching extension files in this way allow you to reuse previously defined extensions in your generations or to share extensions between generations. You can also define extensions as appropriate under the Profile category in the resource file containing the generation definition.

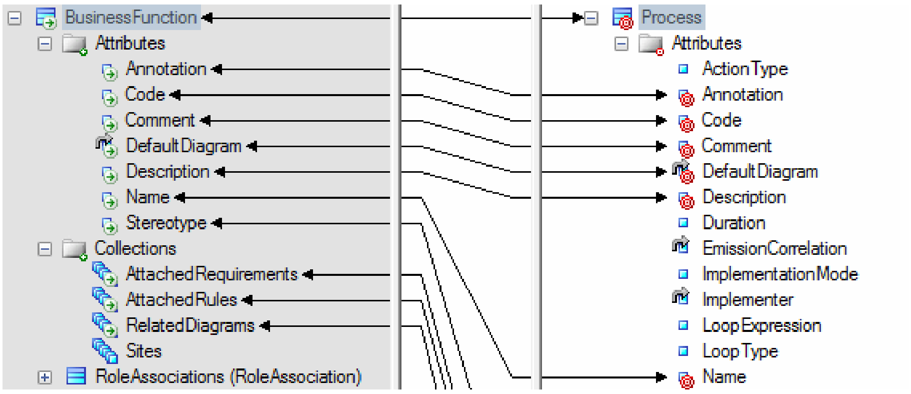
5. Click the **Mappings** button to define mappings from your source to target metaclasses in the Mapping Editor (see *Model-to-Model Generation Mappings* on page 105).
6. Click **Apply** to save your changes.

Model-to-Model Generation Mappings

You control how metaclasses from one PowerDesigner model type will be generated to metaclasses in another model type by mapping them and their attributes and collections in the Mapping Editor. Any extensions defined for the source or target metamodels are displayed and available for mapping.

Note: It is not necessary to map all metaclasses (or all their contents), but only those with which you want to work. If the PowerDesigner metamodel does not contain appropriate metaclasses, attributes, compositions, or aggregations to map against, you should save any existing mappings, close the Mapping Editor, define or attach appropriate extensions, and then reopen the Mapping Editor to map to them.

1. Drag and drop a metaclass from the source pane on the left to a metaclass in the Target pane on the right. Any source attributes are automatically mapped to target attributes with which they share a name:



Note: By default, the Mapping Editor lists the standard attributes and collections of metaclasses, which are displayed, by default, in object property sheets. To display all available properties, click the **Filter Properties** tool, and select `Show All Properties`. You can also filter the tree by using the **Filter Mappings** and **Filter Objects** tools.

2. Drag and drop additional source attributes under the metaclass to target attributes with compatible data types to map them. Attributes are contained in a folder under the metaclass and represent individual properties such as Name, Size, DimensionalType, containing boolean, textual, numeric, or object ID values:
3. Drag and drop source sub-object metaclasses (compositions) under the metaclass to target compositions to create mappings between them:

Any attributes under the source sub-object metaclass are automatically mapped to target attributes with which they share a name. Map other sub-object attributes as necessary.

Note: In certain circumstances, it may be appropriate to map a source sub-object metaclass to a target object metaclass, and so such mappings are also permitted.

4. Drag and drop source collections (aggregations) under the metaclass to target collections to create mappings between them:
5. [optional] Select a metaclass and enter an initialization or post-processing script to modify the objects at or after creation (see *Metamodel Mapping Properties* on page 102).
6. [optional] Click the target model (root node) to display the global list of mappings in the **Mappings** pane at the bottom of the dialog and use the arrows at the bottom of the list to change the order in which objects are generated to ensure that dependencies are respected.

   Note: To control the order in which attributes, compositions, and aggregations are generated, select the target metaclass to display its mappings in the **Mappings** pane, and use the arrows at the bottom of the lists on the **Attribute Mappings**, **Collection Mappings**, and **Sub-Object Mappings** sub-tabs.
7. Click **Apply** to save your changes.

Global Script (Profile)

The profile contains a global script, which you can use to store functions and variables to be reused in your scripts defined for extensions.

For example, we could imagine writing a function for obtaining the data type of an item and reusing it in the scripts for both the custom check and autofix examples (see *Custom Checks (Profile)* on page 72.

The new `DataTypeBase` function is entered on the **Global Script** tab as follows:

```
Function DataTypeBase(datatype)
 Dim position
 position = InStr(datatype, "(")
 If position <> 0 Then
  DataTypeBase = Ucase(Left(datatype, position -1))
 Else
  DataTypeBase = Ucase(datatype)
 End If
End Function
```

The script for the check (see *Example: PDM Custom Check* on page 73 can be rewritten to call the function as follows:

```
Function %Check%(obj)
Dim c 'temporary  index column
 Dim col 'temporary column
 Dim position
 %Check%= True
 If obj.type = "LF" or obj.type = "HG" or obj.type = "CMP" or obj.type
```

```
="HNG" then
  For Each c In obj.IndexColumns
   Set col = c.column
   If (DataTypeBase(col.datatype) = "VARCHAR") And (col.length > 255)
Then
    Output "Table " & col.parent.name & " Column " & col.name & " :
Data type is not compatible with Index " & obj.name & " type " &
obj.type
    %Check% = False
   End If
  Next
 End If
End Function
```

Note: Variables defined on the **Global Script** tab are reinitialized each time they are referenced in another script.

CHAPTER 3

Object, Process, and XML Language Definition Files

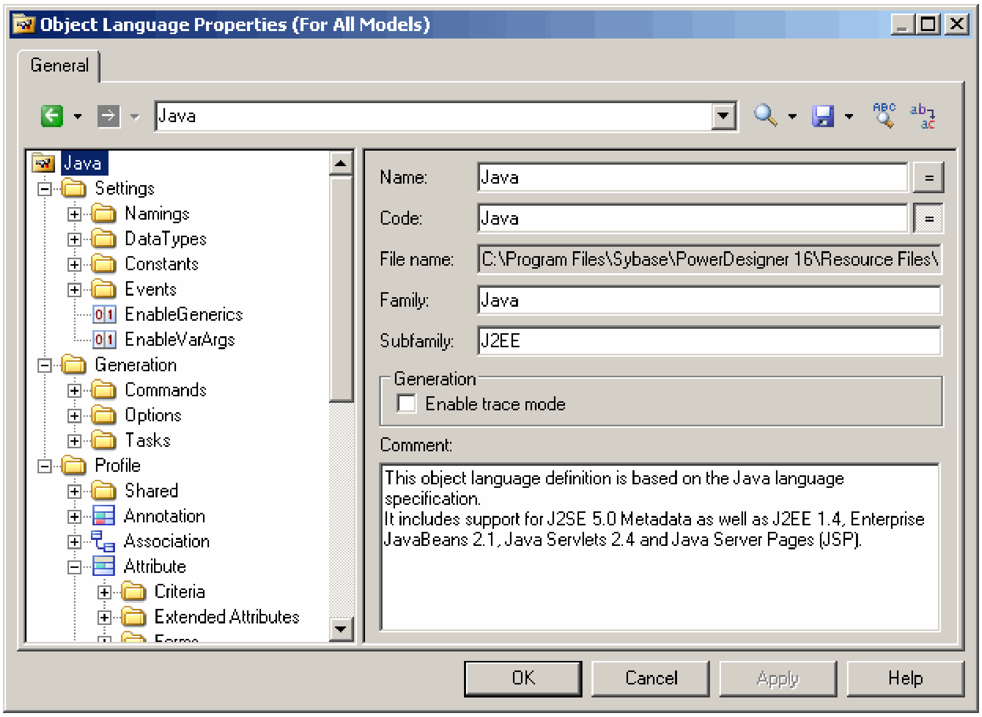
Language definition files provide PowerDesigner with the information necessary to model, reverse-engineer, and generate for a particular object-oriented, business process, or XML language. PowerDesigner provides definition files for many popular languages. You select a language when you create an OOM, BPM, or XSM.

Language definition files have an `.xol`, `.xpl`, or `.xsl` extension and are located in `install_dir/Resource Files`. To view the list of languages, select **Tools > Resources > Object Languages > , Process Languages**, or **XML Languages**. For information about the tools available in resource file lists, see *Chapter 1, PowerDesigner Resource Files* on page 1.

Note: The PDM uses a different form of definition file (see *Chapter 4, DBMS Definition Files* on page 121), and other model types do not have definition files but can be extended with extension files (see *Chapter 2, Extension Files* on page 9).

All target languages have the same basic category structure, but the detail and values of entries differs for each language:

- Settings - contains data types, constants, namings, and events categories used to customize and manage generation features. The types of items in this category differ depending on the type of resource file.
- Generation - contains generation commands, options, and task.
- Profile - contains extensions on metaclasses.



Name: Java
Code: Java
File name: C:\Program Files\Sybase\PowerDesigner 16\Resource Files\
Family: Java
Subfamily: J2EE
Generation
Enable trace mode
Comment:
This object language definition is based on the Java language specification.
It includes support for J2SE 5.0 Metadata as well as J2EE 1.4, Enterprise JavaBeans 2.1, Java Servlets 2.4 and Java Server Pages (JSP).

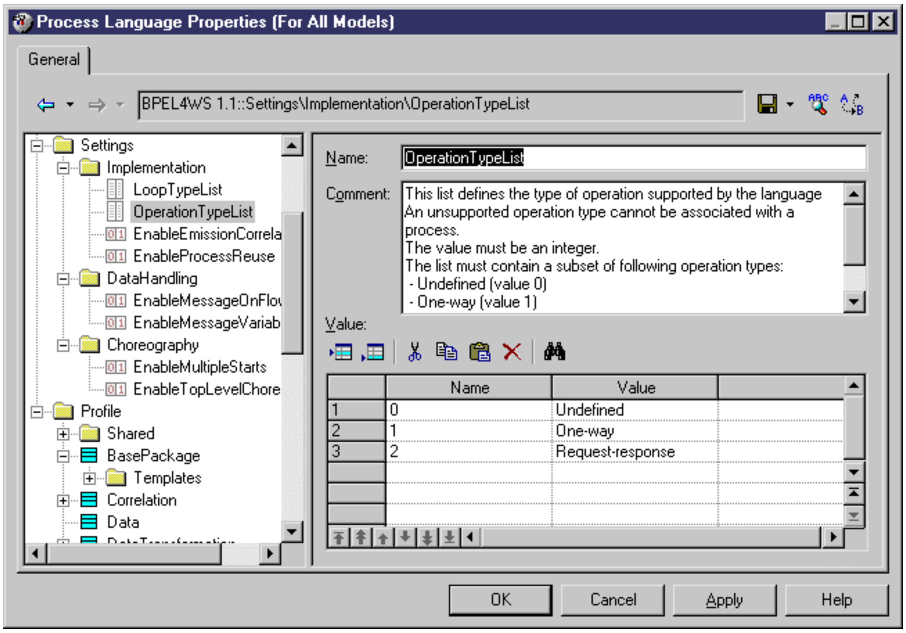
The root node of each file contains the following properties:

Property	Description
Name / Code	Specify the name and code of the language definition file.
File Name	[read-only] Specifies the path to the language definition file. If the target language has been copied to your model, this field is empty.
Version	[read-only] Specifies the repository version if the resource is shared via the repository.
Family / Subfamily	Specifies the family and subfamily of the language, which may enable certain non-default features in the model. For example, object languages of the Java, XML, IDL and SAP® Sybase® PowerBuilder® families support reverse engineering.
Enable Trace Mode	Lets you preview the templates used during generation (see *Templates (Profile)* on page 86). Before starting the generation, click the **Preview** page of the relevant object, and click the **Refresh** tool to display the templates. When you double-click on a trace line from the **Preview** page, the Resource Editor opens to the corresponding template definition.
Comment	Specifies additional information about the target language.

Settings Category: Process Language

The Settings category contains the following items used to control the data types, constants, namings, and events categories used to customize and manage BPM generation features:

- *Implementation* – [executable BPM only] Gathers options that influence the process implementation possibilities. The following constants are defined by default:
    - *LoopTypeList* - This list defines the type of loop supported by the language. The value must be an integer
    - *OperationTypeList* - This list defines the type of operation supported by the language. An unsupported operation type cannot be associated with a process. The value must be an integer
    - *EnableEmissionCorrelation* - enables the definition of a correlation for an emitted message
    - *EnableProcessReuse* - allows a process to be implemented by another process
    - *AutomaticInvokeMode* - indicates if the action type of a process implemented by an operation can be automatically deducted from the operation type. You can specify:
        - 0 (default) - the action type cannot be deduced and must be specified
        - 1 - the language enforces a Request-Response and a One-Way operation to be received by the process and a Solicit-Response and a Notification operation to be invoked by the process
        - 2 the language ensures that a Solicit-Response and a Notification operation are always received by the process while Request-Response and One-Way operations are always invoked by the process



Name: OperationTypeList

Comment: This list defines the type of operation supported by the language
An unsupported operation type cannot be associated with a process.
The value must be an integer.
The list must contain a subset of following operation types:
- Undefined (value 0)
- One-way (value 1)

Value:

	Name	Value
1	0	Undefined
2	1	One-way
3	2	Request-response

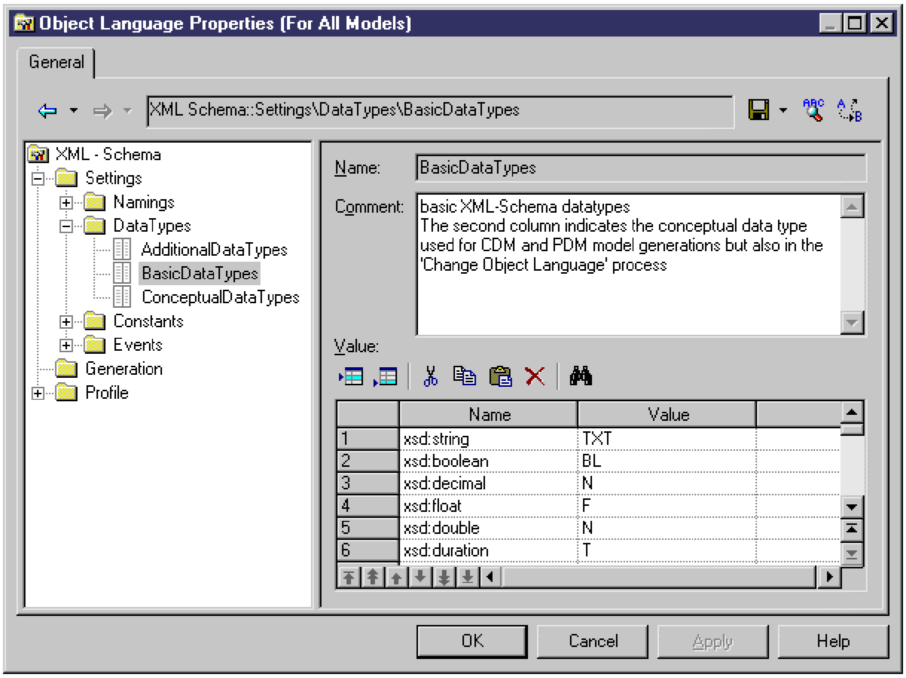
- *DataHandling* - [executable BPM only] Gathers options for managing data in the language. The following constant values are defined by default:
  - *EnableMessageOnFlow* - indicates if a message format can be associated to a flow or not. The default value is Yes
  - *EnableMessageVariable* - enables a variable object to store the whole content of a message format. In this case, the message format objects will appear in the data type combo box of the variable
- *Choreography* - Gathers objects that allow the design of the graph of activities (start, end, decision, synchronization, transition...) Contains the following constant values defined by default:
  - *EnableMultipleStarts* - When set to No, ensures that no more than one start is defined under a composite process
  - *EnableTopLevelChoreography* - When set to No, ensures that no flow or choreography object (start, end, decision...) is defined directly under the model or a package. These objects can be defined only under a composite process

Settings Category: Object Language

The Settings category contains the following items used to control the data types, constants, namings, and events categories used to customize and manage OOM generation features:

- *Data Types* - Tables for mapping internal data types with object language data types. The following data types values are defined by default:

- *BasicDataTypes* – lists the most commonly-used data types. The Value column indicates the conceptual data type used for CDM and PDM model generations.
- *ConceptualDataTypes* – lists internal PowerDesigner data types. The Value column indicates the object language data type used for CDM and PDM model generations.
- *AdditionalDataTypes* – lists additional data types added to data type lists. Can be used to add or change data types of your own. The Value column indicates the conceptual data type used for CDM and PDM model generations.
- *DefaultDataType* – specifies the default data type.



XML Schema::Settings\DataTypes\BasicDataTypes

Name: BasicDataTypes

Comment: basic XML-Schema datatypes
The second column indicates the conceptual data type used for CDM and PDM model generations but also in the 'Change Object Language' process

Value:

	Name	Value	
1	xsd:string	TXT	
2	xsd:boolean	BL	
3	xsd:decimal	N	
4	xsd:float	F	
5	xsd:double	N	
6	xsd:duration	T	

- *Constants* - contains mapping between the following constants and their default values: Null, True, False, Void, Bool.
- *Namings* - contains parameters that influence what will be included in the files that you generate from an OOM:
  - *GetterName* - Name and value for getter operations
  - *GetterCode* - Code and value for getter operations
  - *SetterName* - Name and value for setter operations
  - *SetterCode* - Code and value for setter operations
  - *IllegalChar* - lists illegal characters for the object language. This list populates the Invalid characters field in **Tools > Model Options > Naming Convention**. For example, `"/!=<>""'()"`
- *Events* - defines standard events on operations. This category may contain default existing events such as constructors and destructors, depending on the object language. An event is linked to an operation, and the contents of the Events category is displayed in the Event list

in operation property sheets to describe the events that can be used by an operation. In PowerBuilder for example, the Events category is used to associate operations with PowerBuilder events.

Settings Category: XML Language

The Settings category contains the Data types category that shows a mapping of internal data types with XML language data types.

The following data types values are defined by default:

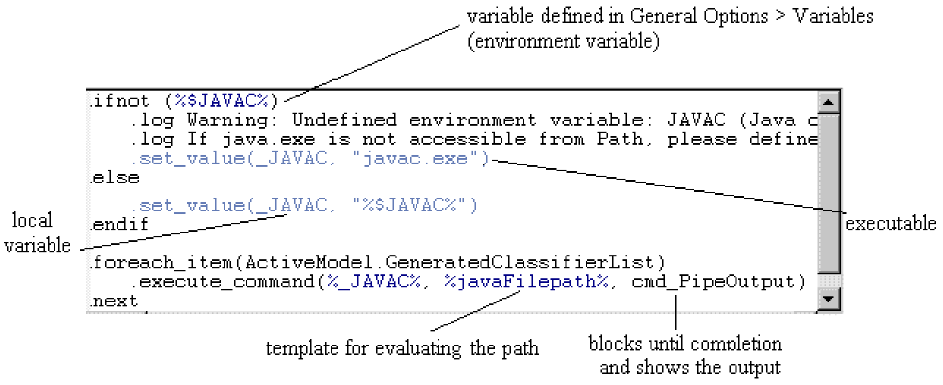
- ConceptualDataTypes - The Value column indicates the XML language data type used for model generations. Conceptual data types are the internal data types of PowerDesigner, and cannot be modified.
- XsmDataTypes- Data types for generations from the XML model.

Generation Category

The Generation category contains categories and entries to define and activate a generation process.

The following sub-categories are available:

- *Commands* - contains generation commands, which can be executed at the end of the generation process, after the generation of all files. Commands are written in GTL (see *Chapter 5, Customizing Generation with GTL* on page 247), and must be included within tasks to be evoked.


variable defined in General Options > Variables (environment variable)
local variable
executable
template for evaluating the path
blocks until completion and shows the output

```
.ifnot (%$JAVAC%)
    .log Warning: Undefined environment variable: JAVAC (Java c
    .log If java.exe is not accessible from Path, please define
    .set_value(_JAVAC, "javac.exe")
.else
    .set_value(_JAVAC, "%$JAVAC%")
.endif

.foreach_item(ActiveModel.GeneratedClassifierList)
    .execute_command(%_JAVAC%, %javaFilepath%, cmd_PipeOutput)
.next
```

- *Options* – contains options, available on the **Options** tab of the Generation dialog, the values of which can be tested by generation templates or commands. You can create options that take boolean, string, or list values. The value of an option may be accessed in a template using the following syntax:

```
%GenOptions.option%
```

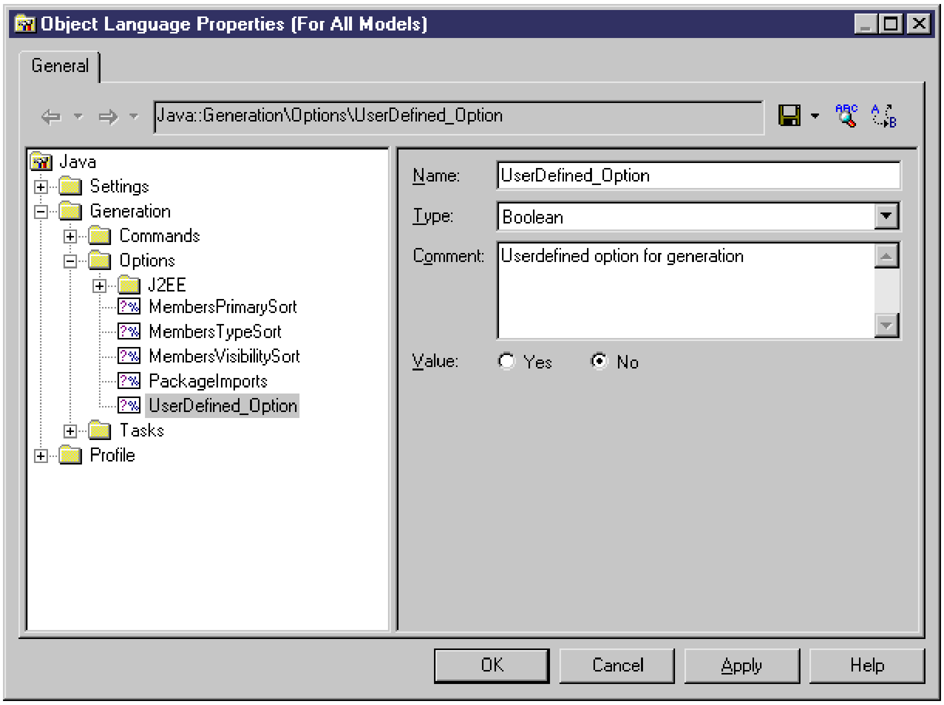
For example, for a boolean option named `GenerateComment`, `%GenOptions.GenerateComment%` will evaluate to either true or false in a template, depending on the value specified in the Generation dialog **Options** tab.

- *Tasks* – contains tasks, available on the **Tasks** tab of the Generation dialog, and which contain lists of generation commands. When a task is selected, the commands included in it are retrieved and their templates evaluated and executed.

Example: Adding a Generation Option

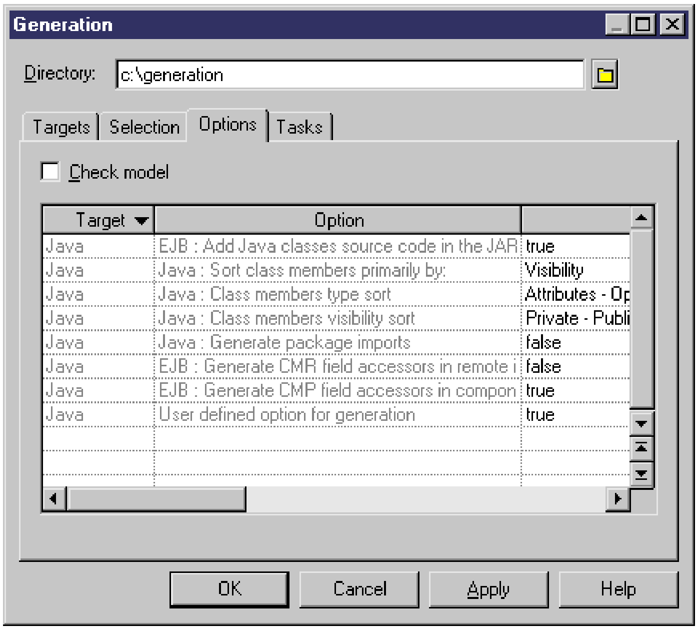
In this example, we will add a generation option to the Java object language.

1. Select **Language > Edit Current Object Language** to open the Java resource file.
2. Expand the Generation category, and then right-click the Options category and select **New**:



Name: UserDefined_Option
Type: Boolean
Comment: Userdefined option for generation
Value: Yes [✓ No]

3. Click **OK** to save your changes and return to the model. Then select **Language > Generate Java code** to open the Generation dialog, and click the **Options** tab. The new option is listed on the tab under its comment (or its name, if no comment has been provided):



c:\generation

☐ Check model

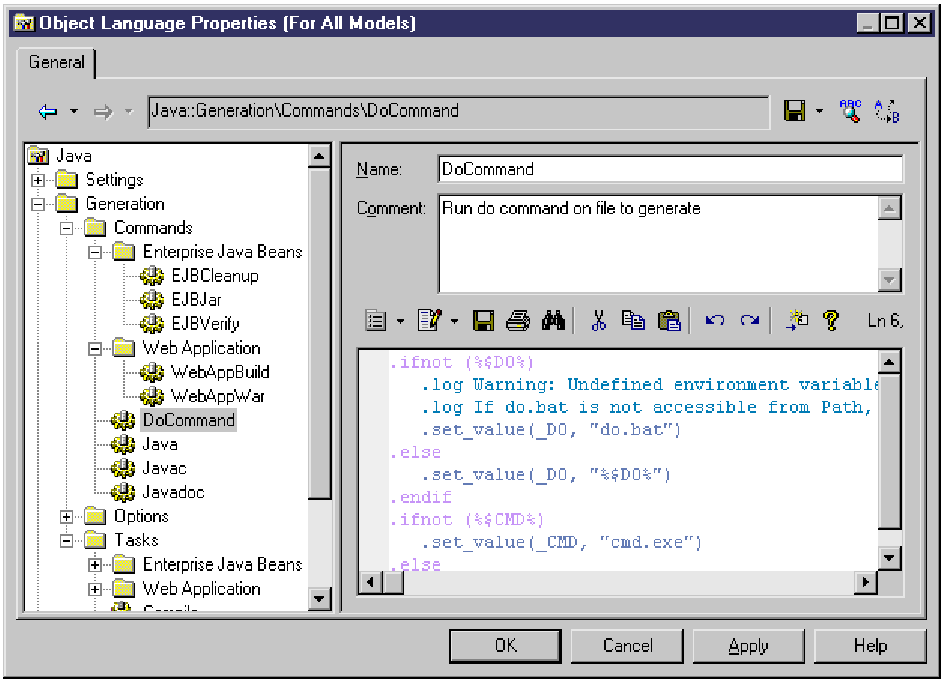
Target	Option	
Java	EJB : Add Java classes source code in the JAR	true
Java	Java : Sort class members primarily by:	Visibility
Java	Java : Class members type sort	Attributes - Op
Java	Java : Class members visibility sort	Private - Publi
Java	Java : Generate package imports	false
Java	EJB : Generate CMR field accessors in remote i	false
Java	EJB : Generate CMP field accessors in compon	true
Java	User defined option for generation	true

Note: For detailed information about creating and modifying generation templates, see *Chapter 5, Customizing Generation with GTL* on page 247.

Example: Adding a Generation Command and Task

In this example, we will add a generation command and associated task to the Java object language

1. Create a new OOM for Java, and then select **Language > Edit Current Object Language**.
2. Expand the Generation category, and then right-click the Commands category and select **New**.
3. Name the command `DoCommand` and enter an appropriate template:

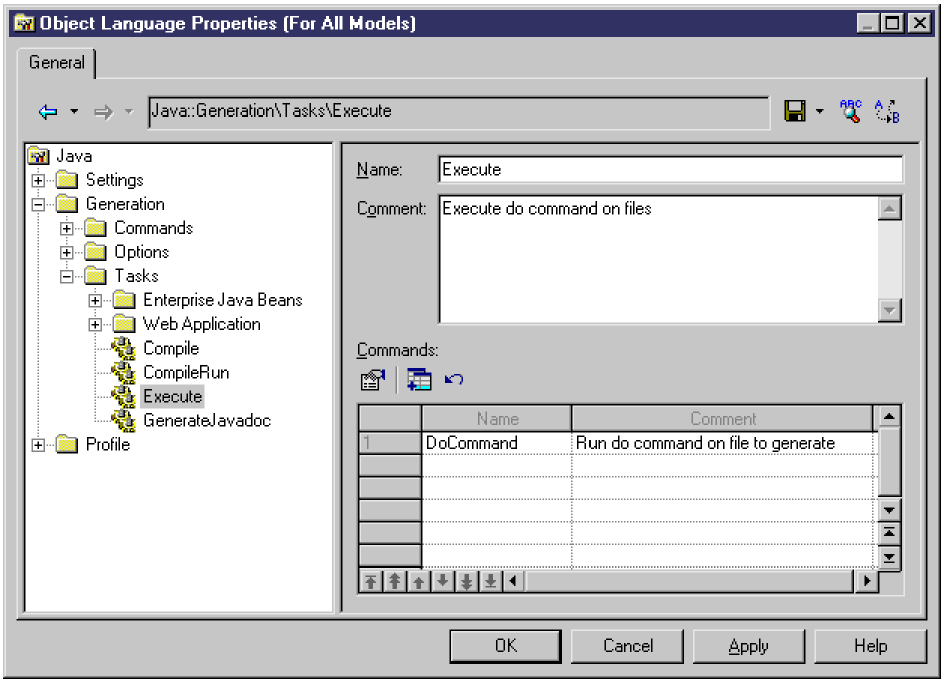


Name: DoCommand

Comment: Run do command on file to generate

```
.ifnot (%$DO%)
   .log Warning: Undefined environment variable
   .log If do.bat is not accessible from Path,
   .set_value(_DO, "do.bat")
.else
   .set_value(_DO, "%$DO%")
.endif
.ifnot (%$CMD%)
   .set_value(_CMD, "cmd.exe")
.else
```

4. Right-click the Tasks category and select **New**. Name the task `Execute`, click the **Add Commands** tool, select `DoCommand` from the list, and then click **OK** to add it to the new task:

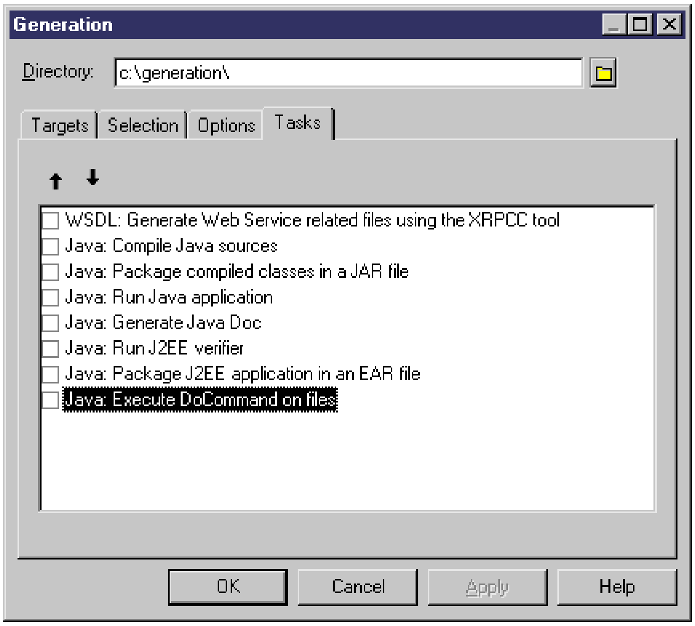


Name: Execute

Comment: Execute do command on files

	Name	Comment
1	DoCommand	Run do command on file to generate

5. Click **OK** to save your changes and return to the model. Then select **Language > Generate Java code** to open the Generation dialog, and click the **Tasks** tab. The new task is listed on the tab under its comment (or its name, if no comment has been provided):



Directory: c:\generation\

- [ ] WSDL: Generate Web Service related files using the XRPCC tool
- [ ] Java: Compile Java sources
- [ ] Java: Package compiled classes in a JAR file
- [ ] Java: Run Java application
- [ ] Java: Generate Java Doc
- [ ] Java: Run J2EE verifier
- [ ] Java: Package J2EE application in an EAR file
- [ ] Java: Execute DoCommand on files

Profile Category (Definition Files)

The language definition file Profile category can contain Stereotypes, Extended attributes, Methods and so on, to extend the metaclasses defined in the PowerDesigner metamodel.

In object languages, the `Shared/Extended Attribute Types` category contains various attributes used to control object language support within PowerDesigner. The **Object Container** variable specifies the default container for implementing associations. This attribute has an editable list of possible values for each object language, from which you can select a default value for your language. You can, if necessary, override this default using the **Default association container** model option.

For detailed information about working with the Profile category, see *Chapter 2, Extension Files* on page 9.

CHAPTER 4 DBMS Definition Files

DBMS definition file provide PowerDesigner with the information necessary to model, reverse-engineer, and generate for a particular DBMS. PowerDesigner provides definition files for most popular DBMSs. You select a DBMS when you create a PDM.

DBMS definition files have an `.xdb` extension and are located in *`install_dir`*`/Resource Files/DBMS`. To view the list of DBMSs, select **Tools > Resources > DBMS**. For information about the tools available in resource file lists, see *Chapter 1, PowerDesigner Resource Files* on page 1.

You can consult or modify the DBMS definition file attached to your PDM in the Resource Editor by selecting **Database > Edit current DBMS**. When you select a *category* or an item in the left-hand pane, the name, value, and related comment appear in the right side of the dialog box.

Warning! The resource files provided with PowerDesigner inside the `Program Files` folder cannot be modified directly. To create a copy for editing, use the **New** tool on the resource file list, and save it in another location. To include resource files from different locations for use in your models, use the **Path** tool on the resource file list.

Each DBMS file has the following structure:

- *General* - contains general information about the database, without any categories (see *General Category (DBMS)* on page 136). All items defined in the General category apply to all database objects.
- *Script* - used for generation and reverse engineering. Contains the following sub-categories:
  - *SQL* - contains the following sub-categories, each of which contains items whose values define general syntax for the database:
    - *Syntax* - general parameters for SQL syntax (see *Syntax Category (DBMS)* on page 137)
    - *Format* - parameters for allowed characters (see *Format Category (DBMS)* on page 138)
    - *File* - header, footer and usage text items used during generation (see *File Category (DBMS)* on page 139)
    - *Keywords* - the list of SQL reserved words and functions (see *Keywords Category (DBMS)* on page 141)
  - *Objects* - contains commands to create, delete or modify all the objects in the database. Also includes commands that define object behavior, defaults, necessary SQL queries, reverse engineering options, and so on (see *Script/Objects Category (DBMS)* on page 143).

    - *Data Type* - contains the list of valid data types for the specified DBMS and the corresponding types in PowerDesigner (see *Script/Data Type Category (DBMS)* on page 198).
    - *Customize* - Retrieves information from PowerDesigner Version 6 DBMS definition files. It is not used in later versions.
- *ODBC* - present only if the DBMS does not support standard statements for generation. In this case the ODBC category contains additional items necessary for live database connection generation .
- *Transformation Profiles* – contains group of transformations used during model generation when you need to apply changes to objects in the source or target models (see *Transformations (Profile)* on page 94).
- *Profile* - allows you to define extended attribute types and extended attributes for database objects (see *Profile Category (DBMS)* on page 201).

The following properties are available on the root of a DBMS definition file:

Property	Description
Name / Code	Name and code of the DBMS.
File Name	[read only] Path and name of the DBMS file.
Family	Used to classify a DBMS, and to establish a link between different database resource files. For example, SAP® Sybase® SQL Anywhere®, and SAP® Sybase® Adaptive Server® Enterprise belong to the SQL Server family. Triggers are retained when you change target within the same family. Merge interface allows to merge models from the same family.
Comment	Additional information about the DBMS

Triggers Templates, Trigger Template Items, and Procedure Templates

The DBMS Trigger templates, Trigger template items, and Procedure templates are accessible via the tabs in the Resource Editor window. In addition, for Oracle, there is a tab for database package templates.

Templates for stored procedures are defined under the Procedure category in the DBMS tree view.

For more information, see *Data Modeling > Building Data Models > Triggers and Procedures*

Database Generation and Reverse Engineering

PowerDesigner supports generation and reverse engineering of databases through scripts and live connections via SQL statements and queries stored in the `Script/Objects` category.

Generation and reverse-engineering of scripts and generation to a live connection all use the same statements, while reverse-engineering from a live connection uses separate queries.

PowerDesigner performs generation and reverse-engineering as follows:

- Generation/Update Database - Each model object selected is applied to the statements in the `Script/Objects` category.
- Reverse engineering:
  - Script - PowerDesigner parses the script and identifies object creation statements by comparing them with the statements in the `Script/Objects` category.
  - Live connection - PowerDesigner uses the queries in the `Script/Objects` category to retrieve information from the database system tables. Each column of a query result set is associated with a variable. The query header specifies the association between the columns of the resultset and the variable. The values of the returned records are stored in these variables which are then committed as object attributes.

Script Generation

PowerDesigner can generate a SQL script from a PDM to create or modify a database. The statements that control script generation are available in the `Script/Objects` category.

When generating a SQL script, PowerDesigner takes each object to be created in turn, and applies the appropriate `Create` or other statement to create or modify the object:

- `Create` - Creates a new object.
- `Alter` / `Modify` - Modifies the attributes of an existing object.
- `Add` - Creates a new sub-object. If keys are defined inside a table, they will be created with an `Add` statement, but if they are created outside the table, then they will be created with a table `Modify` statement.
- `Rename` - Renames an object.
- `Drop` - Drops an object (for use when an Alter statement is not possible).
- *`Object`*`Comment` - Adds a comment on the object.
- `Options` - Defines the physical options of an object.
- `ConstName` - Defines the constraint name template for object checks.

For example, in Sybase ASE 15.7, the `Create` statement in the Table category is the following:

```
create table [%QUALIFIER%]%TABLE%
(
  %TABLDEFN%
)
[%OPTIONS%]
```

This statement contains the parameters for creating the table together with its owner and physical options using variables (see *Variables for Tables and Views* on page 217) that extract the necessary information from the object's properties. The `%TABLDEFN%` variable collects the `Add` items in the Column, PKey, Key, and Reference categories, and the `AddTableCheck` item in the Table category.

Other statements in the object categories are used to customize the PowerDesigner interface and behavior according to database features, such as `Maxlen`, `Permission`, `EnableOwner`, and `AllowedADT`.

Extending Generation with Before and After Statements

You can extend script generation statements to complement generation using the *extension statements*. The extension mechanism allows you to generate statements immediately before or after Create, Drop, and Modify statements, and to retrieve these statements during reverse engineering.

Extension statements are written in GTL (see *Chapter 5, Customizing Generation with GTL* on page 247). During generation, the statements and variables are evaluated and the result is added to the global script.

Note: We recommend that you avoid using GTL macros (other than `.if`) in generation scripts, as they may not be resolvable when reverse engineering by script. Generating and reverse engineering via a live database connection are not subject to this limitation.

Example - Adding an AfterCreate Statement

The extension statement `AfterCreate` is defined in the Table category to complement the table `Create` statement by adding partitions to the table if the value of the partition extended attribute requires it:

```
.if (%ExtTablePartition% > 1)
%CreatePartition%
go
.endif
```

The `.if` macro evaluates variable `%ExtTablePartition%`, which is an extended attribute that contains the number of table partitions. If the value is higher than 1, then `%CreatePartition%`, defined in the Table category, will be generated as follows:

```
alter table [%QUALIFIER%]%TABLE%
 partition %ExtTablePartition%
```

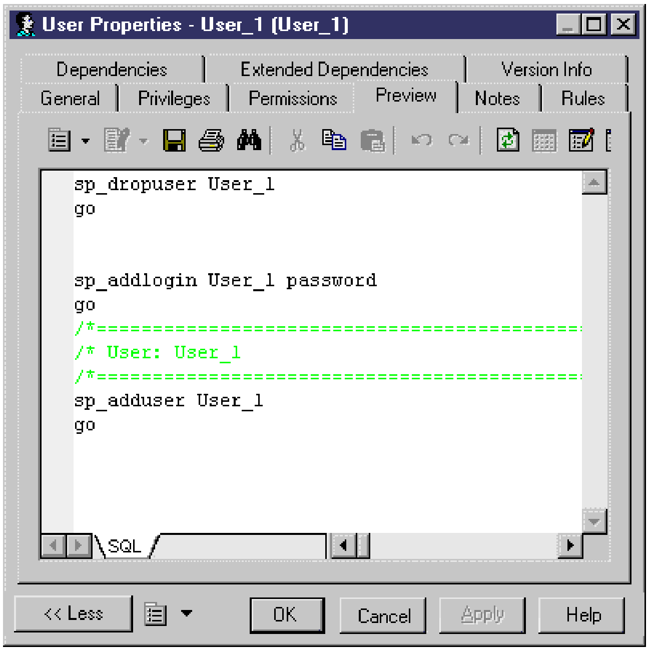
This item generates the statement for creating the number of table partitions specified in `%ExtTablePartition%`.

Example - Adding a BeforeCreate Statement

The extension statement `BeforeCreate` is defined in the User category to create the login of a user before the user `Create` statement is executed:

```
sp_addlogin %Name% %Password%
go
```

The automatically generated login will have the same name as the user, and its password. The `BeforeCreate` statement is displayed before the user creation statement in the **Preview**:



```
sp_dropuser User_1
go


sp_addlogin User_1 password
go
/*==========================================
/* User: User_1
/*==========================================
sp_adduser User_1
go
```

Example - Modify Statements

You can also add `BeforeModify` and `AfterModify` statements to standard `Modify` statements.

Modify statements are executed to synchronize the database with the schema created in the PDM. By default, the modify database feature does not take into account extended attributes when it compares changes performed in the model from the last generation. You can bypass this rule by adding extended attributes in the `ModifiableAttributes` list item. Extended attributes defined in this list will be taken into account in the merge dialog box during database synchronization.

To detect that an extended attribute value has been modified you can use the following variables:

- `%OLDOBJECT%` - to access an old value of the object
- `%NEWOBJECT%` - to access a new value of the object

For example, you can verify that the value of the extended attribute `ExtTablePartition` has been modified using the following GTL syntax:

```
.if (%OLDOBJECT.ExtTablePartition% != %NEWOBJECT.ExtTablePartition%)
```

If the extended attribute value was changed, an extended statement will be generated to update the database. In the Sybase ASE syntax, the `ModifyPartition` extended statement is the following because in case of partition change you need to delete the previous partition and then recreate it:

```
.if (%OLDOBJECT.ExtTablePartition% != %NEWOBJECT.ExtTablePartition%)
 .if (%NEWOBJECT.ExtTablePartition% > 1)
  .if (%OLDOBJECT.ExtTablePartition% > 1)
%DropPartition%
  .endif
%CreatePartition%
 .else
%DropPartition%
 .endif
.endif
```

Script Reverse Engineering

PowerDesigner can reverse engineer SQL scripts into a PDM. The statements that control script generation are available in the `Script/Objects` category.

When reverse-engineering a SQL script into a PDM, PowerDesigner compares each statement in turn with all of the `Create` statements defined in the DBMS definition file and when it finds a match, extracts all of the available information to create or update PDM objects.

The statements used in script reverse engineering are the same as those for script generation (see *Script Generation* on page 123).

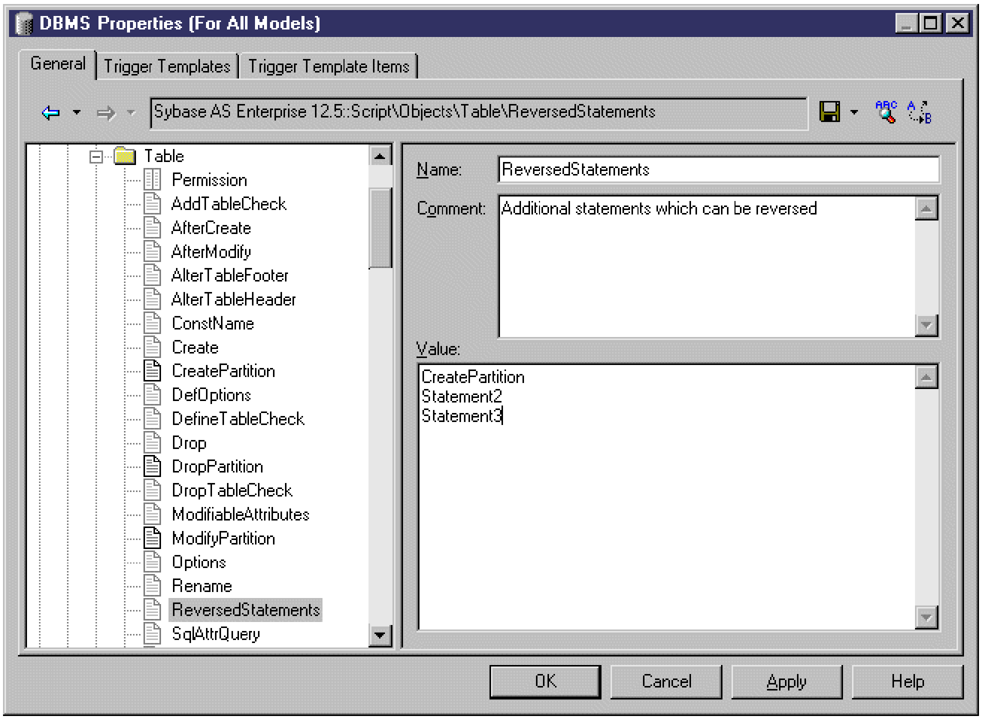
For example, in Sybase IQ v15.2, the `Create` statement in the Table category is the following:

```
create[%ExtGlobalTemporaryTable%? global temporary] table
[%QUALIFIER%]%TABLE% (
   %TABLDEFN%
)[.Z:[[%R%?[.O:[in][on]] %DBSpace%:[%DBSpace%?
   in %DBSpaceGeneratedName%]]][
   on commit %OnCommit%][%NotTransactional%? not transactional][
   at %.q:At%][%R%?partition by range %RevPartition%:[%PartitionKey
%?[%hasLifecycle%?:
   partition by range (%PartitionKey.Code%)
   (
      %PartitionDef%
   )]]]
]
```

This statement contains the parameters for creating the table together with its owner and physical options using variables (see *Variables for Tables and Views* on page 217) that extract the necessary information from the object's properties.

If you are using the extension mechanism for script generation, you have to declare statements in the list item `ReversedStatements` (one statement per line) for them to be properly reversed.

For example, the extension statement `AfterCreate` uses `CreatePartition`, which must be declared in `ReversedStatements` to be properly reverse engineered:



Sybase AS Enterprise 12.5::Script\Objects\Table\ReversedStatements

Table
- Permission
- AddTableCheck
- AfterCreate
- AfterModify
- AlterTableFooter
- AlterTableHeader
- ConstName
- Create
- CreatePartition
- DefOptions
- DefineTableCheck
- Drop
- DropPartition
- DropTableCheck
- ModifiableAttributes
- ModifyPartition
- Options
- Rename
- ReversedStatements
- SqlAttrQuery

Name: ReversedStatements

Comment: Additional statements which can be reversed

Value:

```
CreatePartition
Statement2
Statement3
```

Live Database Generation

PowerDesigner can generate or modify a database from a PDM to a live connection. The statements that control live generation are available in the `Script/Objects` category, except when the DBMS does not support standard SQL syntax. For example, MS Access, which needs VB scripts to create database objects, has special generation statements defined in the ODBC category.

When generating to a live connection, PowerDesigner takes each object to be created in turn, and applies the appropriate `Create` or other statement to create or modify the object.

The statements used in live generation are the same as those for script generation (see *Script Generation* on page 123).

Live Database Reverse Engineering

PowerDesigner can reverse engineer from a live database connection into a PDM. The queries that control live reverse engineering are available in the `Script/Objects` category.

The following queries are used in live reverse engineering:

- `SqlListQuery` - Retrieves a list of available objects to populate the Database Reverse Engineering dialog. This query is memory intensive, and should retrieve the smallest number of columns possible. If it is not defined, then `SqlAttrQuery` will be used to populate the dialog.

- `SqlAttrQuery` - Retrieves the object attributes to be reverse-engineered. This query is not necessary if the object has few attributes, and the `SqlListQuery` can retrieve all necessary information, as is the case for tablespaces in Sybase SQL Anywhere.
- `SqlOptsQuery` - Retrieves the physical options to be reverse-engineered.
- `SqlListChildrenQuery` - Retrieves lists of child objects (such as columns of an index or key or joins of a reference) to be reverse-engineered.
- `SqlSysIndexQuery` - Retrieves system indexes created by the database.
- `SqlChckQuery` - Retrieves object check constraints.
- `SqlPermQuery` - Retrieves object permissions.

Note: You can also create your own queries (see *Creating Queries to Retrieve Additional Attributes* on page 130).

Each type of query has the same basic structure comprised of a comma-separated list of PowerDesigner variables enclosed in curly braces { } followed by a select statement to extract values to populate these variables. The values of the returned records are stored in these variables, which are then committed as object attribute values.

For example, the `SqlListQuery` in the View category of Oracle 11g R1 extracts values for eight variables:

```
{OWNER, VIEW, VIEWSTYLE, ExtObjViewType,
    ExtObjOIDList, ExtObjSuperView, XMLSCHEMA EX, XMLELEMENT EX}

select
   v.owner,
   v.view_name,
   decode (v.view_type, 'XMLTYPE', 'XML', 'View'),
   v.view_type,
   v.oid_text,
   v.superview_name,
   decode (v.view_type, 'XMLTYPE', '%SqlXMLView.'||v.owner||
v.view_name||'1%', ''),
   decode (v.view_type, 'XMLTYPE', '%SqlXMLView.'||v.owner||
v.view_name||'2%', '')
from sys.all_views v
[where v.owner = %.q:SCHEMA%]
```

Each comma-separated part of the header may contain the following:

- Name of variable - [required] can be any standard PDM variable (see *PDM Variables and Macros* on page 213), metamodel public name (see *Navigating in the Metamodel* on page 346) or the name of an extended attribute defined under the metaclass in the Profile (see *Profile Category (DBMS)* on page 201).
- `ID` - [optional] the variable is part of the identifier.

- `...` - [optional] the variable must be concatenated for all the lines returned by the SQL query that have the same values for the ID columns. The `ID` and `...` (ellipsis) keywords are mutually exclusive.
- Value pairs - [optional] lists conversions between retrieved values and PowerDesigner values in the following format (where `*` means all other values):

  ```
  (value1 = PDvalue1, value2 = PDvalue2, * = PDvalue3)
  ```

Example: Using ID to Define the Identifier

In this script, the identifier is defined as `TABLE + ISKEY+ CONSTNAME` through the use of the `ID` keyword:

```
{TABLE ID, ISPKEY ID, CONSTNAME ID, COLUMNS ...}
select
 t.table_name,
 1,
 null,
 c.column_name + ', ',
 c.column_id
from
 systable t,
 syscolumn c
where
etc..
```

In the resulting lines returned by the SQL script, the values of the fourth field are concatenated in the COLUMNS field as long as these ID values are identical.

```
SQL Result set
Table1,1,null,'col1,'
Table1,1,null,'col2,'
Table1,1,null,'col3,'
Table2,1,null,'col4,'
In PowerDesigner memory
Table1,1,null,'col1,col2,col3'
Table2,1,null,'col4'
```

In the example, `COLUMNS` will contain the list of columns separated by commas, and PowerDesigner will process the contents to remove the last comma.

Example: Converting Value Pairs

In this example, when the SQL query returns the value 25 or 26, it is replaced by `JAVA` in the `TYPE` variable:

```
{ADT, OWNER, TYPE(25=JAVA , 26=JAVA)}
SELECT t.type_name, u.user_name,  t.domain_id
FROM sysusertype t, sysuserperms u
WHERE [u.user_name = '%SCHEMA%' AND]
(domain_id = 25 OR domain_id = 26) AND
t.creator = u.user_id
```

Creating Queries to Retrieve Additional Attributes

You can create queries to retrieve additional attributes. These attributes could be added to `SqlAttrQuery`, but retrieving them in a separate query helps to avoid overloading that item. User-created queries are only called during reverse-engineering if their names are added to the `ReversedQueries` item.

To create a new query in a category, right-click the category and select **New > Text Item**. Enter an appropriate name, and then add the name to the `ReversedQueries` item.

For example, in the Oracle family of DBMSs, `SqlColnListQuery` is defined in the View category:

```
{OWNER ID, VIEW ID, VIEWCOLN ...}

select
   c.owner,
   c.table_name,
   c.column_name||', '
from
   sys.all_tab_columns c
where 1 = 1
   [and c.owner=%.q:OWNER%]
   [and c.table_name=%.q:VIEW%]
order by
   1, 2, c.column_id
```

This query retrieves view columns, and is enabled by adding it to `ReversedQueries` in the View category.

Note: Subqueries that are called with the `EX` keyword from within `SqlAttrQuery` or other queries (see *Calling Sub-Queries with the EX Keyword* on page 130) do not need to be added to `ReversedQueries`.

Calling Sub-Queries with the EX Keyword

DBMS system tables may store information to be reversed in columns with LONG, BLOB, TEXT and other incompatible data types, which PowerDesigner cannot directly concatenate into strings.

You can bypass this limitation by using the *EX* keyword and creating user-defined queries and variables in the existing reverse engineering queries with the syntax:

```
%UserDefinedQueryName.UserDefinedVariableName%
```

These user-defined variables are evaluated by sub-queries that you write.

In the following example, the value of OPTIONS is marked as containing a user-defined query, and we see in the body of the query that the 'global partition by range' option contains a user-defined query called :'SqlPartIndexDef', which seeks values for the variables 'i.owner' and 'i.index_name':

```
{OWNER, TABLE, CONSTNAME, OPTIONS EX}

select
 c.owner,
 c.table_name,
 c.constraint_name,
    ...
    'global partition by range
        (%SqlPartIndexDef.'||i.owner||i.index_name||'%)',
    ...
```

Note: Extended queries are not be added to the `ReversedQueries` item.

1. A query is executed to evaluate variables in a set of string statements. If the `EX` keyword is present in the query header, PowerDesigner searches for user-defined queries and variables to evaluate. You can create user-defined queries in any live database reverse engineering query. Each query must have a unique name.
2. The execution of the user-defined query generates a resultset containing pairs of user-defined variable names (without %) and variable value for each of the variables as needed. For example, in the following resultset, the query returns 3 rows and 4 columns by row:

Variable 1	1	Variable 2	2
Variable 3	3	Variable 4	4
Variable 5	5	Variable 6	6

3. These values replace the user-defined variables in the original query.

Live Database Reverse Engineering Physical Options

During reverse engineering, physical options are concatenated in a single string statement. However, when the system tables of a database are partitioned (like in Oracle) or fragmented (like in Informix), the partitions/fragments share the same logical attributes but their physical properties like storage specifications, are stored in each partition/fragment of the database. The columns in the partitions/fragments have a data type (LONG) that allows storing larger amount of unstructured binary information.

Since physical options in these columns cannot be concatenated in the string statement during reverse engineering, `SqlOptsQuery` (Tables category in the DBMS) contains a call to a user-defined query that will evaluate these physical options.

In Informix SQL 9, `SqlOptsQuery` is delivered by default with the following user-defined queries and variables (the following is a subset of `SqlOptsQuery`):

```
select
 t.owner,
 t.tabname,
 '%SqlFragQuery.FragSprt'||f.evalpos||'% %FragExpr'||f.evalpos||'%
in %FragDbsp'||f.evalpos||'% ',
 f.evalpos
from
 informix.systables t,
 informix.sysfragments f
where
 t.partnum = 0
 and t.tabid=f.tabid
[  and t.owner = '%SCHEMA%']
[  and t.tabname='%TABLE%']
```

After the execution of `SqlOptsQuery`, the user-defined query `SqlFragQuery` is executed to evaluate `FragDbsp` n, `FragExpr` n, and `FragSprt` n. n stands for `evalpos` which defines fragment position in the fragmentation list. n allows to assign unique names to variables, whatever the number of fragment defined in the table.

`FragDbsp` n, `FragExpr` n, and `FragSprt` n are user-defined variables that will be evaluated to recover information concerning the physical options of fragments in the database:

User-defined variable	Physical options
FragDbsp n	Fragment location for fragment number n
FragExpr n	Fragment expression for fragment number n
FragSprt n	Fragment separator for fragment number n

`SqlFragQuery` is defined as follows:

```
{A, a(E="expression", R="round robin", H="hash"), B, b, C, c, D,
d(0="", *=",")}
select
 'FragDbsp'||f.evalpos, f.dbspace,
 'FragExpr'||f.evalpos, f.exprtext,
 'FragSprt'||f.evalpos, f.evalpos
from
 informix.systables t,
 informix.sysfragments f
where
 t.partnum = 0
 and f.fragtype='T'
 and t.tabid=f.tabid
[  and t.owner = '%SCHEMA%']
[  and t.tabname='%TABLE%']
```

The header of `SqlFragQuery` contains the following variable names.

```
{A, a(E="expression", R="round robin", H="hash"), B, b, C, c, D,
d(0="", *=",")}
```

Only the translation rules defined between brackets will be used during string concatenation: "FragSprt0", which contains 0 (f.evalpos), will be replaced by " ", and "FragSprt1", which contains 1, will be replaced by ","

`SqlFragQuery` generates a numbered resultset containing as many pairs of user-defined variable name (without %) and variable value as needed, if there are many variables to evaluate.

The user-defined variable names are replaced by their values in the string statement for the physical options of fragments in the database.

Live Database Reverse Engineering Function-based Index

In Oracle 8i and later versions, you can create indexes based on functions and expressions that involve one or more columns in the table being indexed. A function-based index precomputes the value of the function or expression and stores it in the index. The function or the expression will replace the index column in the index definition.

An index column with an expression is stored in system tables with a LONG data type that cannot be concatenated in a string statement during reverse engineering.

To bypass this limitation, `SqlListQuery` (Index category in the DBMS) contains a call to the user-defined query `SqlExpression` used to recover the index expression in a column with the LONG data type and concatenate this value in a string statement (the following is a subset of `SqlListQuery`):

```
select
 '%SCHEMA%',
 i.table_name,
 i.index_name,
 decode(i.index_type, 'BITMAP', 'bitmap', ''),
 decode(substr(c.column_name, 1, 6), 'SYS_NC',
'%SqlExpression.Xpr'||i.table_name||i.index_name||
c.column_position||'%', c.column_name)||' '||c.descend||', ',
 c.column_position
from
 user_indexes i,
 user_ind_columns c
where
 c.table_name=i.table_name
 and c.index_name=i.index_name
[  and i.table_owner='%SCHEMA%']
[  and i.table_name='%TABLE%']
[  and i.index_name='%INDEX%']
```

The execution of `SqlListQuery` calls the execution of the user-defined query `SqlExpression`.

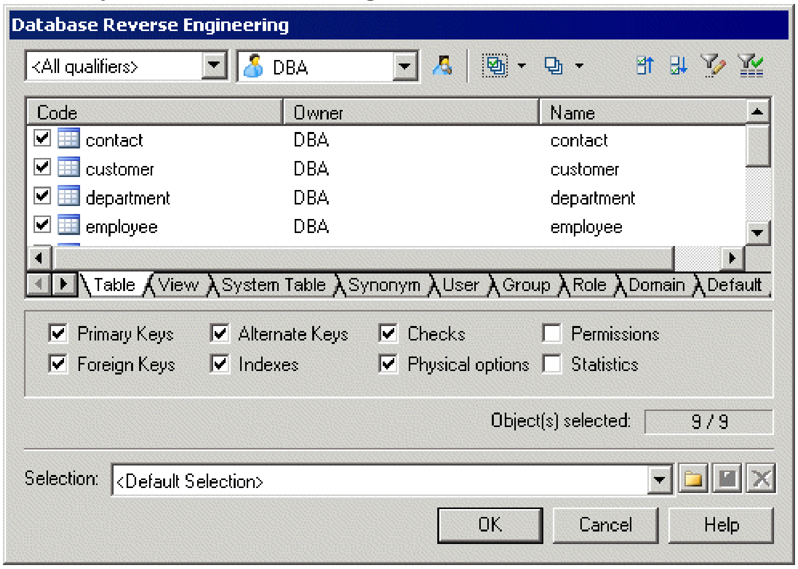
`SqlExpression` is followed by a user-defined variable defined as follow:

```
{VAR, VAL}

select
 'Xpr'||table_name||index_name||column_position,
 column_expression
from
 all_ind_expressions
where 1=1
[  and table_owner='%SCHEMA%']
[  and table_name='%TABLE%']
```

The name of the user-defined variable is unique, it is the result of the concatenation of "Xpr", table name, index name, and column position.

Live Database Reverse Engineering Qualifiers

A qualifier allows the use of the object qualifier that is displayed in the dropdown list box in the upper left corner of the Database Reverse Engineering dialog box. You use a qualifier to select which objects are to be reverse engineered.



<All qualifiers> DBA

Code	Owner	Name
✓ contact	DBA	contact
✓ customer	DBA	customer
✓ department	DBA	department
✓ employee	DBA	employee

[✓] Primary Keys [✓] Alternate Keys [✓] Checks [ ] Permissions
[✓] Foreign Keys [✓] Indexes [✓] Physical options [ ] Statistics

Object(s) selected: 9 / 9

Selection: <Default Selection>

You can add a qualifier section when you customize your DBMS. This section must contain the following items:

- enable: YES/NO
- SqlListQuery (script) : this item contains the SQL query that is executed to retrieve the qualifier list. You should not add a Header to this query

The effect of these items are shown in the table below:

Enable	SqlListQuery present?	Result
Yes	Yes	Qualifiers are available for selection. Select one as required. You can also type the name of a qualifier. SqlListQuery is executed to fill the qualifier list
	No	Only the default (All qualifiers) is selected. You can also type the name of a qualifier
No	No	Dropdown list box is grayed.

Example

In Adaptive Server Anywhere 7, a typical qualifier query is:

```
.Qualifier.SqlListQuery :
select dbspace_name from sysfile
```

Defining Generation and Reverse-Engineering of New Metaclasses

You can extend your DBMS to include new metaclasses that are not present in the standard PowerDesigner metamodel. Many DBMSs contain such metaclasses, which are defined by creating a stereotype on an existing metaclass, and you can also create your own. To include these objects in generation and reverse-engineering, you must add them to the `Script/Objects` category, and define appropriate SQL statements and queries.

1. Create a new metaclass in your DBMS definition file by defining a new stereotype on an existing metaclass and selecting the **Use as metaclass** option (see *Creating New Metaclasses with Stereotypes* on page 37).
2. Define appropriate extended attributes (see *Extended Attributes (Profile)* on page 39) and other extensions as appropriate to accurately define the nature of your object.
3. Right-click the `Script/Objects` category, select **Add Items**, select your new object in the list, and then click **OK** to add it to the category.
4. Right-click the new object entry, and select **Add Items** to add the necessary script items to it. As a minimum, to enable the generation and reverse engineering of the object, you must add the following items:
   - `Create`
   - `Drop`
   - `AlterStatementList`
   - `SqlAttrQuery`
   - `SqlListQuery`
5. Click **OK** to add these script items to your object, and enter the appropriate SQL statements and queries. You will need to enter values for each of these items. For guidance on syntax, see *Common Object Items* on page 145.
6. [optional] To control the order in which this and other objects will be generated, use the `Generation Order` item (see *Script/Objects Category (DBMS)* on page 143).

Adding Scripts Before or After Generation and Reverse Engineering

You can specify scripts to be used before or after database generation or reverse engineering.

1. Open the Profile folder. If there is no entry for Model, then right-click the Profile folder and select **Add Metaclasses**.
2. On the PdPDM sub-tab, select Model and then click **OK** to add the Model item to the Profile folder.

3. Right-click the Model item, and select **New > Event Handler** (see *Event Handlers (Profile)* on page 76).
4. Select one or more of the following event handlers depending on where you want to add a script:
   - BeforeDatabaseGenerate
   - AfterDatabaseGenerate
   - BeforeDatabaseReverseEngineer
   - AfterDatabaseReverseEngineer
5. Click **OK** to add the selected event handlers to the Model item.
6. Select each of the event handlers in turn, click its **Event Handler Script** tab, and enter the desired script.
7. Click **OK** to confirm your changes and return to the model.

General Category (DBMS)

The General category is located directly beneath root, and contains high-level items that define the basic behavior of the DBMS.

Item	Description
EnableCheck	Specifies whether the generation of check parameters is authorized. The following settings are available. If this item is set to `No`, no variables linked to check parameters will be evaluated during generation and reverse-engineering.
EnableConstName	Specifies whether constraint names are supported by the DBMS. If this item is set to `Yes`, table and column constraint names are generated in addition to the constraints themselves.
EnableIntegrity	Specifies whether integrity constraints are supported by the DBMS. If this item is set to `Yes`, primary, alternate, and foreign key check boxes are available for database generation and modification
EnableMultiCheck	Specifies whether the generation of multiple check parameters for tables and columns is supported by the DBMS. If this item is set to `Yes`, multiple check parameters are generated, with the first constraint concatenating all the validation business rules, and additional constraints generated for each constraint business rules attached to the object. If this item is set to `No`, all business rules (validation and constraint) are concatenated into a single constraint expression.
SchemaStereotype	Specifies the user stereotype to be used to indicate a schema (object owner).
SqlSupport	Specifies whether SQL syntax is supported by the DBMS. If this item is set to `Yes`, SQL syntax is supported and the SQL Preview is available.

Item	Description
UniqConstName	Specifies whether unique constraint names for objects are required by the DBMS. If this item is set to `Yes`, all constraint names (including index names) must be unique in the database. Otherwise constraint names must be unique only at the object level.
UserStereotype	Specifies the user stereotype to be used to indicate a user (permissions grantee).

Script/Sql Category (DBMS)

The SQL category is located in the **Root > Script** category and contains sub-categories that define the SQL syntax for the DBMS.

Syntax Category (DBMS)

The Syntax category is located in the **Root > Script > SQL** category, and contains the following items that define the DBMS-specific syntax:

Item	Description
BlockComment	Specifies the character used to enclose a multi-line commentary. Example: `/* */`
BlockTerminator	Specifies the end of block character, which is used to end expressions for triggers and stored procedures.
Delimiter	Specifies the field separation character.
IdentifierDelimiter	Specifies the identifier delimiter character. When the beginning and end delimiters are different, they must be separated by a space character.
LineComment	Specifies the character used to enclose a single line commentary. Example: `%%`
Quote	Specifies the character used to enclose string values. Note that the same quote must be used in the check parameter tab to enclose reserved words used as default.
SqlContinue	Specifies the continuation character. Some databases require a continuation character when a statement is longer than a single line. For the correct character, refer to your DBMS documentation. This character is attached to each line just prior to the linefeed.

Item	Description
Terminator	Specifies the end of statement character, which is used to terminate create table, view, index, or the open/close database, and other statements. If empty, `BlockTerminator` is used instead.
UseBlockTerm	Specifies the use of `BlockTerminator`. The following settings are available: • Yes - `BlockTerminator` is always used • No - `BlockTerminator` is used for triggers and stored procedures only

Format Category (DBMS)

The Format category is located in the **Root > Script > SQL** category, and contains the following items that define script formatting:

Item	Description
AddQuote	Specifies that object codes are systematically enquoted during the generation. The following settings are available: • Yes – Quotes are systematically added to object codes during generation • No - Object codes are generated without quotes
CaseSensitivityU-singQuote	Specifies if the case sensitivity for identifiers is managed using double quotes. Enable this option if the DBMS you are using needs double quotes to preserve the case of object codes.
DateTimeFormat / OdbcDateTimeFor-mat / DateFormat / OdbcDateFormat / TimeFormat / OdbcTimeFormat	Specify the format for generating date and time test data to a script or live database connection. • `yyyy`/`yy`, `mm`, `dd` - Years, months, and days. • `HH`, `MM`, `SS` - Hours, minutes, and seconds. For example, you can define the following value for the `DateTimeFor-mat` item for SQL: `yy-mm-dd HH:MM`. Consult the `Script\DataType\PhysDataType` item (see *Script/Data Type Category (DBMS)* on page 198) to see how PowerDesigner con-verts the date and time data types in your DBMS into its internal conceptual data types.

Item	Description
EnableOwnerPrefix / EnableDtbsPrefix	Specifies that object codes can be prefixed by the object owner (`%OWNER%`), the database name (`%DBPREFIX%`), or both (`%QUALIFIER%`). The following settings are available: • Yes – enables the Owner Prefix and/or Database Prefix options in the Database Generation dialog to require one or both prefixes for objects. • No - The Owner Prefix and Database Prefix options are unavailable **Note:** `EnableOwnerPrefix` enables the **Ignore identifying owner** model option for tables and views.

IllegalChar	[generation only] Specifies invalid characters for names. If there is an illegal character in a Code, the code is set between quotes during generation.
	Example:
	`+-*/!=<>'"()`
	If the name of the table is "SALES+PROFITS", the generated create statement will be:
	`CREATE TABLE "SALES+PROFITS"`
	Double quotes are placed around the table name to indicate that an invalid character is used. During reverse engineering, any illegal character is considered as a separator unless it is located within a quoted name.

LowerCaseOnly / UpperCaseOnly	When generating a script, all objects are generated in lowercase or uppercase independently of the model Naming Conventions and the PDM codes. The following settings are available: • Yes - Forces all generated script characters to lowercase or uppercase. • No - Generates all scripts unchanged from the way objects are written in the model. **Note:** These items are mutually exclusive. If both are enabled, the script is generated in *lowercase*.
MaxScriptLen	Specifies the maximum length of a script line.

File Category (DBMS)

The File category is located in the **Root** > **Script** > **SQL** category, and contains the following items that define script formatting:

Item	Description
AlterHeader	Specifies header text for a modify database script.
AlterFooter	Specifies footer text for a modify database script.

Item	Description
EnableMultiFile	Specifies that multiple scripts are allowed. The following settings are available: • Yes – enables the One File Only check box in the Generate database, Generate Triggers and Procedures, and Modify Database parameters windows. If you deselect this option, a separate script is created for each table (named after the table, and with the extension defined in the `TableExt` item), and a global script summarizes all the single table script items. • The One File Only check box is unavailable, and a single script includes all the statements. The file name of the global script is customizable in the File Name field of the generation or modification windows and has the extension specified in the `ScriptExt` item. The default name for the global script is CREBAS for database generation, CRETRG for triggers and stored procedures generation, and ALTER for database modification.
Footer	Specifies the text for the database generation script footer.
Header	Specifies the text for the database generation script header.
ScriptExt	Specifies the default script extension when you generate a database or modify a database for the first time. Example: `sql`

StartCommand	Specifies the statement for executing a script. Used inside the header file of a multi-file generation to call all the other generated files from the header file.
	Example (Sybase ASE 11):
	`isql %NAMESCRIPT%`
	Corresponds to the %STARTCMD% variable (see *PDM Variables and Macros* on page 213).

TableExt	Specifies the extension of the scripts used to generate each table when the EnableMultiFile item is enabled and the "One File Only" check box is not selected in the Generate or Modify windows. Example: `sql`
TrgFooter	Specifies footer text for a triggers and procedures generation script.
TrgHeader	Header script for triggers and procedures generation.
TrgUsage1	[when using a single script] Specifies text to display in the Output window at the end of trigger and procedure generation.

Item	Description
TrgUsage2	[when using multiple scripts] Specifies text to display in the Output window at the end of trigger and procedure generation.
TriggerExt	Specifies the main script extension when you generate triggers and stored procedures for the first time. Example: `trg`
Usage1	[when using a single script] Specifies text to display in the Output window at the end of database generation.
Usage2	[when using multiple scripts] Specifies text to display in the Output window at the end of database generation.

Keywords Category (DBMS)

The Keywords category is located in the **Root** > **Script** > **SQL** category, and contains the following items that reserve keywords.

The lists of SQL functions and operators are used to populate the PowerDesigner SQL editor to propose lists of available functions to help in entering SQL code.

Item	Description

CharFunc	Specifies a list of SQL functions to use with characters and strings.
	Example:
	`char()`
	`charindex()`
	`char_length() etc`

Commit	Specifies a statement for validating the transaction by live connection.
ConvertAnyTo-String	Specifies a function to convert any type to a string.
ConvertDateTo-Month, ConvertDa-teToQuarter, Con-vertDateToYear	Specifies a function to extract the relevant period from a date.

ConvertFunc	Specifies a list of SQL functions to use when converting values between hex and integer and handling strings.
	Example:
	`convert()`
	`hextoint()`
	`inttohex() etc`

Item	Description

DateFunc	Specifies a list of SQL functions to use with dates.
	Example:
	`dateadd()`
	`datediff()`
	`datename() etc`

GroupFunc	Specifies a list of SQL functions to use with group keywords.
	Example:
	`avg()`
	`count()`
	`max() etc`

ListOperators	Specifies a list of SQL operators to use when comparing values, boolean, and various semantic operators.
	Example:
	`=`
	`!=`
	`not like etc`

NumberFunc	Specifies a list of SQL functions to use with numbers.
	Example:
	`abs()`
	`acos()`
	`asin() etc`

OtherFunc	Specifies a list of SQL functions to use when estimating, concatenating and SQL checks.
	Example:
	`db_id()`
	`db_name()`
	`host_id() etc`

Reserved Default	Specifies a list of keywords that may be used as default values. If a reserved word is used as a default value, it will not be enquoted.
	Example (SAP® Sybase® SQL Anywhere® 10) - USER is a reserved default value:
	`Create table CUSTOMER (`
	`Username varchar(30) default USER`
	`)`
	When you run this script, CURRENT DATE is recognized as a reserved default value.

Item	Description
ReservedWord	Specifies a list of reserved keywords. If a reserved word is used as an object code, it is enquoted during generation (using quotes only in **DBMS > Script > SQL > Syntax > Quote**).
StringConcatena-tionOperator	Specifies the operator used to concatenate two strings.

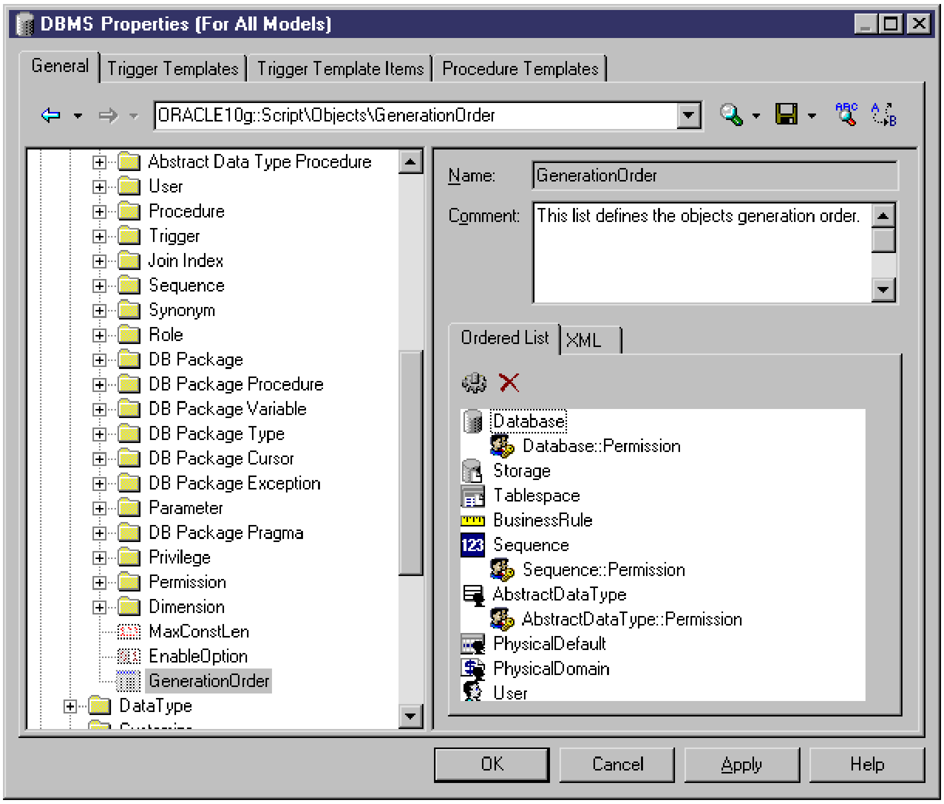
Script/Objects Category (DBMS)

The Objects category is located in the **Root > Script > SQL** category (and, possibly within **Root > ODBC > SQL**), and contains the following items that define the database objects that will be available in your model.

The following items are located in the **Root > Script > Objects** and **Root > ODBC > Objects** categories, and apply to all objects:

- MaxConstLen - Specifies the maximum constraint name length supported by the target database for tables, columns, primary and foreign keys. This value is used during model checking and returns an error if the code exceeds the defined value. The constraint name is also truncated at generation time.

  Note: PowerDesigner has a maximum length of 254 characters for constraint names. If your database supports longer constraint names, you must define the constraint names to fit in 254 characters or less.
- EnableOption - Specifies that physical options are supported by the target DBMS for the model, tables, indexes, alternate keys, and other objects and enables the display of the **Options** tab in object property sheets. For more information, see *Physical Options (DBMS)* on page 208.
- GenerationOrder - Specifies the generation order of database objects. Drag and drop entries in the **Ordered List** tab to adjust the order in which objects will be created.



Name: GenerationOrder

Comment: This list defines the objects generation order.

Note: If an object does not appear on the list, it will still be generated, but after the listed objects. You can add and remove items using the tools on the tab. Sub-objects, such as `Sequence::Permissions`, can be placed directly below their parent object in the list (where they will be indented to demonstrate their parentage) or separately, in which case they will be displayed without indentation. Extended objects (see *Defining Generation and Reverse-Engineering of New Metaclasses* on page 135) cannot be added to this list, and are generated after all other objects.

Common Object Items

The following items are available in various objects located in the **Root** > **Script** > **Objects** category.

Item	Description

Add	Specifies the statement required to add the object inside the creation statement of another object.
	
	Example (adding a column):
	
	`%20:COLUMN% %30:DATATYPE% [default %DEFAULT%]`
	`[%IDENTITY%?identity:[%NULL%][%NOTNULL%]]`
	`[[constraint %CONSTNAME%] check (%CONSTRAINT%)]`

Alter	Specifies the statement required to alter the object.
AlterDBIgnored	Specifies a list of attributes that should be ignored when performing a comparison before launching an update database.
AlterStatementList	Specifies a list of attributes which, when changed, should give rise to an alter statement. Each attribute in the list is mapped to the alter statement that should be used.
BeforeCreate/ AfterCreate / BeforeDrop / AfterDrop / BeforeModify / AfterModify	Specify extended statements executed before or after the main Create, Drop or Modify statements (see *Script Generation* on page 123).
ConstName	Specifies a constraint name template for the object. The template controls how the name of the object will be generated. The template applies to all the objects of this type for which you have not defined an individual constraint name. The constraint name that will be applied to an object is displayed in its property sheet. Examples (ASE 15): • Table: CKT_%.U26:TABLE% • Column: CKC_%.U17:COLUMN%_%.U8:TABLE% • Primary Key: PK_%.U27:TABLE%
Create	[generation and reverse] Specifies the statement required to create the object. Example: `create table %TABLE%`

Item	Description
DefOptions	Specifies default values for physical options (see *Physical Options (DBMS)* on page 208) that will be applied to all objects. These values must respect SQL syntax. Example: `in default_tablespace`

Drop	Specifies the statement required to drop the object.
	
	Example (SQL Anywhere 10):
	```
	if exists( select 1 from sys.systable
	  where table_name=%.q:TABLE%
	  and table_type in ('BASE', 'GBL TEMP')[%QUALI-
	FIER%?
	  and creator=user_id(%.q:OWNER%)]
	) then drop table [%QUALIFIER%]%TABLE%
	end if
	```

Enable	Specifies whether an object is supported.

EnableOwner	Enables the definition of owners for the object. The object owner can differ from the owner of the parent table. The following settings are available:
	
	• Yes - The Owner list is enabled in the object's property sheet.
	• No – Owners are not supported for the object.
	
	Note that, in the case of index owners, you must ensure that the Create statement takes into account the table and index owner. For example, in Oracle 9i, the Create statement of an index is the following:
	```
	create [%UNIQUE%?%UNIQUE% :[%INDEXTYPE% ]]index
	[%QUALIFIER%]%INDEX% on [%CLUSTER%?cluster C_%TA-
	BLE%:[%TABLQUALIFIER%]%TABLE% (
	 %CIDXLIST%
	)]
	[%OPTIONS%]
	```
	Where %QUALIFIER% refers to the current object (index) and %TABL-QUALIFIER% refers to the parent table of the index.

EnableSynonym	Enables support for synonyms on the object.
Footer / Header	Specify the object footer and header. The contents are inserted directly after or before each `create object` statement.
MaxConstLen	Specifies the maximum constraint name length supported for the object in the target database, where this value differs from the default specified in `MaxConstLen` (see .*Script/Objects Category (DBMS)* on page 143).

Item	Description
MaxLen	Specifies the maximum code length for an object. This value is used when checking the model and produces an error if the code exceeds the defined value. The object code is also truncated at generation time.

Modifiable Attributes	Specifies a list of extended attributes that will be taken into account in the merge dialog during database synchronization (see *Script Generation* on page 123).
	Example (ASE 12.5):
	`ExtTablePartition`

Options	Specifies physical options (see *Physical Options (DBMS)* on page 208) available to apply when creating an object.
	Example (ASA 6):
	`in %s : category=tablespace`

Permission	Specifies a list of available permissions for the object. The first column is the SQL name of permission (SELECT for example), and the second column is the shortname that is displayed in the title of grid columns.
	Example (table permissions in ASE 15):
	`SELECT / Sel`
	`INSER / Ins`
	`DELETE / Del`
	`UPDATE / Upd`
	`REFERENCES / Ref`

Reversed Queries	Specifies a list of additional attribute queries to be called during live database reverse engineering (see *Live Database Reverse Engineering* on page 127).
Reversed Statements	Specifies a list of additional statements that will be reverse engineered (see *Script Reverse Engineering* on page 126).

SqlAttrQuery	Specifies a SQL query to retrieve additional information on objects reversed by `SQLListQuery`.
	Example (Join Index in Oracle 10g):
	`{OWNER ID, JIDX ID,  JIDXWHERE ...}`
	`select index_owner, index_name,`
	`outer_table_owner || '.' || outer_table_name ||`
	`'.' || outer_table_column || '=' || inner_ta-`
	`ble_owner || '.' || inner_table_name || '.' || in-`
	`ner_table_column || ','`
	`from all_join_ind_columns`
	`where 1=1`
	`[  and index_owner=%.q:OWNER%]`
	`[  and index_name=%.q:JIDX%]`

Item	Description

SqlListQuery	Specifies a SQL query for listing objects in the reverse engineering dialog. The query is executed to fill header variables and create objects in memory.
	
	Example (Dimension in Oracle 10g):
	
	`{ OWNER, DIMENSION }`
	`select d.owner, d.dimension_name`
	`from sys.all_dimensions d`
	`where 1=1`
	`[  and d.dimension_name=%.q:DIMENSION%]`
	`[  and d.owner=%.q:SCHEMA%]`
	`order by d.owner, d.dimension_name`

SqlOptsQuery	Specifies a SQL query to retrieve physical options from objects reversed by `SqlListQuery`. The result of the query will fill the variable %OPTIONS% and must respect SQL syntax.
	
	Example (Table in SQL Anywhere 10):
	
	`{OWNER, TABLE, OPTIONS}`
	`select u.user_name, t.table_name,`
	` 'in '+ f.dbspace_name`
	`from sys.sysuserperms u`
	` join sys.systab t on (t.creator = u.user_id)`
	` join sys.sysfile f on (f.file_id = t.file_id)`
	`where f.dbspace_name <> 'SYSTEM'`
	` and t.table_type in (1, 3, 4)`
	`[  and t.table_name = %.q:TABLE%]`
	`[  and u.user_name = %.q:OWNER%]`

SqlPermQuery	Specifies a SQL query to reverse engineer permissions granted on the object.
	
	Example (Procedure in SQL Anywhere 10):
	
	`{ GRANTEE, PERMISSION}`
	`select`
	`u.user_name grantee, 'EXECUTE'`
	`from sysuserperms u, sysprocedure s, sysprocperm p`
	`where (s.proc_name = %.q:PROC% ) and`
	`(s.proc_id = p.proc_id) and`
	`(u.user_id = p.grantee)`

Default Variable

In a column, if the type of the default variable is text or string, the query must retrieve the value of the default variable between quotes. Most DBMS automatically add these quotes to the value of the default variable. If the DBMS you are using does not add quotes automatically, you have to specify it in the different queries using the default variable.

For example, in IBM DB2 UDB 8 for OS/390, the following line has been added in SqlListQuery in order to add quotes to the value of the default variable:

```
...
 case(default) when '1' then '''' concat defaultvalue concat ''''
when '5' then '''' concat defaultvalue concat '''' else defaultvalue
end,
...
```

Table Category (DBMS)

The Table category is located in the **Root** > **Script** > **Objects** category, and can contain the following items that define how tables are modeled for your DBMS.

Item	Description
[Common items]	The following common object items may be defined for tables: • AfterCreate, AfterDrop, AfterModify • BeforeCreate, BeforeDrop, BeforeModify • ConstName • Create, Drop • Enable, EnableSynonym • Header, Footer • Maxlen, MaxConstLen • ModifiableAttributes • Options, DefOptions • Permission • ReversedQueries, ReversedStatements • SqlAttrQuery, SqlListQuery, SqlOptsQuery, SqlPermQuery For a description of each of these common items, see *Common Object Items* on page 145.

AddTableCheck	Specifies a statement for customizing the script to modify the table constraints within an `alter table` statement.
	Example (SQL Anywhere 10):
	`alter table [%QUALIFIER%]%TABLE%`
	`  add [constraint %CONSTNAME% ]check (%.A:CON-`
	`STRAINT%)`

AllowedADT	Specifies a list of abstract data types on which a table can be based. This list populates the Based On field of the table property sheet.
	You can assign an abstract data type to a table, the table will use the properties of the type and the type attributes become table columns.
	Example (Oracle 10g):
	`OBJECT`

Item	Description
AlterTable Footer	Specifies a statement to be placed after `alter table` statements (and before the terminator). Example: `AlterTableFooter = /* End of alter statement */`
AlterTable Header	Specifies a statement to be placed before `alter table` statements. You can place an alter table header in your scripts to document or perform initialization logic. Example: `AlterTableHeader = /* Table name: %TABLE% */`
DefineTable Check	Specifies a statement for customizing the script of table constraints (checks) within a `create table` statement. Example: `check (%CONSTRAINT%)`

DropTable Check	Specifies a statement for dropping a table check in an `alter table` statement.
	Example:
	`alter table [%QUALIFIER%]%TABLE%`
	`  delete check`

InsertIdentityOff	Specifies a statement for enabling insertion of data into a table containing an identity column.
	Example (ASE 15):
	`set identity_insert [%QUALIFIER%]%@OBJTCODE% off`

InsertIdentityOn	Specifies a statement for disabling insertion of data into a table containing an identity column.
	Example (ASE 15):
	`set identity_insert [%QUALIFIER%]%@OBJTCODE% on`

Item	Description

Rename	[modify] Specifies a statement for renaming a table. If not specified, the modify database process drops the foreign key constraints, creates a new table with the new name, inserts the rows from the old table in the new table, and creates the indexes and constraints on the new table using temporary tables.
	Example (Oracle 10g):
	`rename %OLDTABL% to %NEWTABL%`
	The %OLDTABL% variable is the code of the table before renaming, and the %NEWTABL% variable is the new code.

SqlChckQuery	Specifies a SQL query to reverse engineer table checks.
	Example (SQL Anywhere 10):
	`{OWNER, TABLE, CONSTNAME, CONSTRAINT}`
	`select u.user_name, t.table_name,`
	` k.constraint_name,`
	` case(lcase(left(h.check_defn, 5))) when 'check' then substring(h.check_defn, 6) else h.check_defn end`
	`from sys.sysconstraint k`
	` join sys.syscheck h on (h.check_id = k.constraint_id)`
	` join sys.systab t on (t.object_id = k.table_object_id)`
	` join sys.sysuserperms u on (u.user_id = t.creator)`
	`where k.constraint_type = 'T'`
	` and t.table_type in (1, 3, 4)`
	`[  and u.user_name = %.q:OWNER%]`
	`[  and t.table_name = %.q:TABLE%]`
	`order by 1, 2, 3`

Item	Description

SqlListRefr Tables	Specifies a SQL query used to list the tables referenced by a table.
	Example (Oracle 10g):
	`{OWNER, TABLE, POWNER, PARENT}`
	`select c.owner, c.table_name, r.owner,`
	` r.table_name`
	`from sys.all_constraints c,`
	` sys.all_constraints r`
	`where (c.constraint_type = 'R' and c.r_con-`
	`straint_name = r.constraint_name and c.r_owner =`
	`r.owner)`
	`[ and c.owner = %.q:SCHEMA%]`
	`[ and c.table_name = %.q:TABLE%]`
	`union select c.owner, c.table_name,`
	` r.owner, r.table_name`
	`from sys.all_constraints c,`
	` sys.all_constraints r`
	`where (r.constraint_type = 'R' and r.r_con-`
	`straint_name = c.constraint_name and r.r_owner =`
	`c.owner)`
	`[ and c.owner = %.q:SCHEMA%]`
	`[ and c.table_name = %.q:TABLE%]`

SqlListSchema	Specifies a query used to retrieve registered schemas in the database. This item is used with tables of XML type (a reference to an XML document stored in the database).
	When you define an XML table, you need to retrieve the XML documents registered in the database in order to assign one document to the table, this is done using the SqlListSchema query.
	Example (Oracle 10g):
	`SELECT schema_url FROM dba_xml_schemas`

SqlStatistics	Specifies a SQL query to reverse engineer column and table statistics. See SqlStatistics in *Column Category (DBMS)* on page 153.
SqlXMLTable	Specifies a sub-query used to improve the performance of SqlAttrQuery (see *Common Object Items* on page 145).

TableComment	[generation and reverse] Specifies a statement for adding a table comment. If not specified, the Comment check box in the Tables and Views tabs of the Database Generation box is unavailable.
	Example (Oracle 10g):
	`comment on table [%QUALIFIER%]%TABLE% is`
	`%.q:COMMENT%`
	The %TABLE% variable is the name of the table defined in the List of Tables, or in the table property sheet. The %COMMENT% variable is the comment defined in the Comment textbox of the table property sheet.

Item	Description
TypeList	Specifies a list of types (for example, DBMS: relational, object, XML) for tables. This list populates the Type list of the table property sheet. The XML type is to be used with the SqlListSchema item.
UniqConstraint Name	Specifies whether the same name for index and constraint name may be used in the same table. The following settings are available: • Yes – The table constraint and index names must be different, and this will be tested during model checking • No - The table constraint and index names can be identical

Column Category (DBMS)

The Column category is located in the **Root > Script > Objects** category, and can contain the following items that define how columns are modeled for your DBMS.

Item	Description
[Common items]	The following common object items may be defined for columns: • Add • AfterCreate, AfterDrop, AfterModify • BeforeCreate, BeforeDrop, BeforeModify • ConstName • Create, Drop • Enable • Maxlen, MaxConstLen • ModifiableAttributes • Options, DefOptions • Permission • ReversedQueries, ReversedStatements • SqlAttrQuery, SqlListQuery, SqlOptsQuery, SqlPermQuery For a description of each of these common items, see *Common Object Items* on page 145.

AddColnCheck	Specifies a statement for customizing the script for modifying column constraints within an alter table statement.
	
	Example (Oracle 10g):
	
	`alter table [%QUALIFIER%]%TABLE%`
	` add [constraint %CONSTNAME%] check (%.A:CONSTRAINT%)`

Item	Description

AlterTableAdd Default	Specifies a statement for defining the default value of a column in an alter statement.
	
	Example (SQL Server 2005):
	
	`[[ constraint %ExtDeftConstName%] default %DEFAULT% ]for %COLUMN%`

AltEnableAdd ColnChk	Specifies if a column check constraint, built from the check parameters of the column, can or cannot be added in a table using an `alter table` statement. The following settings are available: • Yes - `AddColnChck` can be used to modify the column check constraint in an `alter table` statement. • No - PowerDesigner copies data to a temporary table before recreating the table with the new constraints. See also `AddColnChck`.
AltEnableTS Copy	Enables timestamp columns in insert statements.

Bind	Specifies a statement for binding a rule to a column.
	
	Example (ASE 15):
	
	`[%R%?[exec ]][execute ]sp_bindrule [%R%?['[%QUALIFIER%]%RULE%'][[%QUALIFIER%]%RULE%]:['[%QUALIFIER%]%RULE%']], '%TABLE%.%COLUMN%'`

CheckNull	Specifies whether a column can be null.
Column Comment	Specifies a statement for adding a comment to a column. Example: `comment on column [%QUALIFIER%]%TABLE%.%COLUMN% is %.q:COMMENT%`
DefineColn Check	Specifies a statement for customizing the script of column constraints (checks) within a `create table` statement. This statement is called if the create, add, or alter statements contain %CONSTDEFN%. Example: `[constraint %CONSTNAME%] check (%CONSTRAINT%)`

Item	Description

DropColnChck	Specifies a statement for dropping a column check in an `alter table` statement. This statement is used in the database modification script when the check parameters have been removed on a column.
	
	If `DropColnChck` is empty, PowerDesigner copies data to a temporary table before recreating the table with the new constraints.
	
	Example (SQL Anywhere 10):
	
	`alter table [%QUALIFIER%]%TABLE%`
	` drop constraint %CONSTNAME%`

DropColnComp	Specifies a statement for dropping a column computed expression in an alter table statement.
	
	Example (SQL Anywhere 10):
	
	`alter table [%QUALIFIER%]%TABLE%`
	` alter %COLUMN% drop compute`

DropDefault Constraint	Specifies a statement for dropping a constraint linked to a column defined with a default value
	
	Example (SQL Server 2005):
	
	`[%ExtDeftConstName%?alter table [%QUALIFIER%]%TA-`
	`BLE%`
	` drop constraint %ExtDeftConstName%]`

EnableBindRule	Specifies whether business rules may be bound to columns for check parameters. The following settings are available: • Yes - The Create and Bind entry of Rule are generated • No - The check is generated inside the column Add order
Enable ComputedColn	Specifies whether computed columns are permitted.

Item	Description

EnableDefault	Specifies whether predefined default values are permitted. The following settings are available:
	• Yes - The default value (if defined) is generated for columns. It can be defined in the check parameters for each column. The %DEFAULT% variable contains the default value. The Default Value check box for columns must be selected in the Tables & Views tabs of the Database Generation box
	• No - The default value can not be generated, and the Default Value check box is unavailable.
	Example (AS IQ 12.6):
	EnableDefault is enabled and the default value for the column employee function `EMPFUNC` is Technical Engineer. The generated script is:
	`create table EMPLOYEE`
	`(`
	`  EMPNUM  numeric(5)    not null,`
	`  EMP_EMPNUM  numeric(5)      ,`
	`  DIVNUM  numeric(5)    not null,`
	`  EMPFNAM   char(30)      ,`
	`  EMPLNAM   char(30)    not null,`
	`  EMPFUNC   char(30)`
	`  default 'Technical Engineer',`
	`  EMPSAL  numeric(8,2)      ,`
	`  primary key (EMPNUM)`
	`);`

Item	Description
EnableIdentity	Specifies whether the Identity keyword is supported. Identity columns are serial counters maintained by the database (for example Sybase and Microsoft SQL Server). The following settings are available: • Yes - Enables the Identity check box in the column property sheet. • No - The Identity check box is not available. When the Identity check box is selected, the Identity keyword is generated in the script after the column data type. An identity column is never null, and so the Mandatory check box is automatically selected. PowerDesigner ensures that: • Only one identity column is defined per table • A foreign key cannot be an identity column • The Identity column has an appropriate data type. If the Identity check box is selected for a column with an unsupported data type, the data type is changed to *numeric*. If the data type of an identity column is changed to an unsupported type, an error is displayed. Note that, during generation, the %IDENTITY% variable contains the value "identity" but you can easily change it, if needed, using the following syntax : `[%IDENTITY%?new identity keyword]`
EnableNotNull WithDflt	Specifies whether default values are assigned to columns containing Null values. The following settings are available: • Yes - The With Default check box is enabled in the column property sheet. When it is selected, a default value is assigned to a column when a Null value is inserted. • No - The With Default check box is not available.

ModifyColn Chck	Specifies a statement for modifying a column check in an `alter table` statement. This statement is used in the database modification script when the check parameters of a column have been modified in the table.
	If `AddColnChck` is empty, PowerDesigner copies data to a temporary table before recreating the table with the new constraints.
	Example (AS IQ 12.6):
	`alter table [%QUALIFIER%]%TABLE%`
	` modify %COLUMN% check (%.A:CONSTRAINT%)`
	The %COLUMN% variable is the name of the column defined in the table property sheet. The % CONSTRAINT % variable is the check constraint built from the new check parameters.
	`AltEnableAddColnChk` must be set to YES to allow use of this statement.

Item	Description

ModifyColn Comp	Specifies a statement for modifying a computed expression for a column in an alter table.
	
	Example (ASA 6):
	
	`alter table [%QUALIFIER%]%TABLE%`
	` alter %COLUMN% set compute (%COMPUTE%)`

ModifyColnDflt	Specifies a statement for modifying a column default value in an `alter table` statement. This statement is used in the database modification script when the default value of a column has been modified in the table.
	
	If `ModifyColnDflt` is empty, PowerDesigner copies data to a temporary table before recreating the table with the new constraints.
	
	Example (ASE 15):
	
	`alter table [%QUALIFIER%]%TABLE%`
	` replace %COLUMN% default %DEFAULT%`
	
	The %COLUMN% variable is the name of the column defined in the table property sheet. The %DEFAULT% variable is the new default value of the modified column.

ModifyColnNull	Specifies a statement for modifying the null/not null status of a column in an `alter table` statement.
	
	Example (Oracle 10g):
	
	`alter table [%QUALIFIER%]%TABLE%`
	` modify %COLUMN% %MAND%`

ModifyColumn	Specifies a statement for modifying a column. This is a different statement from the `alter table` statement, and is used in the database modification script when the column definition has been modified.
	
	Example (SQL Anywhere 10):
	
	`alter table [%QUALIFIER%]%TABLE%`
	` modify %COLUMN% %DATATYPE% %NOTNULL%`

NullRequired	Specifies the mandatory status of a column. This item is used with the NULLNOTNULL column variable, which can take the "null", "not null" or empty values. For more information, see *Working with Null Values* on page 160.

Rename	Specifies a statement for renaming a column within an `alter table` statement.
	
	Example (Oracle 10g):
	
	`alter table [%QUALIFIER%]%TABLE%`
	` rename column %OLDCOLN% to %NEWCOLN%`

Item	Description
SqlChckQuery	Specifies a SQL query to reverse engineer column check parameters. The result must conform to proper SQL syntax. Example (SQL Anywhere 10): `{OWNER, TABLE, COLUMN, CONSTNAME, CONSTRAINT}` `select u.user_name, t.table_name,` ` c.column_name, k.constraint_name,` ` case(lcase(left(h.check_defn, 5))) when 'check'` `then substring(h.check_defn, 6) else h.check_defn` `end` `from sys.sysconstraint k` ` join sys.syscheck h on (h.check_id = k.con-` `straint_id)` ` join sys.systab t on (t.object_id = k.table_ob-` `ject_id)` ` join sys.sysuserperms u on (u.user_id = t.creator)` ` join sys.syscolumn c on (c.object_id = k.ref_ob-` `ject_id)` `where k.constraint_type = 'C'` `[  and u.user_name=%.q:OWNER%]` `[  and t.table_name=%.q:TABLE%]` `[  and c.column_name=%.q:COLUMN%]` `order by 1, 2, 3, 4`
SqlStatistics	Specifies a SQL query to reverse engineer column and table statistics. Example (ASE 15): `[%ISLONGDTTP%?{ AverageLength }` `select [%ISLONGDTTP%?[%ISSTRDTTP%?` `avg(char_length(%COLUMN%)):avg(datalength(%COLUMN` `%))]:null] as average_length` `from [%QUALIFIER%]%TABLE%` `:{ NullValuesRate, DistinctValues, AverageLength }` `select` `[%ISMAND%?null:(count(*) - count(%COLUMN%)) * 100 /` `count(*)]  as null_values,` `[%ISMAND%?null:count(distinct %COLUMN%)]  as dis-` `tinct_values,` `[%ISVARDTTP%?[%ISSTRDTTP%?avg(char_length(%COLUMN` `%)):avg(datalength(%COLUMN%))]:null] as aver-` `age_length` `from [%QUALIFIER%]%TABLE%]`
Unbind	Specifies a statement for unbinding a rule to a column. Example (ASE 15): `[%R%?[exec ]][execute ]sp_unbindrule '%TABLE%.%COL-` `UMN%'`

Working with Null Values

The NullRequired item specifies the mandatory status of a column. This item is used with the NULLNOTNULL column variable, which can take the "null", "not null" or empty values. The following combinations are available

When the Column Is Mandatory

"not null" is always generated whether NullRequired is set to True or False as shown in the following example:

```
create domain DOMN_MAND char(33) not null;
create domain DOMN_NULL char(33)   null;

create table TABLE_1
(
 COLN_MAND_1 char(33)  not null,
 COLN_MAND_2 DOMN_MAND not null,
 COLN_MAND_3 DOMN_NULL not null,
);
```

When the Column Is not Mandatory

- If NullRequired is set to True, "null" is generated. The NullRequired item should be used in ASE for example, where nullability is a database option, and the "null" or "not null" keywords are required.

  In the following example, all "null" values are generated:

```
create domain DOMN_MAND char(33) not null;
create domain DOMN_MAND char(33)   null;

create table TABLE_1
(
 COLN_NULL_1 char(33)  null,
 COLN_NULL_2 DOMN_NULL   null,
 COLN_NULL_3 DOMN_MAND   null
)
```

- If NullRequired is set to False, an empty string is generated. However, if a column attached to a mandatory domain becomes non-mandatory, "null" will be generated.

  In the following example, "null" is generated only for COLUMN_NULL3 because this column uses the mandatory domain, the other columns generate an empty string:

```
create domain DOMN_MAND char(33) not null;
create domain DOMN_NULL char(33)   null;

create table TABLE_1
(
 COLUMN_NULL1 char(33)    ,
 COLUMN_NULL2 DOMN_NULL   ,
 COLUMN_NULL3 DOMN_MAND   null
);
```

Index Category (DBMS)

The Index category is located in the **Root > Script > Objects** category, and can contain the following items that define how indexes are modeled for your DBMS.

Item	Description
[Common items]	The following common object items may be defined for indexes: • Add • AfterCreate, AfterDrop, AfterModify • BeforeCreate, BeforeDrop, BeforeModify • Create, Drop • Enable, EnableOwner • Header, Footer • Maxlen • ModifiableAttributes • Options, DefOptions • ReversedQueries • ReversedStatements • SqlAttrQuery, SqlListQuery, SqlOptsQuery For a description of each of these common items, see *Common Object Items* on page 145. **Note:** For information about using variables in the SqlListQuery to reverse-engineering function-based indexes, see *Live Database Reverse Engineering Function-based Index* on page 133

AddColIndex	Specifies a statement for adding a column in the `Create Index` statement. This parameter defines each column in the column list of the `Create Index` statement.
	
	Example (ASE 15):
	
	`%COLUMN%[ %ASC%]`
	
	%COLUMN% is the code of the column defined in the column list of the table. %ASC% is ASC (ascending order) or DESC (descending order) depending on the Sort radio button state for the index column.

AlterIgnoreOrder	Specifies that changes in the order of the collection should not provoke a modify database order.
Cluster	Specifies the value to be assigned to the Cluster keyword. If this parameter is empty, the default value of the %CLUSTER% variable is CLUSTER.

Item	Description
CreateBefore Key	Controls the generation order of keys and indexes. The following settings are available: • Yes – Indexes are generated before keys. • No – Indexes are generated after keys.

DefIndexType	Specifies the default type of an index.
	Example (DB2):
	`Type2`

DefineIndex Column	Specifies the column of an index.
EnableAscDesc	Enables the Sort property in Index property sheets, which allows sorting in ascending or descending order. The following settings are available: • Yes – The Sort property is enabled for indexes, with Ascending selected by default. The variable %ASC% is calculated, and the ASC or DESC keyword is generated when creating or modifying the database • No – Index sorting is not supported. Example (SQL Anywhere 10): A primary key index is created on the TASK table, with the PRONUM column sorted in ascending order and the TSKNAME column sorted in descending order: `create index IX_TASK on TASK (PRONUM asc, TSKNAME desc);`
EnableCluster	Enables the creation of cluster indexes. The following settings are available: • Yes - The Cluster check box is enabled in index property sheets. • No – Cluster indexes are not supported.
EnableFunction	Enables the creation of function-based indexes. The following settings are available: • Yes - You can define expressions for indexes. • No – Function-based indexes are not supported.

IndexComment	Specifies a Statement for adding a comment to an index.
	Example (SQL Anywhere 10):
	`comment on index [%QUALIFIER%]%TABLE%.%INDEX% is %.q:COMMENT%`

Item	Description

IndexType	Specifies a list of available index types.
	
	Example (IQ 12.6):
	
	`CMP`
	`HG`
	`HNG`
	`LF`
	`WD`
	`DATE`
	`TIME`
	`DTTM`

MandIndexType	Specifies whether the index type is mandatory for indexes. The following settings are available: • Yes – The index type is mandatory. • No - The index type is not mandatory.
MaxColIndex	Specifies the maximum number of columns that may be included in an index. This value is used during model checking.

SqlSysIndex Query	Specifies a SQL query used to list system indexes created by the database. These indexes are excluded during reverse engineering.
	
	Example (AS IQ 12.6):
	
	`{OWNER, TABLE, INDEX, INDEXTYPE}`
	`select u.user_name, t.table_name, i.index_name,`
	`i.index_type`
	`from sysindex i, systable t, sysuserperms u`
	`where t.table_id = i.table_id`
	`and u.user_id = t.creator`
	`and i.index_owner != 'USER'`
	`[and u.user_name=%.q:OWNER%]`
	`[and t.table_name=%.q:TABLE%]`
	`union`
	`select u.user_name, t.table_name, i.index_name,`
	`i.index_type`
	`from sysindex i, systable t, sysuserperms u`
	`where t.table_id = i.table_id`
	`and u.user_id = t.creator`
	`and i.index_type = 'SA'`
	`[and u.user_name=%.q:OWNER%]`
	`[and t.table_name=%.q:TABLE%]`

UniqName	Specifies whether index names must be unique within the global scope of the database. The following settings are available: • Yes – Index names must be unique within the global scope of the database. • No – Index names must be unique per object

Pkey Category (DBMS)

The Pkey category is located in the **Root > Script > Objects** category, and can contain the following items that define how primary keys are modeled for your DBMS.

Item	Description
[Common items]	The following common object items may be defined for primary keys: • Add • ConstName • Create, Drop • Enable • Options, DefOptions • ReversedQueries For a description of each of these common items, see *Common Object Items* on page 145.
EnableCluster	Specifies whether clustered constraints are permitted on primary keys. • Yes - Clustered constraints are permitted. • No - Clustered constraints are not permitted.
PkAutoIndex	Determines whether a `Create Index` statement is generated for every Primary key statement. The following settings are available: • Yes - Automatically generates a primary key index with the primary key statement. If you select the primary key check box under create index when generating or modifying a database, the primary key check box of the create table will automatically be cleared, and vice versa. • No - Primary key indexes are not automatically generated. Primary key and create index check boxes can be selected at the same time.
PKeyComment	Specifies a statement for adding a primary key comment.

Item	Description

UseSpPrimKey	Specifies the use of the `Sp_primarykey` statement to generate primary keys. For a database that supports the procedure to implement key definition, you can test the value of the corresponding variable %USE_SP_PKEY% and choose between the creation key in the table or launching a procedure. The following settings are available:
	• Yes - The `Sp_primarykey` statement is used to generate primary keys.
	• No - Primary keys are generated separately in an `alter table` statement.
	Example (ASE 15):
	If UseSpPrimKey is enabled the Add entry for Pkey contains:
	`UseSpPrimKey = YES`
	`Add entry of`
	
	`[%USE_SP_PKEY%?[execute] sp_primarykey %TABLE%, %PKEYCOLUMNS%`
	`:alter table [%QUALIFIER%]%TABLE%`
	` add [constraint %CONSTNAME%] primary key [%IsClus-tered%] (%PKEYCOLUMNS%)`
	`  [%OPTIONS%]]`

Key Category (DBMS)

The Key category is located in the **Root** > **Script** > **Objects** category, and can contain the following items that define how keys are modeled for your DBMS.

Item	Description
[Common items]	The following common object items may be defined for keys: • Add • AfterCreate, AfterDrop, AfterModify • BeforeCreate, BeforeDrop, BeforeModify • ConstName • Create, Drop • Enable • MaxConstLen • ModifiableAttributes • Options, DefOptions • ReversedQueries, ReversedStatements • SqlAttrQuery, SqlListQuery, SqlOptsQuery For a description of each of these common items, see *Common Object Items* on page 145.

Item	Description
AKeyComment	Specifies a statement for adding an alternate key comment.
AllowNullable Coln	Specifies whether non-mandatory columns are permitted. The following settings are available: • Yes - Non mandatory columns are permitted. • No - Non mandatory column are not permitted.
AlterIgnoreOrder	Specifies that changes in the order of the collection should not provoke a modify database order.
EnableCluster	Specifies whether clustered constraints are permitted on alternate keys. • Yes - Clustered constraints are permitted. • No - Clustered constraints are not permitted.

SqlAkeyIndex	Specifies a reverse-engineering query for obtaining the alternate key indexes of a table by live connection.
	Example (SQL Anywhere 10):
	`select distinct  i.index_name`
	`from sys.sysuserperms u`
	`  join sys.systable t on`
	`  (t.creator=u.user_id)`
	`  join sys.sysindex i on`
	`  (i.table_id=t.table_id)`
	`where i."unique" not in ('Y', 'N')`
	`[  and t.table_name = %.q:TABLE%]`
	`[  and u.user_name = %.q:SCHEMA%]`

UniqConstAuto Index	Determines whether a `Create Index` statement is generated for every key statement. The following settings are available: • Yes - Automatically generates an alternate key index within the alternate key statement. If you select the alternate key check box under create index when generating or modifying a database, the alternate key check box of the create table will automatically be cleared, and vice versa. • No - Alternate key indexes are not automatically generated. Alternate key and create index check boxes can be selected at the same time.

Reference Category (DBMS)

The Reference category is located in the **Root > Script > Objects** category, and can contain the following items that define how references are modeled for your DBMS.

Item	Description
[Common items]	The following common object items may be defined for references: • Add • AfterCreate, AfterDrop, AfterModify • BeforeCreate, BeforeDrop, BeforeModify • ConstName • Create, Drop • Enable • MaxConstLen • ModifiableAttributes • ReversedQueries, ReversedStatements • SqlAttrQuery, SqlListQuery For a description of each of these common items, see *Common Object Items* on page 145.
CheckOn Commit	Specifies that referential integrity testing is performed only after the COMMIT. Contains the keyword used to specify a reference with the CheckOn-Commit option. Example: `CHECK ON COMMIT`
DclDelIntegrity	Specifies a list of declarative referential integrity constraints allowed for delete. The list can contain any or all of the following values, which control the availability of the relevant radio buttons on the Integrity tab of reference property sheets: • RESTRICT • CASCADE • SET NULL • SET DEFAULT

Item	Description
DclUpdIntegrity	Specifies a list of declarative referential integrity constraints allowed for update. The list can contain any or all of the following values, which control the availability of the relevant radio buttons on the Integrity tab of reference property sheets: • RESTRICT • CASCADE • SET NULL • SET DEFAULT
DefineJoin	Specifies a statement to define a join for a reference. This is another way of defining the contents of the `create reference` statement, and corresponds to the %JOINS% variable. Usually the `create` script for a reference uses the %CKEYCOLUMNS% and %PKEYCOLUMNS% variables, which contain the lists of child and parent columns separated by commas. If you use %JOINS%, you can refer to each paired parent and child columns separately. A loop is executed on Join for each paired parent and child columns, allowing to have a syntax mix of PK and FK. Example (Access 2000): `P=%PK% F=%FK%`
EnableChange JoinOrder	Specifies whether, when a reference is linked to a key as shown in the Joins tab of reference properties, the auto arrange join order check box and features are available. The following settings are available: • Yes - The join order can be established automatically, using the Auto arrange join order check box. Selecting this check box sorts the list according to the key column order. Clearing this check box allows manual sorting of the join order with the move buttons. • No - The auto arrange join order property is unavailable.
EnableCluster	Specifies whether clustered constraints are permitted on foreign keys. • Yes - Clustered constraints are permitted. • No - Clustered constraints are not permitted.
EnablefKey Name	Specifies the foreign key role allowed during database generation. The following settings are available: • Yes - The code of the reference is used as role for the foreign key. • No - The foreign key role is not allowed.

Item	Description
FKAutoIndex	Determines whether a `Create Index` statement is generated for every foreign key statement. The following settings are available: • Yes - Automatically generates a foreign key index with the foreign key statement. If you select the foreign key check box under create index when generating or modifying a database, the foreign key check box of the create table will automatically be cleared, and vice versa. • No – Foreign key indexes are not automatically generated. Foreign key and create index check boxes can be selected at the same time.
FKeyComment	Specifies a statement for adding an alternate key comment.

SqlListChildren Query	Specifies a SQL query used to list the joins in a reference.
	Example (Oracle 10g):
	`{CKEYCOLUMN, FKEYCOLUMN}`
	`[%ISODBCUSER%?select`
	` p.column_name, f.column_name`
	`from sys.user_cons_columns f,`
	` sys.all_cons_columns p`
	`where f.position = p.position`
	`  and f.table_name=%.q:TABLE%`
	`[ and p.owner=%.q:POWNER%]`
	`  and p.table_name=%.q:PARENT%`
	`  and f.constraint_name=%.q:FKCONSTRAINT%`
	`  and p.constraint_name=%.q:PKCONSTRAINT%`
	`order by f.position`
	`:select p.column_name, f.column_name`
	`from sys.all_cons_columns f,`
	` sys.all_cons_columns p`
	`where f.position = p.position`
	`  and f.owner=%.q:SCHEMA%`
	`  and f.table_name=%.q:TABLE%`
	`[ and p.owner=%.q:POWNER%]`
	`  and p.table_name=%.q:PARENT%`
	`  and f.constraint_name=%.q:FKCONSTRAINT%`
	`  and p.constraint_name=%.q:PKCONSTRAINT%`
	`order by f.position]`

UseSpFornKey	Specifies the use of the `Sp_foreignkey` statement to generate a foreign key. The following settings are available: • Yes - The `Sp_foreignkey` statement is used to create references. • No - Foreign keys are generated separately in an `alter table` statement using the Create order of reference. See also `UseSpPrimKey` (*Pkey Category (DBMS)* on page 164).

View Category (DBMS)

The View category is located in the **Root** > **Script** > **Objects** category, and can contain the following items that define how views are modeled for your DBMS.

Item	Description
[Common items]	The following common object items may be defined for views: • AfterCreate, AfterDrop, AfterModify • BeforeCreate, BeforeDrop, BeforeModify • Create, Drop • Enable, EnableSynonym • Header, Footer • ModifiableAttributes • Options • Permission • ReversedQueries, ReversedStatements • SqlAttrQuery, SqlListQuery, SqlOptsQuery, SqlPermQuery For a description of each of these common items, see *Common Object Items* on page 145.

EnableIndex	Specifies a list of view types for which a view index is available.
	Example (Oracle 10g):
	`MATERIALIZED`

SqlListSchema	Specifies a query used to retrieve registered schemas in the database. This item is used with views of XML type (a reference to an XML document stored in the database).
	When you define an XML view, you need to retrieve the XML documents registered in the database in order to assign one document to the view, this is done using the SqlListSchema query.
	Example (Oracle 10g):
	`SELECT schema_url FROM dba_xml_schemas`

SqlXMLView	Specifies a sub-query used to improve the performance of SqlAttrQuery.
TypeList	Specifies a list of types (for example, DBMS: relational, object, XML) for views. This list populates the Type list of the view property sheet. The XML type is to be used with the SqlListSchema item.

Item	Description

ViewCheck	Specifies whether the With Check Option check box in the view property sheet is available. If the check box is selected and the `ViewCheck` parameter is not empty, the value of `ViewCheck` is generated at the end of the view select statement and before the terminator.
	
	Example (SQL Anywhere 10):
	
	If ViewCheck is set to with check option, the generated script is:
	
	`create view TEST as`
	`select CUSTOMER.CUSNUM, CUSTOMER.CUSNAME, CUSTOM-`
	`ER.CUSTEL`
	`from CUSTOMER`
	`with check option;`

ViewComment	Specifies a statement for adding a view comment. If this parameter is empty, the Comment check box in the Views groupbox in the Tables and Views tabs of the Generate Database box is unavailable.
	
	Example (Oracle 10g):
	
	`[%VIEWSTYLE%=view? comment on table [%QUALIFIER%]`
	`%VIEW% is`
	`%.q:COMMENT%]`

ViewStyle	Specifies a view usage. The value defined is displayed in the Usage list of the view property sheet.
	
	Example (Oracle 10g):
	
	`materialized view`

Tablespace Category (DBMS)

The Tablespace category is located in the **Root > Script > Objects** category, and can contain the following items that define how tablespaces are modeled for your DBMS.

Item	Description
[Common items]	The following common object items may be defined for tablespaces: • AfterCreate, AfterDrop, AfterModify • BeforeCreate, BeforeDrop, BeforeModify • Create, Drop • Enable • ModifiableAttributes • Options, DefOptions • ReversedQueries, ReversedStatements • SqlAttrQuery, SqlListQuery, SqlOptsQuery For a description of each of these common items, see *Common Object Items* on page 145.
Tablespace Comment	Specifies a statement for adding a tablespace comment.

Storage Category (DBMS)

The Storage category is located in the **Root > Script > Objects** category, and can contain the following items that define how storages are modeled for your DBMS.

Item	Description
[Common items]	The following common object items may be defined for storages: • AfterCreate, AfterDrop, AfterModify • BeforeCreate, BeforeDrop, BeforeModify • Create, Drop • Enable • ModifiableAttributes • Options, DefOptions • ReversedQueries, ReversedStatements • SqlAttrQuery, SqlListQuery For a description of each of these common items, see *Common Object Items* on page 145.
Storage Comment	Specifies a statement for adding a storage comment.

Database Category (DBMS)

The Database category is located in the **Root > Script > Objects** category, and can contain the following items that define how databases are modeled for your DBMS.

Item	Description
[Common items]	The following common object items may be defined for databases: • AfterCreate, AfterDrop, AfterModify • BeforeCreate, BeforeDrop, BeforeModify • Create, Drop • Enable • ModifiableAttributes • Options, DefOptions • Permission • ReversedQueries, ReversedStatements • SqlAttrQuery, SqlListQuery, SqlOptsQuery, SqlPermQuery For a description of each of these common items, see *Common Object Items* on page 145.
BeforeCreate Database	Controls the order in which databases, tablespaces, and storages are generated. The following settings are available: • Yes – [default] Create Tablespace and Create Storage statements are generated before the Create Database statement. • No - Create Tablespace and Create Storage statements are generated after the Create Database statement
CloseDatabase	Specifies the command for closing the database. If this parameter is empty, the Database/Close option on the Options tab of the Generate Database box is unavailable.
EnableMany Databases	Enables support for multiple databases in the same model.

OpenDatabase	Specifies the command for opening the database. If this parameter is empty, the Database/Open option on the Options tab of the Generate Database box is unavailable.
	Example (ASE 15):
	`use %DATABASE%`
	The %DATABASE% variable is the code of the database associated with the generated model.

Domain Category (DBMS)

The Domain category is located in the **Root > Script > Objects** category, and can contain the following items that define how domains are modeled for your DBMS.

Item	Description
[Common items]	The following common object items may be defined for domains: • AfterCreate, AfterDrop, AfterModify • BeforeCreate, BeforeDrop, BeforeModify • Create, Drop • Enable, EnableOwner • Maxlen • ModifiableAttributes • ReversedQueries, ReversedStatements • SqlAttrQuery, SqlListQuery For a description of each of these common items, see *Common Object Items* on page 145.

Bind	Specifies the syntax for binding a business rule to a domain.
	Example (ASE 15):
	`[%R%?[exec ]][execute ]sp_bindrule [%R%?['[%QUALI-FIER%]%RULE%'][[%QUALIFIER%]%RULE%]:['[%QUALIFIER %]%RULE%']], %DOMAIN%`

EnableBindRule	Specifies whether business rules may be bound to domains for check parameters. The following settings are available: • Yes - The Create and Bind entry of Rule are generated • No - The check inside the domain Add order is generated
EnableCheck	Specifies whether check parameters are generated. This item is tested during column generation. If User-defined Type is selected for columns in the Generation dialog box, and EnableCheck is set to Yes for domains, then the check parameters are not generated for columns, since the column is associated with a domain with check parameters. When the checks on the column diverge from those of the domain, the column checks are generated. The following settings are available: • Yes - Check parameters are generated • No - Variables linked to check parameters are not evaluated during generation and reverse

Item	Description
EnableDefault	Specifies whether default values are generated. The following settings are available: • Yes - Default values defined for domains are generated. The default value can be defined in the check parameters. The %DEFAULT% variable contains the default value • No - Default values are not generated
SqlListDefault Query	Specifies a SQL query to retrieve and list domain default values in the system tables during reverse engineering.
UddtComment	Specifies a statement for adding a user-defined data type comment.

Unbind	Specifies the syntax for unbinding a business rule from a domain.
	Example (ASE 15):
	`[%R%?[exec ]][execute ]sp_unbindrule %DOMAIN%`

Abstract Data Type Category (DBMS)

The Abstract Data Type category is located in the **Root > Script > Objects** category, and can contain the following items that define how abstract data types are modeled for your DBMS.

Item	Description
[Common items]	The following common object items may be defined for abstract data types: • AfterCreate, AfterDrop, AfterModify • BeforeCreate, BeforeDrop, BeforeModify • Create, Drop • Enable • ModifiableAttributes • Permission • ReversedQueries, ReversedStatements • SqlAttrQuery, SqlListQuery, SqlPermQuery For a description of each of these common items, see *Common Object Items* on page 145.
ADTComment	Specifies a statement for adding an abstract data type comment.

AllowedADT	Specifies a list of abstract data types which can be used as data types for abstract data types.
	Example (Oracle 10g):
	`OBJECT`
	`TABLE`
	`VARRAY`

Item	Description
Authorizations	Specifies a list of those users able to invoke abstract data types.

CreateBody	Specifies a statement for creating an abstract data type body.
	Example (Oracle 10g):
	`create [or replace ]type body [%QUALIFIER%]%ADT%`
	`[.O:[as][is]]`
	` %ADTBODY%`
	`end;`

EnableAdtOn Coln	Specifies whether abstract data types are enabled for columns. The following settings are available: • Yes - Abstract Data Types are added to the list of column types provided they have the valid type. • No - Abstract Data Types are not allowed for columns.
EnableAdtOn Domn	Specifies whether abstract data types are enabled for domains. The following settings are available: • Yes - Abstract Data Types are added to the list of domain types provided they have the valid type • No - Abstract Data Types are not allowed for domains
Enable Inheritance	Enables inheritance for abstract data types.

Install	Specifies a statement for installing a Java class as an abstract data class (in ASA, abstract data types are installed and removed rather than created and deleted). This item is equivalent to a `create` statement.
	Example (SQL Anywhere 10):
	`install JAVA UPDATE from file %.q:FILE%`

JavaData	Specifies a list of available instantiation mechanisms for SQL Java abstract data types.

Remove	Specifies a statement for installing a Java class as an abstract data class.
	Example (SQL Anywhere 10):
	`remove JAVA class %ADT%`

Abstract Data Type Attribute Category (DBMS)

The Abstract Data Types Attribute category is located in the **Root > Script > Objects** category, and can contain the following items that define how abstract data type attributes are modeled for your DBMS.

Item	Description
[Common items]	The following common object items may be defined for abstract data type attributes: • Add • AfterCreate, AfterDrop, AfterModify • BeforeCreate, BeforeDrop, BeforeModify • Create, Drop, Modify • ModifiableAttributes • ReversedQueries, ReversedStatements • SqlListQuery For a description of each of these common items, see *Common Object Items* on page 145.

AllowedADT	Specifies a list of abstract data types which can be used as data types for abstract data type attributes.
	Example (Oracle 10g):
	`OBJECT`
	`TABLE`
	`VARRAY`
	If you select the type OBJECT for an abstract data type, an Attributes tab appears in the abstract data type property sheet, allowing you to specify the attributes of the object data type.

User Category (DBMS)

The User category is located in the **Root > Script > Objects** category, and can contain the following items that define how users are modeled for your DBMS.

Item	Description
[Common items]	The following common object items may be defined for users: • AfterCreate, AfterDrop, AfterModify • BeforeCreate, BeforeDrop, BeforeModify • Create, Drop • Enable • Maxlen • ModifiableAttributes • Options, DefOptions • ReversedQueries, ReversedStatements • SqlAttrQuery, SqlListQuery, SqlOptsQuery, SqlPermQuery For a description of each of these common items, see *Common Object Items* on page 145.
UserComment	Specifies a statement for adding a user comment.

Rule Category (DBMS)

The Rule category is located in the **Root > Script > Objects** category, and can contain the following items that define how rules are modeled for your DBMS.

Item	Description
[Common items]	The following common object items may be defined for rules: • AfterCreate, AfterDrop, AfterModify • BeforeCreate, BeforeDrop, BeforeModify • Create, Drop • Enable • Maxlen • ModifiableAttributes • ReversedQueries, ReversedStatements • SqlAttrQuery, SqlListQuery For a description of each of these common items, see *Common Object Items* on page 145.

Item	Description

ColnDefault Name	Specifies the name of a default for a column. This item is used with DBMSs that do not support check parameters on columns. When a column has a specific default value defined in its check parameters, a name is created for this default value.
	
	The corresponding variable is %DEFAULTNAME%.
	
	Example (ASE 15):
	
	`D_%.19:COLUMN%_%.8:TABLE%`
	
	The `EMPFUNC` column of the EMPLOYEE table has a default value of `Technical Engineer`. The `D_EMPFUNC_EMPLOYEE` column default name is created:
	
	`create default D_EMPFUNC_EMPLOYEE`
	`as 'Technical Engineer'`
	`go`
	`execute sp_bindefault D_EMPFUNC_EMPLOYEE, "EMPLOY-`
	`EE.EMPFUNC"`
	`go`

ColnRuleName	Specifies the name of a rule for a column. This item is used with DBMSs that do not support check parameters on columns. When a column has a specific rule defined in its check parameters, a name is created for this rule.
	
	The corresponding variable is %RULE%.
	
	Example (ASE 15):
	
	`R_%.19:COLUMN%_%.8:TABLE%`
	
	The TEASPE column of the Team table has a list of values - Industry, Military, Nuclear, Bank, Marketing - defined in its check parameters:
	
	The R_TEASPE_TEAM rule name is created and associated with the TEA-SPE column:
	
	`create rule R_TEASPE_TEAM`
	`as @TEASPE in ('Industry','Military','Nu-`
	`clear','Bank','Marketing')`
	`go`
	`execute sp_bindrule R_TEASPE_TEAM, "TEAM.TEASPE"`
	`go`

MaxDefaultLen	Specifies the maximum length that the DBMS supports for the name of the column Default name
RuleComment	Specifies a statement for adding a rule comment.

Item	Description

UddtDefault Name	Specifies the name of a default for a user-defined data type. This item is used with DBMSs that do not support check parameters on user-defined data types. When a user-defined data type has a specific default value defined in its check parameters, a name is created for this default value.
	
	The corresponding variable is %DEFAULTNAME%.
	
	Example (ASE 15):
	
	`D_%.28:DOMAIN%`
	
	The `FunctionList` domain has a default value defined in its check parameters: `Technical Engineer`. The following SQL script will generate a default name for that default value:
	
	`create default D_FunctionList`
	`as 'Technical Engineer'`
	`go`

UddtRuleName	Specifies the name of a rule for a user-defined data type. This item is used with DBMSs that do not support check parameters on user-defined data types. When a user-defined data type has a specific rule defined in its check parameters, a name is created for this rule.
	
	The corresponding variable is %RULE%.
	
	Example (ASE 15):
	
	`R_%.28:DOMAIN%`
	
	The `Domain_speciality` domain has to belong to a set of values. This domain check has been defined in a validation rule. The SQL script will generate the rule name following the template defined in the item `UddtRuleName`:
	
	`create rule R_Domain_speciality`
	`as (@Domain_speciality in ('Industry','Mili-`
	`tary','Nuclear','Bank','Marketing'))`
	`go`
	`execute sp_bindrule R_Domain_speciality, T_Do-`
	`main_speciality`
	`go`

Procedure Category (DBMS)

The Procedure category is located in the **Root > Script > Objects** category, and can contain the following items that define how procedures are modeled for your DBMS.

Item	Description
[Common items]	The following common object items may be defined for procedures: • AfterCreate, AfterDrop, AfterModify • BeforeCreate, BeforeDrop, BeforeModify • Create, Drop • Enable, EnableOwner, EnableSynonym • Maxlen • ModifiableAttributes • Permission • ReversedQueries, ReversedStatements • SqlAttrQuery, SqlListQuery, SqlPermQuery For a description of each of these common items, see *Common Object Items* on page 145.

CreateFunc	Specifies the statement for creating a function.
	Example (SQL Anywhere 10):
	`create function [%QUALIFIER%]%FUNC%[%PROCPRMS%?([%PROCPRMS%])] %TRGDEFN%`

CustomFunc	Specifies the statement for creating a user-defined function, a form of procedure that returns a value to the calling environment for use in queries and other SQL statements.
	Example (SQL Anywhere 10):
	`create function [%QUALIFIER%]%FUNC% (<arg> <type>)`
	`RETURNS <type>`
	`begin`
	`end`

CustomProc	Specifies the statement for creating a stored procedure.
	Example (SQL Anywhere 10):
	`create procedure [%QUALIFIER%]%PROC% (IN <arg> <type>)`
	`begin`
	`end`

Item	Description

DropFunc	Specifies the statement for dropping a function.
	Example (SQL Anywhere 10):
	`if exists(select 1 from sys.sysprocedure where proc_name = %.q:FUNC%[ and user_name(creator) = %.q:OWNER%]) then`
	` drop function [%QUALIFIER%]%FUNC%`
	`end if`

EnableFunc	Specifies whether functions are allowed. Functions are forms of procedure that return a value to the calling environment for use in queries and other SQL statements.
Function Comment	Specifies a statement for adding a function comment.
ImplementationType	Specifies a list of available procedure template types.
MaxFuncLen	Specifies the maximum length of the name of a function.
Procedure Comment	Specifies a statement for adding a procedure comment.

Trigger Category (DBMS)

The Trigger category is located in the **Root > Script > Objects** category, and can contain the following items that define how triggers are modeled for your DBMS.

Item	Description
[Common items]	The following common object items may be defined for triggers: • AfterCreate, AfterDrop, AfterModify • BeforeCreate, BeforeDrop, BeforeModify • Create, Drop • Enable, EnableOwner • Maxlen • ModifiableAttributes • ReversedQueries, ReversedStatements • SqlAttrQuery, SqlListQuery For a description of each of these common items, see *Common Object Items* on page 145.

DefaultTrigger Name	Specifies a template to define default trigger names.
	Example (SQL Anywhere 10):
	`%TEMPLATE%_%.L:TABLE%`

EnableMulti Trigger	Enables the use of multiple triggers per type.

Item	Description

Event	Specifies a list of trigger event attributes to populate the Event list on the Definition tab of Trigger property sheets.
	Example:
	`Delete`
	`Insert`
	`Update`

EventDelimiter	Specifies a character to separate multiple trigger events.
ImplementationType	Specifies a list of available trigger template types.

Time	Specifies a list of trigger time attributes to populate the Time list on the Definition tab of Trigger property sheets.
	Example:
	`Before`
	`After`

Trigger Comment	Specifies a statement for adding a trigger comment.
UniqName	Specifies whether trigger names must be unique within the global scope of the database. The following settings are available: • Yes – Trigger names must be unique within the global scope of the database. • No – Trigger names must be unique per object

Item	Description

UseErrorMsg Table	Specifies a macro for accessing trigger error messages from a message table in your database.
	
	Enables the use of the User-defined radio button on the Error Messages tab of the Trigger Rebuild dialog box (see *Data Modeling > Building Data Models > Triggers and Procedures > Generating Triggers and Procedures > Creating User-Defined Error Messages*).
	
	If an error number in the trigger script corresponds to an error number in the message table, the default error message of the .ERROR macro is replaced your message.
	
	Example (ASE 15):
	
	`begin`
	` select @errno  = %ERRNO%,`
	`    @errmsg = %MSGTXT%`
	` from %MSGTAB%`
	` where  %MSGNO% = %ERRNO%`
	` goto error`
	`end`
	
	Where:
	
	• %ERRNO% - error number parameter to the .ERROR macro
	• %ERRMSG% - error message text parameter to the .ERROR macro
	• %MSGTAB% - name of the message table
	• %MSGNO% - name of the column that stores the error message number
	• %MSGTXT% - name of the column that stores the error message text
	
	See also UseErrorMsgText.

UseErrorMsg Text	Specifies a macro for accessing trigger error messages from the trigger template definition.
	
	Enables the use of the Standard radio button on the Error Messages tab of the Trigger Rebuild dialog box.
	
	The error number and message defined in the template definition are used.
	
	Example (ASE 15):
	
	`begin`
	` select @errno  = %ERRNO%,`
	`    @errmsg = %MSGTXT%`
	` goto error`
	`end`
	
	See also UseErrorMsgTable.

ViewTime	Specifies a list of available times available for trigger on view.

DBMS Trigger Category (DBMS)

The DBMS Trigger category is located in the **Root > Script > Objects** category, and can contain the following items that define how DBMS triggers are modeled for your DBMS.

Item	Description
[Common items]	The following common object items may be defined for DBMS triggers: • AfterCreate, AfterDrop, AfterModify • BeforeCreate, BeforeDrop, BeforeModify • Create, Drop • Alter, AlterStatementList, AlterDBIgnored • Enable, EnableOwner • Header, Footer • Maxlen • ModifiableAttributes • ReversedQueries, ReversedStatements • SqlAttrQuery, SqlListQuery For a description of each of these common items, see *Common Object Items* on page 145.
EventDelimiter	Specifies a character to separate multiple trigger events.
Events_*scope*	Specifies a list of trigger event attributes to populate the Event list on the Definition tab of Trigger property sheets for the selected *scope*, for example, schema, database, server.
Scope	Specifies a list of available scopes for the DBMS trigger. Each scope must have an associated Events_*scope* item.

Time	Specifies a list of trigger time attributes to populate the Time list on the Definition tab of Trigger property sheets.
	Example:
	`Before`
	`After`

Trigger Comment	Specifies a statement for adding a trigger comment.

Join Index Category (DBMS)

The Join Index category is located in the **Root > Script > Objects** category, and can contain the following items that define how join indexes are modeled for your DBMS.

Item	Description
[Common items]	The following common object items may be defined for join indexes: • Add • AfterCreate, AfterDrop, AfterModify • BeforeCreate, BeforeDrop, BeforeModify • Create, Drop • Enable, EnableOwner • Header, Footer • Maxlen • ModifiableAttributes • Options, DefOptions • ReversedQueries, ReversedStatements • SqlAttrQuery, SqlListQuery, SqlOptsQuery For a description of each of these common items, see *Common Object Items* on page 145.
AddJoin	Specifies the SQL statement used to define joins for join indexes. Example: `Table1.coln1 = Table2.coln2`
EnableJidxColn	Enables support for attaching multiple columns to a join index. In Oracle 9i, this is called a bitmap join index.
JoinIndex Comment	Specifies a statement for adding a join index comment.

Qualifier Category (DBMS)

The Qualifier category is located in the **Root > Script > Objects** category, and can contain the following items that define how qualifiers are modeled for your DBMS.

Item	Description
[Common items]	The following common object items may be defined for qualifiers: • Enable • ReversedQueries • SqlListQuery For a description of each of these common items, see *Common Object Items* on page 145.

Item	Description
Label	Specifies a label for <all> in the qualifier selection list.

Sequence Category (DBMS)

The Sequence category is located in the **Root > Script > Objects** category, and can contain the following items that define how sequences are modeled for your DBMS.

Item	Description
[Common items]	The following common object items may be defined for sequences: • AfterCreate, AfterDrop, AfterModify • BeforeCreate, BeforeDrop, BeforeModify • Create, Drop • Enable, EnableOwner, EnableSynonym • Maxlen • ModifiableAttributes • Options, DefOptions • Permission • ReversedQueries, ReversedStatements • SqlAttrQuery, SqlListQuery, SqlPermQuery For a description of each of these common items, see *Common Object Items* on page 145.

Rename	Specifies the command for renaming a sequence.
	Example (Oracle 10g):
	`rename %OLDNAME% to %NEWNAME%`

Sequence Comment	Specifies a statement for adding a sequence comment.

Synonym Category (DBMS)

The Synonym category is located in the **Root > Script > Objects** category, and can contain the following items that define how synonyms are modeled for your DBMS.

Item	Description
[Common items]	The following common object items may be defined for synonyms: • Create, Drop • Enable, EnableSynonym • Maxlen • ReversedQueries • SqlAttrQuery, SqlListQuery For a description of each of these common items, see *Common Object Items* on page 145.
EnableAlias	Specifies whether synonyms may have a type of alias.

Group Category (DBMS)

The Group category is located in the **Root > Script > Objects** category, and can contain the following items that define how groups are modeled for your DBMS.

Item	Description
[Common items]	The following common object items may be defined for groups: • AfterCreate, AfterDrop, AfterModify • BeforeCreate, BeforeDrop, BeforeModify • Create, Drop • Enable • Maxlen • ModifiableAttributes • ReversedQueries, ReversedStatements • SqlAttrQuery, SqlListQuery, SqlPermQuery For a description of each of these common items, see *Common Object Items* on page 145.

Bind	Specifies a command for adding a user to a group.
	Example (SQL Anywhere 10):
	`grant membership in group %GROUP% to %USER%`

Group Comment	Specifies a statement for adding a group comment.
ObjectOwner	Allows groups to be object owners.

Item	Description

SqlListChildren Query	Specifies a SQL query for listing the members of a group.
	
	Example (ASE 15):
	
	`{GROUP ID, MEMBER}`
	`select g.name, u.name`
	`from`
	` [%CATALOG%.]dbo.sysusers u, [%CATALOG%.]dbo.sysus-`
	`ers g`
	`where`
	` u.suid > 0 and`
	` u.gid = g.gid and`
	` g.gid = g.uid`
	`order by 1, 2`

Unbind	Specifies a command for removing a user from a group.
	
	Example (SQL Anywhere 10):
	
	`revoke membership in group %GROUP% from %USER%`

Role Category (DBMS)

The Role category is located in the **Root > Script > Objects** category, and can contain the following items that define how roles are modeled for your DBMS.

Item	Description
[Common items]	The following common object items may be defined for roles: • AfterCreate, AfterDrop, AfterModify • BeforeCreate, BeforeDrop, BeforeModify • Create, Drop • Enable • Maxlen • ModifiableAttributes • ReversedQueries, ReversedStatements • SqlAttrQuery, SqlListQuery, SqlPermQuery For a description of each of these common items, see *Common Object Items* on page 145.

Bind	Specifies a command for adding a role to a user or to another role.
	
	Example (ASE 15):
	
	`grant role %ROLE% to %USER%`

Item	Description

SqlListChildren Query	Specifies a SQL query for listing the members of a group.
	
	Example (ASE 15):
	
	`{ ROLE ID, MEMBER }`
	`SELECT r.name, u.name`
	`FROM`
	` master.dbo.sysloginroles l,`
	` [%CATALOG%.]dbo.sysroles s,`
	` [%CATALOG%.]dbo.sysusers u,`
	` [%CATALOG%.]dbo.sysusers r`
	`where`
	` l.suid = u.suid`
	` and s.id   =l.srid`
	` and r.uid = s.lrid`

Unbind	Specifies a command for removing a role from a user or another role.

DB Package Category (DBMS)

The DB Package category is located in the **Root > Script > Objects** category, and can contain the following items that define how database packages are modeled for your DBMS.

Item	Description
[Common items]	The following common object items may be defined for database packages: • AfterCreate, AfterDrop, AfterModify • BeforeCreate, BeforeDrop, BeforeModify • Create, Drop • Enable, EnableSynonym • Maxlen • ModifiableAttributes • Permission • ReversedQueries, ReversedStatements • SqlAttrQuery, SqlListQuery, SqlPermQuery For a description of each of these common items, see *Common Object Items* on page 145.
Authorizations	Specifies a list of those users able to invoke database packages.

Item	Description

CreateBody	Specifies a template for defining the body of the database package. This statement is used in the extension statement AfterCreate.
	
	Example (Oracle 10g):
	
	`create [or replace ]package body [%QUALIFIER%] %DBPACKAGE% [.O:[as][is]][%IsPragma% ? pragma serially_reusable]`
	` %DBPACKAGEBODY%`
	`[begin`
	` %DBPACKAGEINIT%`
	`]end[ %DBPACKAGE%];`

DB Package Sub-objects Category (DBMS)

The following categories are located in the **Root** > **Script** > **Objects** category.

- DB Package Procedure
- DB Package Variable
- DB Package Type
- DB Package Cursor
- DB Package Exception
- DB Package Pragma

Each contains many of the following items that define how database packages are modeled for your DBMS.

Item	Description
[Common items]	The following common object items may be defined for database packages: • Add • ReversedQueries For a description of each of these common items, see *Common Object Items* on page 145.

DBProcedure Body	[database package procedures only] Specifies a template for defining the body of the package procedure in the Definition tab of its property sheet.
	
	Example (Oracle 10g):
	
	`begin`
	`end`

Item	Description

ParameterTypes	[database package procedures and cursors only] Specifies the available types for procedures or cursors.
	
	Example (Oracle 10g: procedure):
	
	`in`
	`in nocopy`
	`in out`
	`in out nocopy`
	`out`
	`out nocopy`

Parameter Category (DBMS)

The Parameter category is located in the **Root > Script > Objects** category, and can contain the following items that define how parameters are modeled for your DBMS.

Item	Description
[Common items]	The following common object items may be defined for database packages: • Add • ReversedQueries For a description of each of these common items, see *Common Object Items* on page 145.

Privilege Category (DBMS)

The Privilege category is located in the **Root > Script > Objects** category, and can contain the following items that define how privileges are modeled for your DBMS.

Item	Description
[Common items]	The following common object items may be defined for privileges: • AfterCreate, AfterDrop, AfterModify • BeforeCreate, BeforeDrop, BeforeModify • Create, Drop • Enable • ModifiableAttributes • ReversedQueries, ReversedStatements For a description of each of these common items, see *Common Object Items* on page 145.

Item	Description

GrantOption	Specifies the grant option for a privileges statement.
	Example (Oracle 10g):
	`with admin option`

RevokeInherited	Allows you to revoke inherited privileges from groups and roles.
RevokeOption	Specifies revoke option for a privileges statement.

System	Specifies a list of available system privileges.
	Example (ASE 15):
	`CREATE DATABASE`
	`CREATE DEFAULT`
	`CREATE PROCEDURE`
	`CREATE TRIGGER`
	`CREATE RULE`
	`CREATE TABLE`
	`CREATE VIEW`

Permission Category (DBMS)

The Permission category is located in the **Root > Script > Objects** category, and can contain the following items that define how permissions are modeled for your DBMS.

Item	Description
[Common items]	The following common object items may be defined for permissions: • Create, Drop • Enable • ReversedQueries • SqlListQuery For a description of each of these common items, see *Common Object Items* on page 145.

GrantOption	Specifies the grant option for a permissions statement.
	Example (ASE 15):
	`with grant option`

RevokeInherited	Allows you to revoke inherited permissions from groups and roles.

RevokeOption	Specifies the revoke option for a permissions statement.
	Example (ASE 15):
	`cascade`

Default Category (DBMS)

The Default category is located in the **Root > Script > Objects** category, and can contain the following items that define how defaults are modeled for your DBMS.

Item	Description
[Common items]	The following common object items may be defined for defaults: • AfterCreate, AfterDrop, AfterModify • BeforeCreate, BeforeDrop, BeforeModify • Create, Drop • Enable, EnableOwner • Maxlen • ModifiableAttributes • ReversedQueries, ReversedStatements • SqlAttrQuery, SqlListQuery For a description of each of these common items, see *Common Object Items* on page 145.

Bind	Specifies the command for binding a default object to a domain or a column.
	When a domain or a column use a default object, a *binddefault* statement is generated after the domain or table creation statement. In the following example, column Address in table Customer uses default object CITYDFLT:
	`create table CUSTOMER (`
	`  ADDRESS  char(10)  null`
	`)`
	`sp_bindefault CITYDFLT, 'CUSTOMER.ADDRESS'`
	If the domain or column use a default value directly typed in the Default list, then the default value is declared in the column creation line:
	`ADDRESS  char(10)  default 'StdAddr' null`

PublicOwner	Enables PUBLIC to own public synonyms.

Unbind	Specifies the command for unbinding a default object from a domain or a column.
	Example (ASE 15):
	`[%R%?[exec ]][execute ]sp_unbindefault`
	`%.q:BOUND_OBJECT%`

Web Service and Web Operation Category (DBMS)

The Web Service and Web Operation categories are located in the **Root** > **Script** > **Objects** category, and can contain the following items that define how web services and web operations are modeled for your DBMS.

Item	Description
[Common items]	The following common object items may be defined for web services and web operations: • AfterCreate, AfterDrop, AfterModify • Alter • BeforeCreate, BeforeDrop, BeforeModify • Create, Drop • Enable, EnableOwner • Header, Footer • MaxConstLen (web operations only) • Maxlen • ModifiableAttributes • ReversedQueries, ReversedStatements • SqlAttrQuery, SqlListQuery For a description of each of these common items, see *Common Object Items* on page 145.
Enable Namespace	Specifies whether namespaces are supported.
EnableSecurity	Specifies whether security options are supported.

OperationType List	[web operation only] Specifies a list of web service operation types.
	Example (DB2 UDB 8.x CS):
	`query`
	`update`
	`storeXML`
	`retrieveXML`
	`call`

ServiceTypeList	[web service only] Specifies a list of web service types.
	Example (SQL Anywhere 10):
	`RAW`
	`HTML`
	`XML`
	`DISH`

UniqName	Specifies whether web service operation names must be unique in the data-base.

Item	Description
WebService Comment/ WebOperation Comment	Specifies the syntax for adding a comment to web service or web service operation.

Web Parameter Category (DBMS)

The Web Parameter category is located in the **Root > Script > Objects** category, and can contain the following items that define how web parameters are modeled for your DBMS.

Item	Description
[Common items]	The following common object items may be defined for web parameters: • Add • Enable For a description of each of these common items, see *Common Object Items* on page 145.
EnableDefault	Allows default values for web service parameters.
ParameterDttp List	Specifies a list of data types that may be used as web service parameters.

Result Column Category (DBMS)

The Result Column category are located in the **Root > Script > Objects** category, and can contain the following items that define how web services and web operations are modeled for your DBMS.

Item	Description
ResultColumn DttpList	Specifies a list of data types that may be used for result columns.

Dimension Category (DBMS)

The Dimension category is located in the **Root > Script > Objects** category, and can contain the following items that define how dimensions are modeled for your DBMS.

Item	Description
[Common items]	The following common object items may be defined for dimensions: • AfterCreate, AfterDrop, AfterModify • Alter • BeforeCreate, BeforeDrop, BeforeModify • Create, Drop • Enable • Header, Footer • Maxlen • ReversedQueries • SqlAttrQuery, SqlListQuery For a description of each of these common items, see *Common Object Items* on page 145.

AddAttr Hierarchy	Specifies the syntax for defining a list of hierarchy attributes.
	Example (Oracle 10g):
	`child of %DIMNATTRHIER%`

AddAttribute	Specifies the syntax for defining an attribute.
	Example (Oracle 10g):
	`attribute %DIMNATTR% determines [.O:[(%DIMNDEPCOLN-LIST%)][%DIMNDEPCOLN%]]`

AddHierarchy	Specifies the syntax for defining a dimension hierarchy.
	Example (Oracle 10g):
	`hierarchy %DIMNHIER% ( %DIMNATTRHIERFIRST% %DIMNATTRHIERLIST%)`

AddJoin Hierarchy	Specifies the syntax for defining a list of joins for hierarchy attributes. Example (Oracle 10g): join key [.O:[(%DIMNKEYLIST%)][%DIMNKEYLIST%]] references %DIMNPARENTLEVEL%

Item	Description
AddLevel	Specifies the syntax for dimension level (attribute). Example (Oracle 10g): level %DIMNATTR% is [.O:[(%DIMNCOLNLIST%)][%DIMNTABL%.%DIMNCOLN%]]

Extended Object Category (DBMS)

The Extended Object category is located in the **Root** > **Script** > **Objects** category, and can contain the following items that define how extended objects are modeled for your DBMS.

Item	Description
[Common items]	The following common object items may be defined for extended objects: • AfterCreate, AfterDrop, AfterModify • BeforeCreate, BeforeDrop, BeforeModify • Create, Drop • EnableSynonym • Header, Footer • ModifiableAttributes • ReversedQueries, ReversedStatements • SqlAttrQuery, SqlListQuery For a description of each of these common items, see *Common Object Items* on page 145.
AlterStatement List	Specifies a list of text items representing statements modifying the corresponding attributes
Comment	Specifies the syntax for adding a comment to an extended object.

Script/Data Type Category (DBMS)

The Data Type category provides mappings to allow PowerDesigner to handle DBMS-specific data types correctly.

The following variables are used in many of the entries:

- `%n` - Length of the data type
- `%s` - Size of the data type
- `%p` - Precision of the data type

Item	Description
AmcdAmcd-Type	Lists mappings to convert from specialized data types (such as `XML`, `IVL`, `MEDIA`, etc) to standard PowerDesigner data types. These mappings are used to help conversion from one DBMS to another, when the new DBMS does not support one or more of these specialized types. For example, if the `XML` data type is not supported, `TXT` is used.
AmcdDataType	Lists mappings to convert from PowerDesigner (**Internal**) data types to DBMS (**Physical Model**) data types. These mappings are used during CDM to PDM generation and with the **Change Current DBMS** command. Examples (ASE 15): • The PowerDesigner `A%n` datatype is converted to a `char(%n)` for ASE 15. • The PowerDesigner `VA%n` datatype is converted to a `varchar(%n)` for ASE 15.
PhysDataType	Lists mappings to convert from DBMS (**Physical Model**) data types to PowerDesigner (**Internal**) data types. These mappings are used during PDM to CDM generation and with the **Change Current DBMS** command. Examples (ASE 15): • The ASE 15 `sysname` datatype is converted to a `VA30` for PowerDesigner. • The ASE 15 `integer` datatype is converted to a `I` for PowerDesigner.
PhysDttpSize	Lists the storage sizes of DBMS data types. These values are used when estimating the size of a database. Examples (ASE 15): • The ASE 15 `smallmoney` requires 8 bytes of space. • The ASE 15 `smalldatetime` requires 4 bytes of space.
OdbcPhysData Type	Lists mappings to convert from live database (**ODBC**) data types to DBMS (**Physical Model**) data types during database reverse engineering. These mappings are used when data types are stored differently in the database (often due to the inclusion of a default size) than in the DBMS notation. Examples (ASE 15): • A `float(8)` in an ASE 15 database is reversed as a `float`. • A `decimal(30,6)` in an ASE 15 database is reversed as a `decimal`.

Item	Description
PhysOdbcDataType	Lists mappings of DBMS (**Physical Model**) data types to database (**ODBC**) data types for use when updating and reverse engineering a database. These mappings are used when data types that are functionally equivalent but different to those specified in the PDM are found in an existing database to avoid the display of unnecessary and irrelevant differences in the Merge dialog. Examples (ASE 15): • A `unichar` is treated as equivalent to a `unichar(1)` in an ASE 15 database. • A `float(1)` is treated as equivalent to a `float(4)` in an ASE 15 database.
PhysLogADTType	Lists mappings to convert from DBMS (**Physical Model**) abstract data types to PowerDesigner (**Internal**) abstract data types. These mappings are used to populate the **Type** field and display the appropriate properties in abstract data type property sheets and with the **Change Current DBMS** command. Examples (Oracle 11g): • The Oracle 11g `VARRAY` abstract data type is converted to an `Array` for PowerDesigner. • The Oracle 11g `SQLJ_OBJECT` datatype is converted to a `JavaObject` for PowerDesigner.
LogPhysADTType	Lists mappings to convert from PowerDesigner (**Internal**) abstract data types to DBMS (**Physical Model**) abstract data types. These mappings are used with the **Change Current DBMS** command. Examples (Oracle 11g): • The PowerDesigner `List` abstract data type is converted to a `TABLE` for Oracle 11g. • The PowerDesigner `Object` abstract data type is converted to an `OBJECT` for Oracle 11g.
AllowedADT	Lists the abstract data types that may be used as types for columns and domains in the DBMS. Example (ASE 15): • JAVA

Item	Description
HostDataType	Lists mappings to convert from DBMS data types (**Physical Model**) to data types permitted as procedure parameters (**Trigger**). These mappings are used to populate the **Data type** field in ADT procedure parameter property sheets Examples (Oracle 11g): • The Oracle 11g `DEC` data type is converted to a `number`. • The Oracle 11g `SMALLINT` datatype is converted to an `integer`.

Profile Category (DBMS)

The Profile category is used to extend standard PowerDesigner objects. You can refine the definition, behavior, and display of existing objects by creating extended attributes, stereotypes, criteria, forms, symbols, generated files, etc, and add new objects by creating and stereotyping extended objects and sub-objects.

You can add extensions in either:

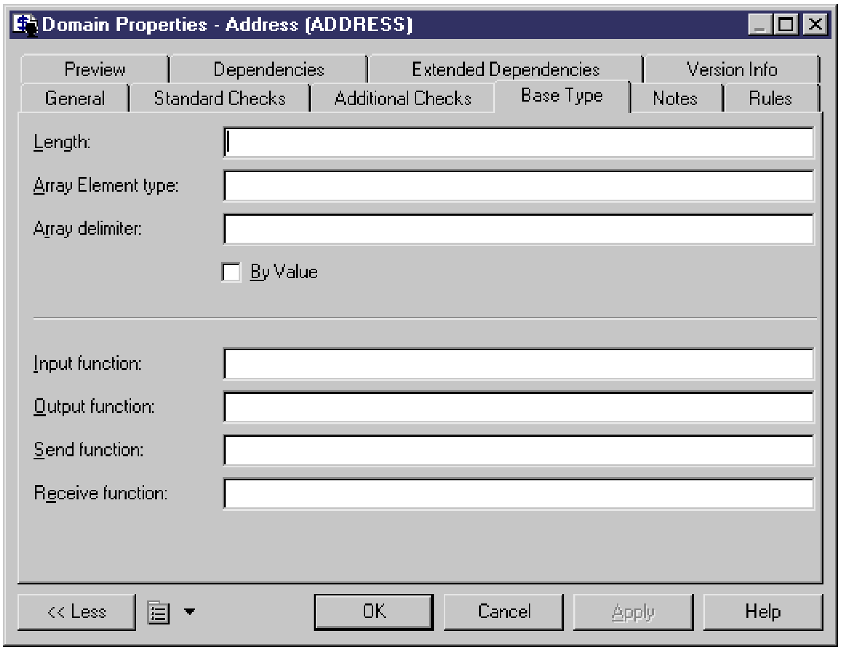
- your DBMS definition file - you should save a backup of this file before editing it.
- a separate extension file - which you attach to your model.

For detailed information about working with profiles, including adding extended attributes and objects, see *Chapter 2, Extension Files* on page 9.

Using Extended Attributes During Generation

Extended attributes can be taken into account during generation. Each extended attribute value can be used as a variable that can be referenced in the scripts defined in the Script category.

Some DBMSs include predefined extended attributes. For example in PostgreSQL, domains include default extended attributes used for the creation of user-defined data types.



You can create as many extended attributes as you need, for each DBMS supported object.

Note: PowerDesigner variable names are case sensitive. The variable name must be an exact match of the extended attribute name.

Example

For example, in DB2 UDB 7 OS/390, the extended attribute `WhereNotNull` allows you to add a clause enforcing the uniqueness of index names if they are not null.

In the `Create index` order, `WhereNotNull` is evaluated as follows:

```
create [%INDEXTYPE% ][%UNIQUE% [%WhereNotNull%?where not
null ]]index [%QUALIFIER%]%INDEX% on [%TABLQUALIFIER%]%TABLE% (
            %CIDXLIST%
)
[%OPTIONS%]
```

If the index name is unique, and if you set the type of the `WhereNotNull` extended attribute to True, the "where not null" clause is inserted in the script.

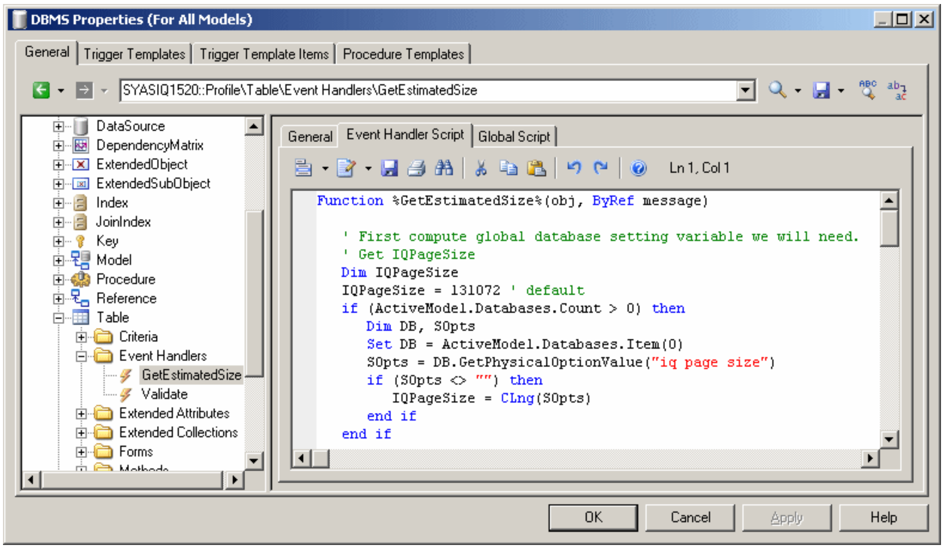
In the `SqlListQuery` item:

```
{OWNER, TABLE, INDEX, INDEXTYPE, UNIQUE, INDEXKEY, CLUSTER,
WhereNotNull}

select
 tbcreator,
 tbname,
 name,
 case indextype when '2' then 'type 2' else 'type 1' end,
 case uniquerule when 'D' then '' else 'unique' end,
 case uniquerule when 'P' then 'primary' when 'U' then 'unique' else
'' end,
 case clustering when 'Y' then 'cluster' else '' end,
 case uniquerule when 'N' then 'TRUE' else 'FALSE' end
from
 sysibm.sysindexes
where 1=1
[  and tbname=%.q:TABLE%]
[  and tbcreator=%.q:OWNER%]
[  and dbname=%.q:CATALOG%]
order by
 1 ,2 ,3
```

Modifying the Estimate Database Size Mechanism

By default, the Estimate Database Size mechanism uses standard algorithms to calculate the sizes of tablespaces, tables, columns, and indexes and adds them together to provide an indication of the size that the database will require. You can override the algorithm for one or more of these types of objects or include additional objects in the calculation by adding the `GetEstimatedSize` event handler to the appropriate object in the `Profile` category and entering a script to calculate its size.

1. Select **Database > Edit Current DBMS** to open the DBMS definition file, and expand the profile category.
2. Right-click the metaclass for which you want to provide a script to calculate the object size, select **New > Event Handler** to open a selection dialog, select the `GetEstimatedSize` event handler, and then click **OK** to add it under the metaclass.
3. Click the **Event Handler Script** tab in the right pane and enter appropriate code to calculate the size of your chosen object.



```
Function %GetEstimatedSize%(obj, ByRef message)

   ' First compute global database setting variable we will need.
   ' Get IQPageSize
   Dim IQPageSize
   IQPageSize = 131072 ' default
   if (ActiveModel.Databases.Count > 0) then
      Dim DB, SOpts
      Set DB = ActiveModel.Databases.Item(0)
      SOpts = DB.GetPhysicalOptionValue("iq page size")
      if (SOpts <> "") then
         IQPageSize = CLng(SOpts)
      end if
   end if
```

In the following example, we look at extracts of a `GetEstimatedSize` event handler defined on the `Table` metaclass to estimate the size of the database by calculating the size of each table as the total size of all its columns plus the total size of all its indexes.

Note: For examples of the `GetEstimatedSize` event handler in use on the Table and other metaclasses, see the Sybase IQ v15.2 and HP Neoview R2.4 DBMS definition files.

In this first extract from the script, the `GetEstimatedSize` function opens and the size of each table is obtained by looping through the size of each of its columns. The actual work of calculating the column size is done by the line:

```
ColSize = C.GetEstimatedSize(message, false)
```

, which calls the `GetEstimatedSize` event handler on the `Column` metaclass (see *Calling the GetEstimatedSize Event Handler on Another Metaclass* on page 206):

```
Function %GetEstimatedSize%(obj, ByRef message)

' First compute global database setting variable we will need.

' Get table size and keep column size for future use
   Dim ColSizes, TblSize, ColSize, C
   Set ColSizes = CreateObject("Scripting.Dictionary")

   TblSize = 0 ' May be changed to take into account table
definition initial size.

  for each C in obj.Columns

     ' Start browsing table columns and use event handler defined
on column metaclass (if it exists).
      ColSize = C.GetEstimatedSize(message, false)
```

```
        ' Store column size in the map for future use in indexes.
      ColSizes.Add C, ColSize

        ' Increase the table global size.
      TblSize = TblSize + ColSize
   next
   Dim RawDataSize
   RawDataSize = BlockSize * int(obj.Number * TblSize / BlockSize)
    ' At this point, the RawDataSize is the size of table in
database.
```

Next the size of the table indexes is calculated directly in the script without making a call to an event handler on the Index metaclass, the line outputting index sizes is formatted and the size of the indexes added to the total database size:

```
' Now calculate index sizes. Set up variables to store indexes
sizes.
   Dim X, XMsg, XDataSize
   XMsg = ""
   for each X in obj.Indexes
      XDataSize = 0
      ' Browsing index columns and get their size added in
XDataSize
      For each C in X.IndexColumns
         XDataSize = XDataSize + ColSizes.Item(C.Column)
      next
      XDataSize = BlockSize * int(obj.Number * XDataSize /
BlockSize)

        ' Format the display message in order to get size
information in output and result list.
      XMsg = XMsg & CStr(XDataSize) & "|" & X.ObjectID & vbCrLf

      ' Add the index size to table size.
      RawDataSize = RawDataSize + XDataSize
   next
```

Finally the size information is formatted for output (see *Formatting the Database Size Estimation Output* on page 206). Each table is printed on a separate line in both the Output and Result List windows, and its total size including all columns and indexes is given:

```
    ' set the global message to table size and all indexes
(separate with carriage return).
   message = CStr(RawDataSize) & "||" & obj.ShortDescription &
vbCrLf & XMsg

   %GetEstimatedSize% = RawDataSize

End Function
```

Once all the tables have been processed, PowerDesigner calculates and prints the total estimated size of the database.

Calling the GetEstimatedSize Event Handler on Another Metaclass

You can call a `GetEstimatedSize` event handler defined on another metaclass to use this size in your calculation. For example, you may define `GetEstimatedSize` on the `Table` metaclass, and make a call to `GetEstimatedSize` defined on the `Column` and `Index` metaclasses to use these sizes to calculate the total size of the table.

The syntax of the function is as follows, where *message* is the name of your variable containing the results to print:

```
GetEstimatedSize(message[,true|false])
```

In general, we recommend that you use the function in the folllowing form:

```
GetEstimatedSize(message, false)
```

The use of the `false` parameter (which is the default, but which is shown here for clarity) means that we call the `GetEstimatedSize` event handler on the other metaclass, and use the default mechanism only if the event handler is not available.

Setting the parameter to true will force the use of the default mechanism for calculating the size of objects (only possible for tables, columns, and join indexes):

```
GetEstimatedSize(message, true)
```

Formatting the Database Size Estimation Output

You can format the output for your database size estimation. Sub-objects (such as columns and indexes) contained in a table are offset, and you can print additional information after the total.

The syntax for the output is as follows:

```
[object-size][:compartment]|[ObjectID][|label]
```

where:

- *object-size* - is the size of the object.
- *compartment* - is a one-digit number, which indicates that the size of the object should be excluded from the total size of the database and should be printed after the database size has been calculated. For example, you may include the size of individual tables in your calculation of the database size and print the sizes of tablespaces separately after the calculation.
- `ObjectID` - is unneccessary for objects, such as tables, but required for sub-objects if you want to print them to the Result List.
- *label* - is any appropriate identifying string, and is generally set to `ShortDescription`, which prints the type and name of the selected object.

For example, in the event handler defined on the `Table` metaclass (having calculated and stored the size of a table, the size of all the columns of type LONG contained in the table, and the size of each index in the table), we create a message variable to print this information. We begin by printing a line giving the size of a table:

```
message = CStr(TableSize) & "||" & objTable.ShortDescription & vbCrLf
```

We then add a line printing the total size of all the columns of type LONG in the table:

```
message = message & CStr(LongSize) & "||Columns of type LONG" &
vbCrLf
```

We then add a line printing the size of each index in the table:

```
message = message & CStr(IndexSize) & "|" & objIndex.ObjectID &
vbCrLf
```

In the event handler defined on the `Tablespace` metaclass (having calculated and stored the size of a tablespace), we create a message variable to print this information after the database size calculation has been printed.

We begin by overriding the default introduction to this second compartment:

```
message = ":1||Tables are allocated to the following tablespaces:"
```

We then add a line printing the size of each tablespace in the table

```
message = message + CStr(tablespaceSize) & ":1||" &
objTablespace.ShortDescription
```

The result gives the following output:

```
Estimate of the size of the Database "Sales"...

 Number    Estimated size      Object
-------    --------------      ------------------------------------

 10,000           6096 KB      Table 'Invoices'
                                 Columns of type LONG (35 KB)
                                 Index 'customerFKeyIndex' (976 KB)
                                 Index 'descriptionIndex' (1976 KB)

                           [...etc...]

 Tables are allocated to the following tablespaces:

           Estimated size      Object
           --------------      ------------------------------------
                  6096 KB      Tablespace 'mainStorage'

                           [...etc...]
```

ODBC Category (DBMS)

The ODBC category contains items for live database generation when the DBMS does not support the generation statements defined in the Script category.

For example, data exchange between PowerDesigner and MSACCESS works with VB scripts and not SQL, this is the reason why these statements are located in the ODBC category. You have to use a special program (access.mdb) to convert these scripts into MSACCESS database objects.

Physical Options (DBMS)

For some DBMSs, additional options are used to specify how an object is optimized or stored in a database. In PowerDesigner, these options are called *physical options* and are displayed on the **Physical Options** and **Physical Options (Common)** tabs of object property sheets.

To appear on the **Physical Options** tab, an option must be defined in the `Script\Objects\`*`object`*`\Options` item (see *Common Object Items* on page 145). Default values can be stored in `Options` or in `DefOptions`. To appear on the **Physical Options (Common)** tab (or any other property sheet tab), the physical option must, additionally be associated with an extended attribute (see *Adding DBMS Physical Options to Your Forms* on page 211).

During generation, the options selected in the model for each object are stored as a SQL string in the %OPTIONS% variable, which must appear at the end of the Create statement of the object, and cannot be followed by anything else. The following example uses the correct syntax:

```
create table
[%OPTIONS%]
```

During reverse engineering by script, the section of the SQL query determined as being the physical options is stored in %OPTIONS%, and will then be parsed when required by an object property sheet.

During live database reverse engineering, the `SqlOptsQuery` SQL statement is executed to retrieve the physical options which is stored in %OPTIONS% to be parsed when required by an object property sheet.

You can use PowerDesigner variables (see *PDM Variables and Macros* on page 213) to set physical options for an object. For example, in Oracle, you can set the following variable for a cluster to make the cluster take the same name as the table.

```
Cluster %TABLE%
```

For information about setting physical options, see *Data Modeling > Building Data Models > Physical Implementation > Physical Options*.

Simple Physical Options

Simple physical options must contain a name, and may contain a %d, %s, or other variable to let the user specify a value, and keywords to specify permitted values and defaults.

Simple physical options are specified on a single line using the following syntax:

```
name [=] %s|%d|%variable% [: keywords]
```

Everything entered before the colon is generated in scripts. The *name* is required by PowerDesigner, but you can place it between carets (`<name>`) if you need to exclude it from the final script. The `%d` or `%s` variables require a numeric or string value, and you can also use a PowerDesigner variable or GTL snippet.

Physical Option	Generates As
`max_rows_per_page=%d`	`max_rows_per_page=`*`value`*
`for instance %s`	`for instance `*`string`*
`<Partition-name> %s`	*`name`*

You can insert a colon followed by comma-separated keywords to control your options:

Keyword	Value and result

`category=`*`metaclass`*	Allows the user to associate the object with an object of the specified kind. The following settings are available:
	• tablespace
	• storage
	Note: In Oracle, the `storage` composite physical option is used as a template to define all the storage values in a storage entry to avoid having to set values independently each time you need to re-use them same values in a storage clause. For this reason, the Oracle physical option does not include the storage name (%s).
	• *qualified metaclass collection* - For example: `Model.Tables` or `Table.Columns`
	`on %s : category=storage`
	`{`

`list=`*`value`*`|`*`value`*	Specifies a list of pipe-separated values permitted for the option.
`default=`*`value`*	Specifies a default value for the option.
`dquoted=yes` and `squoted=yes`	Specifies that the value is enclosed in double or single quotes.

Keyword	Value and result
`multi-ple=yes`	Specifies that the option is displayed with a `<*>` suffix in the left pane of the Physical Options tab and can be added to the right pane as many times as necessary. If the option is selected in the right pane and you click the same option in the left pane to add it, a message box asks you if you want to reuse the selected option. If you click **No**, a second instance of the option is added to the right pane.
`enable-dbpre-fix=yes`	Specifies that the database name is inserted as a prefix (see tablespace options in DB2 OS/390).
`pre-vmand=yes` and `next-mand=yes`	Specifies that the previous or next physical option is required for the present option and that if the present option is added to the right pane, then the previous or next option is also added.

Examples

Physical Option	Generates As
`ccsid %s : list=ascii|ebcdic|unicode, default=ascii`	`ccsid ascii`
`table=%s : category=Model.Tables, dquoted=yes`	`table="`*`table`*`"`
`<flashback_archive> %s`	*`string`*

Composite Physical Options

Composite physical options are specified over multiple lines, and contain one or more dependent options. If you add the composite option to the right pane of the **Physical Options** tab, all the dependant options are added with it. If you add a dependant option, the composite option is added as well to contain it.

Composite physical options are defined with the following syntax:

```
name [=] [%s|%d|%variable%] : composite=yes[, keywords]
{
sub-option
[sub-option...]
}
```

Everything entered before the colon is generated in scripts. The *name* is required by PowerDesigner, but you can place it between carets (`<name>`) if you need to exclude it from the final script. The `%d` or `%s` variables require a numeric or string value, and you can also use a PowerDesigner variable or GTL snippet.

The `composite=yes` keyword is required for composite options, and can be used in conjunction with any of the simple physical option keywords or any of the following:

Keyword	Value and result
`composite=yes`	Specifies that the option is a composite option containing dependant options surround by curly braces.
`separator=yes`	Specifies that the dependant options are separated by commas.
`parenthesis=yes`	Specifies that the ensemble of dependant objects are contained between parentheses.
`chldmand=yes`	Specifies that at least one of the dependant options must be set.

Examples

Physical Option	Generates As

`<list> : composite=yes, multi-`
`ple=yes`
` {`
`  <frag-expression> %s`
`  in %s : category=storage`
` }`
	`  `*`frag-expression`*
	`  in `*`storage`*
	
	`frag-expression2`
	`  in `*`storage2`*
	`etc`

`<using_block> : compo-`
`site=yes,parenthesis=yes`
`{`
` using vcat %s`
` using stogroup %s : catego-`
`ry=storage, composite=yes`
` {`
`  priqty %d : default=12`
`  secqty %d`
`  erase %s : default=no, list=yes`
`| no`
` }`
	`using vcat `*`string`*
	` using stogroup `*`storage`*
	`  priqty `*`value`*
	`  secqty `*`value`*
	`  erase no)`

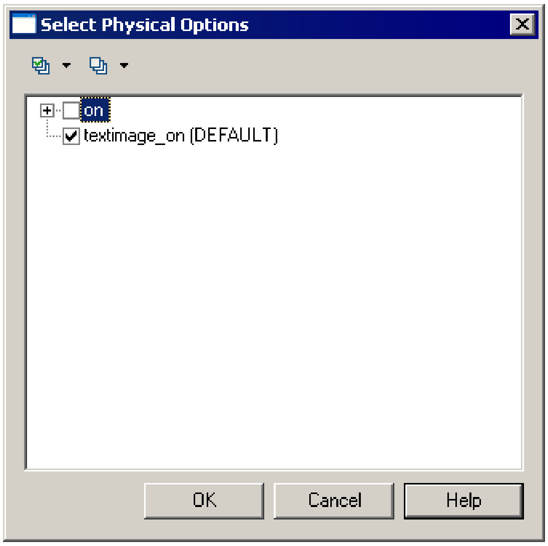
Adding DBMS Physical Options to Your Forms

Many DBMSs use *physical options* as part of the definition of their objects. The most commonly-used physical options are displayed on a form, **Physical Options (Common)**, defined under the appropriate metaclass. You can edit this form, or add physical options to your own forms.

Note: PowerDesigner displays all of the available options for an object (defined at `Script/Objects/`*`object`*`/Options` category) on the **Physical Options** tab (see *Physical Options (DBMS)* on page 208).

For a physical option to be displayed in a form, it must be associated with an extended attribute with the type `physical option`.

1. Right-click the metaclass and select **New Extended Attribute from Physical Options** to open the Select Physical Options dialog:

   Note: This dialog will be empty if no physical options are defined at `Script/Objects/`*`object`*`/Options`.

2. Select the physical option required and click **OK** to create an extended attribute associated with it.
3. Specify any other appropriate properties.
4. Select the form in which you want to insert the physical option and click the Add Attribute tool to insert it as a control (see *Adding Extended Attributes and Other Controls to Your Form* on page 57).

Note: To change the physical option associated with an extended attribute, click the ellipsis to the right of the **Physical Options** field in the Extended Attribute property sheet.

PDM Variables and Macros

The SQL queries recorded in the DBMS definition file items make use of various PDM variables, which are written between percent signs. These variables are replaced with values from your model when the scripts are generated, and are evaluated to create PowerDesigner objects during reverse engineering.

For example, in the following query, the variable `%TABLE%` will be replaced by the code of the table being created:

```
CreateTable = create table %TABLE%
```

Note: You can use these variables freely in your own queries, but you cannot change the method of their evaluation (ie, `%TABLE%` can only ever evaluate to the code of the table). You can alternately, access any object properties using GTL (see *Chapter 5, Customizing Generation with GTL* on page 247) and the public names available through the PowerDesigner metamodel (see *Chapter 8, The PowerDesigner Public Metamodel* on page 345).

The evaluation of variables depends on the parameters and context. For example, the `%COLUMN%` variable cannot be used in a `Create Tablespace` query, because it is only valid in a column context.

These variables can be used for all objects supporting these concepts:

Variable	Comment
%COMMENT%	Comment of Object or its name (if no comment defined)
%OWNER%	Generated code of User owning Object or its parent. You should not use this variable for queries on objects listed in live database reverse dialog boxes, because their owner is not defined yet
%DBPREFIX%	Database prefix of objects (name of Database + '.' if database defined)
%QUALIFIER%	Whole object qualifier (database prefix + owner prefix)
%OPTIONS%	SQL text defining physical options for Object
%OPTIONSEX%	The parsed SQL text defining physical options of the object
%CONSTNAME%	Constraint name of Object
%CONSTRAINT%	Constraint SQL body of Object. Ex: (A <= 0) AND (A >= 10)
%CONSTDEFN%	Column constraint definition. Ex: constraint C1 checks (A>=0) AND (A<=10)
%RULES%	Concatenation of Server expression of business rules associated with Object

Variable	Comment
%NAMEISCODE%	True if the object (table, column, index) name and code are identical (AS 400 specific)
%TABLQUALIFIER%	Parent table qualifier (database prefix + owner prefix)
%TABLOWNER%	The generated code of the user owning the parent table

Testing Variable Values with the [ ] Operators

You can use square brackets [ ] to test for the existence or value of a variable.

You can use square brackets to

- Include optional strings and variables, or lists of strings and variables in the syntax of SQL statements: `[%`*`variable`*`%]`
- Test the value of a variable and insert or reconsider a value depending of the result of the test: `[%`*`variable`*`%? `*`true`*` : `*`false`*`]`
- Test the content of a variable `[%`*`variable`*`%=`*`constant`*`? `*`true`*` : `*`false`*`]`

Variable	Generation
`[%`*`variable`*`%]`	Tests for the existence of the variable. Generation: Generated only if *variable* exists and is not assigned `NO` or `FALSE`. Reverse: Evaluated if the parser detects a SQL statement corre-sponding to the variable and it is not assigned `NO` or `FALSE`.
`[%`*`variable`*`%? `*`true`*` : `*`false`*`]`	Tests for the existence of the variable and allows conditional output. Generation: *true* is generated if *variable* exists and is not assigned `NO` or `FALSE`. Otherwise, *false* is generated. Reverse: If the parser detects *variable* and it is not assigned `NO` or `FALSE`, *true* is reversed. Otherwise, *false* is reversed. *variable* is set to `True` or `False` as appropriate.
`[%`*`variable`*`%=`*`con-stant`*`? `*`true`*` : `*`false`*`]`	Tests the value of the variable and allows conditional output. Generation: If *variable* equals *constant*, *true* is generated. Otherwise, *false* is generated. Reverse: If the parser detects that *variable* equals *constant*, *true* is reversed. Otherwise, *false* is reversed.

Variable	Generation
`[.Z: [item1] [item2]...]`	Specifies that the *items* do not have a significant order. Generation: `.Z` is ignored Reverse: The *items* can be reversed in any order they are encountered.
`[.O: [item1] [item2]...]`	Specifies that the *items* are synonyms, only one of which should be output. Generation: Only the first *item* listed is generated. Reverse: The reverse parser must find one of the *items* to validate the full statement.

Examples

- `[%OPTIONS%]`

  If `%OPTIONS%` (physical options for the objects visible in the object property sheet) exists and is not assigned `NO` or `FALSE`, it is generated to the value of `%OPTIONS%`.
- `[default %DEFAULT%]`

  If the statement `default 10` is found during reverse engineering, `%DEFAULT%` is assigned the value `10`, but the statement is not mandatory and reversing continues even if it is absent. In script generation, if `%DEFAULT%` has a value of `10`, it is generated as `default 10` otherwise nothing is generated for the block.
- `[%MAND%? not null : null ]`

  If `%MAND%` is evaluated as true or contains a value other than `False` or `NO`, it is generated as `not null`. Otherwise it is generated as `null`.
- `[%DELCONST%=RESTRICT?:[on delete %DELCONST%]]`

  If `%DELCONST%` contains the value `RESTRICT`, it is generated as `on delete RESTRICT`.
- `%COLUMN% %DATATYPE%[.Z: [%NOTNULL%][%DEFAULT%]]`

  Because of the presence of the `.Z` variable, both of the following statements will be reversed correctly even though the column attributes are not in the same order:
  - `Create table abc (a integer not null default 99)`
  - `Create table abc (a integer default 99 not null)`
- `[.O:[procedure][proc]]`

  This statement will generate `procedure`. During reverse engineering, the parser will match either `procedure` or `proc` keywords.
- **Note:** A string between square brackets is always generated. For reverse engineering, placing a string between square brackets means that it is optional and its absence will not cancel the reversing of the statement.

```
create [or replace] view %VIEW% as %SQL%
```

A script containing either `create` or `create or replace` will be correctly reversed because `or replace` is optional.

Formatting Variable Values

You can specify a format for variable values. For example, you can force values to lowercase or uppercase, truncate the length of values, or place values between quotes.

You embed formatting options in variable syntax as follows:

```
%[[?][-][x][.[-]y][options]:]variable%
```

The variable formatting options are the following:

Option	Description
?	Mandatory field, if a null value is returned the translate call fails

`[-][x].[-]y[M]`	Extracts the first *y* characters or, for `-`*y*, the last *y* characters.
	
	If *x* is specified, and *y* is lower than *x*, then blanks or zeros are added to the right of the extracted characters to fill the width up to *x*. For `-`*x*, the blanks or zeros are added to the left and the output is right-justified.
	
	If the `M` option is appended, then the first *x* characters of the variable are discarded and the next *y* characters are output.
	
	Thus, for an object named `abcdefghijklmnopqrstuvwxyz` (with parentheses present simply to demonstrate padding):
	```
	Template                Output
	(%.3:Name%)      gives   (abc)
	(%.-3:Name%)     gives   (xyz)
	(%10.3:Name%)    gives   (abc       )
	(%10.-3:Name%)   gives   (xyz       )
	(%-10.3:Name%)   gives   (       abc)
	(%-10.-3:Name%)  gives   (       xyz)
	(%10.3M:Name%)   gives   (jkl)
	```

`L[F]`, `U[F]`, and `c`	Converts the output to lowercase or uppercase. If `F` is specified, only the first character is converted. `c` is equivalent to `UF`.
`q` and `Q`	Surrounds the variable with single or double quotes.
`T`	Trims leading and trailing whitespace from the variable.
`H`	Converts number to hexadecimal.

You can combine format codes. For example, the template `(%12.3QMFU:Name%)` applied to object `abcdefghijklmnopqrstuvwxyz` generates `("Lmn")`.

Variables for Tables and Views

PowerDesigner can use variables in the generation and reverse-engineering of tables and views.

The following variables are available for tables:

Variable	Comment
%TABLE%	Generated code of Table
%TNAME%	Name of Table
%TCODE%	Code of Table
%TLABL%	Comment of Table
%PKEYCOLUMNS%	List of primary key columns. Ex: A, B
%TABLDEFN%	Complete body of Table definition. It contains definition of columns, checks and keys
%CLASS%	Abstract data type name
%CLASSOWNER%	Owner of the class object
%CLASSQUALIFIER%	Qualifier of the class object
%CLUSTERCOLUMNS%	List of columns used for a cluster
%INDXDEFN%	Table indexes definition
%TABLTYPE%	Table type

The following variables are available for views:

Variable	Comment
%VIEW%	Generated code of View
%VIEWNAME%	View name
%VIEWCODE%	View code
%VIEWCOLN%	List of columns of View. Ex: "A, B, C"
%SQL%	SQL text of View. Ex: Select * from T1
%VIEWCHECK%	Contains Keyword "with check option" if this option is selected in View
%SCRIPT%	Complete view creation order. Ex: create view V1 as select * from T1
%VIEWSTYLE%	Style of view: view, snapshot, materialized view

Variable	Comment
%ISVIEW%	True is it is a view (and not a snapshot)
%USAGE%	Read-only=0, Updatable=1, Check option=2

The following variables are available for tables and views:

Variable	Comment
%XMLELEMENT%	Element contained in the XML schema
%XMLSCHEMA%	XML schema

Variables for Columns, Domains, and Constraints

PowerDesigner can use variables in the generation and reverse-engineering of columns, domains, and constraints. Parent table variables are also available.

The following variables are available for columns:

Variable	Comment
%COLUMN%	Generated code of Column
%COLNNO%	Position of Column in List of columns of Table
%COLNNAME%	Name of Column
%COLNCODE%	Code of Column
%PRIMARY%	Contains Keyword "primary" if Column is primary key column
%ISPKEY%	TRUE if Column is part of a primary key
%ISAKEY%	TRUE if Column is part of an alternate key
%FOREIGN%	TRUE if Column is part of a foreign key
%COMPUTE%	Compute constraint text
%PREVCOLN%	Code of the previous column in the list of columns of the table
%NEXTCOLN%	Code of the next column in the list of columns of the table
%NULLNOTNULL%	Mandatory status of a column. This variable is always used with Null-Required item, see *Working with Null Values* on page 160
%PKEYCLUSTER%	CLUSTER keyword for the primary key when it is defined on the same line

Variable	Comment
%AKEYCLUSTER%	CLUSTER keyword for the alternate key when it is defined on the same line
%AVERAGELENGTH%	Average length
%ISVARDTTP%	TRUE if the column datatype has a variable length
%ISLONGDTTP%	TRUE if the column datatype is a long datatype but not an image or a blob
%ISBLOBDTTP%	TRUE if the column datatype is an image or a blob
%ISSTRDTTP%	TRUE if the column datatype contains characters

The following variables are available for domains:

Variable	Comment
%DOMAIN%	Generated code of Domain (also available for columns)
%DEFAULTNAME%	Name of the default object associated with the domain (SQL Server specific)

The following variables are available for constraints:

Variable	Comment
%UNIT%	Unit attribute of standard check
%FORMAT%	Format attribute of standard check
%DATATYPE%	Data type. Ex: int, char(10) or numeric(8, 2)
%DTTPCODE%	Data type code. Ex: int, char or numeric
%LENGTH%	Data type length. Ex: 0, 10 or 8
%PREC%	Data type precision. Ex: 0, 0 or 2
%ISRDONLY%	TRUE if Read-only attribute of standard check has been selected
%DEFAULT%	Default value
%MINVAL%	Minimum value
%MAXVAL%	Maximum value
%VALUES%	List of values. Ex: (0, 1, 2, 3, 4, 5)

Variable	Comment
%LISTVAL%	SQL constraint associated with List of values. Ex: C1 in (0, 1, 2, 3, 4, 5)
%MINMAX%	SQL constraint associated with Min and max values. Ex: (C1 <= 0) AND (C1 >= 5)
%ISMAND%	TRUE if Domain or column is mandatory
%MAND%	Contains Keywords "null" or "not null" depending on Mandatory attribute
%NULL%	Contains Keyword "null" if Domain or column is not mandatory
%NOTNULL%	Contains Keyword "not null" if Domain or column is mandatory
%IDENTITY%	Keyword "identity" if Domain or Column is identity (Sybase specific)
%WITHDEFAULT%	Keyword "with default" if Domain or Column is with default
%ISUPPERVAL%	TRUE if the upper-case attribute of standard check has been selected
%ISLOWERVAL%	TRUE if the lower-case attribute of standard check has been selected
%UPPER%	SQL constraint associated with upper only values
%LOWER%	SQL constraint associated with lower only values
%CASE%	SQL constraint associated with cases (upper, lower, first word capital, etc)

Variables for Keys

PowerDesigner can use variables in the generation and reverse-engineering of keys.

Variable	Comment
%COLUMNS% or %COLNLIST%	List of columns of Key. Ex: "A, B, C"
%ISPKEY%	TRUE when Key is Primary key of Table
%PKEY%	Constraint name of primary key
%AKEY%	Constraint name of alternate key
%KEY%	Constraint name of the key
%ISMULTICOLN%	True if the key has more than one column
%CLUSTER%	Cluster keyword

Variables for Indexes and Index Columns

PowerDesigner can use variables in the generation and reverse-engineering of indexes and index columns.

The following variables are available for indexes:

Variable	Comment
%INDEX%	Generated code of index
%TABLE%	Generated code of the parent of an index, can be a table or a query table (view)
%INDEXNAME%	Index name
%INDEXCODE%	Index code
%UNIQUE%	Contains Keyword "unique" when index is unique
%INDEXTYPE%	Contains index type (available only for a few DBMS)
%CIDXLIST%	List of index columns with separator, on the same line. Example: A asc, B desc, C asc
%INDEXKEY%	Contains keywords "primary", "unique" or "foreign" depending on index origin
%CLUSTER%	Contains keyword "cluster" when index is cluster
%INDXDEFN%	Used for defining an index within a table definition

The following variables are available for index columns:

Variable	Comment
%ASC%	Contains keywords "ASC" or "DESC" depending on sort order
%ISASC%	TRUE if index column sort is ascending

Variables for References and Reference Columns

PowerDesigner can use variables in the generation and reverse-engineering of references and reference columns.

The following variables are available for references:

Variable	Comment
%REFR%	Generated code of reference
%PARENT%	Generated code of parent table

Variable	Comment
%PNAME%	Name of parent table
%PCODE%	Code of parent table
%PQUALIFIER%	Qualifier of parent table. See also QUALIFIER.
%CHILD%	Generated code of child table
%CNAME%	Name of child table
%CCODE%	Code of child table
%CQUALIFIER%	Qualifier of child table. See also QUALIFIER.
%REFRNAME%	Reference name
%REFRCODE%	Reference code
%FKCONSTRAINT%	Foreign key (reference) constraint name
%PKCONSTRAINT%	Constraint name of primary key used to reference object
%CKEYCOLUMNS%	List of parent key columns. Ex: C1, C2, C3
%FKEYCOLUMNS%	List of child foreign key columns. Ex: C1, C2, C3
%UPDCONST%	Contains Update declarative constraint keywords "restrict", "cascade", "set null" or "set default"
%DELCONST%	Contains Delete declarative constraint keywords "restrict", "cascade", "set null" or "set default"
%MINCARD%	Minimum cardinality
%MAXCARD%	Maximum cardinality
%POWNER%	Parent table owner name
%COWNER%	Child table owner name
%CHCKONCMMT%	TRUE when check on commit is selected on Reference (ASA 6.0 specific)
%REFRNO%	Reference number in child table collection of references
%JOINS%	References joins.

The following variables are available for reference columns:

Variable	Comment
%CKEYCOLUMN%	Generated code of parent table column (primary key)
%FKEYCOLUMN%	Generated code of child table column (foreign key)
%PK%	Generated code of primary key column
%PKNAME%	Primary key column name
%FK%	Generated code of foreign key column
%FKNAME%	Foreign key column name
%AK%	Alternate key column code (same as PK)
%AKNAME%	Alternate key column name (same as PKNAME)
%COLTYPE%	Primary key column data type
%COLTYPENOOWNER%	Primary column owner
%DEFAULT%	Foreign key column default value
%HOSTCOLTYPE%	Primary key column data type used in procedure declaration. For example: without length

Variables for Triggers and Procedures

PowerDesigner can use variables in the generation and reverse-engineering of triggers and procedures.

The following variables are available for triggers:

Variable	Comment
%ORDER%	Order number of Trigger (in case DBMS support more than one trigger of one type)
%TRIGGER%	Generated code of trigger
%TRGTYPE%	Trigger type. It contains Keywords "beforeinsert", "afterupdate", ...etc.
%TRGEVENT%	Trigger event. It contains Keywords "insert", "update", "delete"
%TRGTIME%	Trigger time. It contains Keywords NULL, "before", "after"
%REFNO%	Reference order number in List of references of Table
%ERRNO%	Error number for standard error
%ERRMSG%	Error message for standard error

Variable	Comment
%MSGTAB%	Name of Table containing user-defined error messages
%MSGNO%	Name of Column containing Error numbers in User-defined error table
%MSGTXT%	Name of Column containing Error messages in User-defined error table
%SCRIPT%	SQL script of trigger or procedure.
%TRGBODY%	Trigger body (only for Oracle live database reverse engineering)
%TRGDESC%	Trigger description (only for Oracle live database reverse engineering)
%TRGDEFN%	Trigger definition
%TRGSCOPE%	Trigger scope (keywords: database, schema, all server)
%TRGSCOPEOWNER%	Trigger scope owner
%TRGSCOPEQUALIFIER%	Trigger scope owner plus dot

The following variables are available for procedures:

Variable	Comment
%PROC%	Generated code of Procedure (also available for trigger when Trigger is implemented with a procedure)
%FUNC%	Generated code of Procedure if Procedure is a function (with a return value)
%PROCPRMS%	List of parameters of the procedure

Variables for Rules

PowerDesigner can use variables in the generation and reverse-engineering of rules.

Variable	Comment
%RULE%	Generated code of Rule
%RULENAME%	Rule name
%RULECODE%	Rule code
%RULECEXPR%	Rule client expression
%RULESEXPR%	Rule server expression

Variables for Sequences

PowerDesigner can use variables in the generation and reverse-engineering of sequences.

Variable	Comment
%SQNC%	Name of sequence
%SQNCOWNER%	Name of the owner of the sequence

Variables for Synonyms

PowerDesigner can use variables in the generation and reverse-engineering of synonyms.

Variable	Comment
%SYNONYM%	Generated code of the synonym
%BASEOBJECT%	Base object of the synonym
%BASEOWNER%	Owner of the base object
%BASEQUALIFIER%	Qualifier of the base object
%VISIBILITY%	Private (default) or public
%SYNMTYPE%	Synonym of alias (DB2 only)
%ISPRIVATE%	True for a private synonym
%ISPUBLIC%	True for a public synonym

Variables for Tablespaces and Storages

PowerDesigner can use variables in the generation and reverse-engineering of tablespaces and storages.

Variable	Comment
%TABLESPACE%	Generated code of Tablespace
%STORAGE%	Generated code of Storage

Variables for Abstract Data Types

PowerDesigner can use variables in the generation and reverse-engineering of abstract data types and their child objects.

The following variables are available for abstract data types:

Variable	Comment
%ADT%	Generated code of Abstract data type

Variable	Comment
%TYPE%	Type of Abstract data type. It contains keywords like "array", "list", ...
%SIZE%	Abstract data type size
%FILE%	Abstract data type Java file
%ISARRAY%	TRUE if Abstract data type is of type array
%ISLIST%	TRUE if Abstract data type is of type list
%ISSTRUCT%	TRUE if Abstract data type is of type structure
%ISOBJECT%	TRUE if Abstract data type is of type object
%ISJAVAOBJECT%	TRUE if Abstract data type is of type JAVA object
%ISJAVA%	TRUE if Abstract data type is of type JAVA class
%ADTDEF%	Contains Definition of Abstract data type
%ADTBODY%	Abstract data type body
%SUPERADT%	Abstract data type supertype
%ADTNOTFINAL%	Abstract data type final
%ADTABSTRACT%	Abstract data type instantiable
%ADTHEADER%	Abstract data type body with ODBC
%ADTTEXT%	Abstract data type spec with ODBC
%SUPERQUALIFIER%	Abstract data type supertype qualifier
%SUPEROWNER%	Abstract data type supertype owner
%ADTAUTH%	Abstract data type authorization
%ADTJAVANAME%	Abstract data type JAVA name
%ADTJAVADATA%	Abstract data type JAVA data
%ADTATTRDEF%	Attributes part of abstract data type definition
%ADTMETHDEF%	Methods part of abstract data type definition

The following variables are available for abstract data type attributes:

Variable	Comment
%ADTATTR%	Generated code of Abstract data type attribute
%ATTRJAVA-NAME%	Abstract data type attribute JAVA name

The following variables are available for abstract data type procedures:

Variable	Comment
%ADTPROC%	Procedure code
%PROCTYPE%	Procedure type (constructor, order, map)
%PROCFUNC%	Procedure type (procedure, function)
%PROCDEFN%	Procedure body (begin... end)
%PROCRETURN%	Procedure return type
%PARAM%	Procedure parameters
%PROCNOTFI-NAL%	Procedure final
%PROCSTATIC%	Procedure member
%PROCAB-STRACT%	Procedure instantiable
%SUPERPROC%	Procedure super-procedure
%ISCONSTRUC-TOR%	True if the procedure is a constructor
%PROCJAVA-NAME%	Procedure JAVA name
%ISJAVAVAR%	True if procedure is mapped to a static JAVA variable
%ISSPEC%	True in specifications, undefined in body

Variables for Join Indexes (IQ)

PowerDesigner can use variables in the generation and reverse-engineering of IQ join indexes.

Variable	Comment
%JIDX%	Generated code for join index
%JIDXDEFN%	Complete body of join index definition
%REFRLIST%	List of references (for live database connections)
%RFJNLIST%	List of reference joins (for live database connections)
%FACTQUALIFIER%	Qualifier for the fact table
%JIDXFACT%	Fact (base table)
%JIDXCOLN%	List of columns
%JIDXFROM%	From clause
%JIDXWHERE%	Where clause

Variables for ASE & SQL Server

PowerDesigner can use variables in the generation and reverse-engineering of objects for ASE and SQL Server.

Variable	Comment
%RULENAME%	Name of Rule object associated with Domain
%DEFAULTNAME%	Name of Default object associated with Domain
%USE_SP_PKEY%	Use sp_primary key to create primary keys
%USE_SP_FKEY%	Use sp_foreign key to create foreign keys

Variables for Database Synchronization

PowerDesigner can use variables in the generation and reverse-engineering of objects during database synchronization.

Variable	Comment
%OLDOWNER%	Old owner name of Object. See also OWNER
%NEWOWNER%	New owner name of Object. See also OWNER
%OLDQUALIFIER%	Old qualifier of Object. See also QUALIFIER
%NEWQUALIFIER%	New qualifier of Object. See also QUALIFIER
%OLDTABL%	Old code of Table

Variable	Comment
%NEWTABL%	New code of Table
%OLDCOLN%	Old code of Column
%NEWCOLN%	New code of Column
%OLDNAME%	Old code of Sequence
%NEWNAME%	New code of Sequence

Variables for DB Packages and Their Child Objects

PowerDesigner can use variables in the generation and reverse-engineering of database packages and their child objects.

The following variables are available for database packages:

Variable	Comment
%DBPACKAGE%	Generated code of the database package
%DBPACKAGECODE%	Initialization code at the end of the package
%DBPACKAGESPEC%	Database package specification
%DBPACKAGEBODY%	Database package body
%DBPACKAGEINIT%	Database package initialization code
%DBPACKAGEPRIV%	Database package authorization (old privilege)
%DBPACKAGEAUTH%	Database package authorization
%DBPACKAGEPUBLIC%	True for public sub-object
%DBPACKAGETEXT%	Database package body with ODBC
%DBPACKAGEHEADER%	Database package spec with ODBC

The following variables are available for database package procedures:

Variable	Comment
%DBPKPROC%	Procedure code
%DBPKPROCTYPE%	Procedure type (procedure, function)
%DBPKPROCCODE%	Procedure body (begin... end)
%DBPKPROCRETURN%	Procedure return type

Variable	Comment
%DBPKPROCPARAM%	Procedure parameters

The following variables are available for database package variables:

Variable	Comment
%DBPFVAR%	Variable code
%DBPFVARTYPE%	Variable type
%DBPFVARCONST%	Variable of constant type
%DBPFVARVALUE%	Variable default value for constant

The following variables are available for database package types:

Variable	Comment
%DBPKTYPE%	Type code
%DBPKTYPEVAR%	List of variables
%DBPKISSUBTYPE%	True if type is a subtype

The following variables are available for database package cursors:

Variable	Comment
%DBPKCURSOR%	Cursor code
%DBPKCURSORRE-TURN%	Cursor return type
%DBPKCURSORQUERY %	Cursor query
%DBPKCURSORPARAM %	Cursor parameter

The following variables are available for database package exceptions:

Variable	Comment
%DBPKEXEC%	Exception code

The following variables are available for database package parameters:

Variable	Comment
%DBPKPARM%	Parameter code
%DBPKPARMTYPE%	Parameter type
%DBPKPARMDTTP%	Parameter data type
%DBPKPARMDEFAULT%	Parameter default value

The following variables are available for database package pragmas:

Variable	Comment
%DBPKPRAGMA%	Pragma directive
%DBPKPRAGMAOBJ%	Pragma directive on object
%DBPKPRAGMAPARAM%	Pragma directive parameter

Variables for Database Security

PowerDesigner can use variables in the generation and reverse-engineering of database security objects.

Variable	Comment
%PRIVLIST%	List of privileges for a grant order
%REVPRIVLIST%	List of privileges for a revoke order
%PERMLIST%	List of permissions for a grant order
%REVPERMLIST%	List of permissions for a revoke order
%COLNPERMISSION%	Permissions on a specific list of columns
%BITMAPCOLN%	Bitmap of specific columns with permissions
%USER%	Name of the user
%GROUP%	Name of the group
%ROLE%	Name of the role
%GRANTEE%	Generic name used to design a user, a group, or a role
%PASSWORD%	Password for a user, group, or role
%OBJECT%	Database objects (table, view, column, and so on)
%PERMISSION%	SQL grant/revoke order for a database object

Variable	Comment
%PRIVILEGE%	SQL grant/revoke order for an ID (user, group, or role)
%GRANTOPTION%	Option for grant: with grant option / with admin option
%REVOKEOPTION%	Option for revoke: with cascade
%GRANTOR%	User that grants the permission
%MEMBER%	Member of a group or member with a role
%GROUPS%	List of groups separated by the delimiter
%MEMBERS%	List of members (users or roles) of a group or role separated by the delimiter
%ROLES%	List of parent roles of a user or role
%SCHEMADEFN%	Schema definition

Variables for Defaults

PowerDesigner can use variables in the generation and reverse-engineering of defaults.

Variable	Comment
%BOUND_OBJECT%	Binded object

Variables for Web Services

PowerDesigner can use variables in the generation and reverse-engineering of Web services.

The following variables are available for web services:

Variable	Comment
%WEBSERVICENAME%	Only generated code of the web service
%WEBSERVICE%	Generated code of the web service and local path
%WEBSERVICETYPE%	Web service type
%WEBSERVICESQL%	SQL statement
%WEBSERVICELOCAL-PATH%	Local path

The following variables are available for web service operations:

Variable	Comment
%WEBOPERATION-NAME%	Only generated code of the web operation
%WEBOPERATION%	Generated code of the operation, service, and local path
%WEBOPERATIONTYPE%	We operation type
%WEBOPERATIONSQL%	SQL statement
%WEBOPERATIONPAR-AM%	Web operation parameters list

The following variables are available for web service security:

Variable	Comment
%WEBUSER%	Connection user required for web service
%WEBCNCTSECURED%	Connection secured
%WEBAUTHREQUIRED%	Authorization required

The following variables are available for web service parameters:

Variable	Comment
%WEBPARAM%	List of web parameters
%WEBPARAMNAME%	Web parameter name
%WEBPARAMTYPE%	Web parameter type
%WEBPARAMDTTP%	Web parameter data type
%WEBPARAMDEFAULT%	Web parameter default value

Variables for Dimensions

PowerDesigner can use variables in the generation and reverse-engineering of dimensions.

Variable	Comment
%DIMENSION%	Generated code of dimension
%DIMNDEF%	Dimension definition

Variable	Comment
%DIMNATTR%	Dimension attribute (level)
%DIMNOWNERTABL%	Level table owner
%DIMNTABL%	Level table
%DIMNCOLN%	Level column
%DIMNCOLNLIST%	Level columns list
%DIMNHIER%	Dimension hierarchy
%DIMNKEY%	List of child key columns
%DIMNKEYLIST%	List of child key columns
%DIMNLEVELLIST%	Level list for hierarchy
%DIMNATTRHIER%	Attribute of hierarchy
%DIMNATTRHIERFIRST %	First attribute of hierarchy
%DIMNATTRHIERLIST%	List of attributes of hierarchy
%DIMNPARENTLEVEL %	Parent level for hierarchy
%DIMNDEPATTR%	Dimension dependant attribute
%DIMNDEPCOLN%	Dependent column
%DIMNDEPCOLNLIST%	List of dependent columns

Variables for Extended Objects

PowerDesigner can use variables in the generation and reverse-engineering of extended objects.

Variable	Comment
%EXTENDEDOBJECT%	Generated code for extended object
%EXTENDEDSUBOBJECT%	Generated code for extended sub-object
%EXTSUBOBJTPARENT %	Generated code for parent of extended sub-object
%EXTSUBOBJTPARENTOWNER%	Generated code for owner of extended sub-object
%EXTSUBOBJTPARENTQUALIFIER%	Parent object qualifier (database prefix and owner prefix)

Variable	Comment
%EXTOBJECTDEFN%	Complete body of the extended object definition. Contains definition of extended collection listed in DefinitionContent DBMS item.

Variables for Reverse Engineering

PowerDesigner can use variables during the reverse engineering of objects.

Variable	Comment
%R%	Set to TRUE during reverse engineering
%S%	Allow to skip a word. The string is parsed for reverse but not generated
%D%	Allow to skip a numeric value. The numeric value is parsed for reverse but not generated
%A%	Allow to skip all Text. The text is parsed for reverse but not generated
%ISODBCUSER%	True if Current user is Connected one
%CATALOG%	Catalog name to be used in live database connection reverse queries
%SCHEMA%	Variable representing a user login and the object belonging to this user in the database. You should use this variable for queries on objects listed in database reverse dialog boxes, because their owner is not defined yet. Once the owner of an object is defined, you can use SCHEMA or OWN-ER
%SIZE%	Data type size of column or domain. Used for live database reverse, when the length is not defined in the system tables
%VALUE%	One value from the list of values in a column or domain
%PERMISSION%	Allow to reverse engineer permissions set on a database object
%PRIVILEGE%	Allow to reverse engineer privileges set on a user, a group, or a role

Variables for Database, Triggers, and Procedures Generation

PowerDesigner can use variables in the generation of databases, triggers, and procedures.

Variable	Comment
%DATE%	Generation date & time
%USER%	Login name of User executing Generation
%PATHSCRIPT%	Path where File script is going to be generated
%NAMESCRIPT%	Name of File script where SQL orders are going to be written
%STARTCMD%	Description to explain how to execute Generated script

Variable	Comment
%ISUPPER%	TRUE if upper case generation option is set
%ISLOWER%	TRUE if lower case generation option is set
%DBMSNAME%	Name of DBMS associated with Generated model
%DATABASE%	Code of Database associated with Generated model
%DATASOURCE%	Name of the data source associated with the generated script
%USE_SP_PKEY%	Use stored procedure primary key to create primary keys (SQL Server specific)
%USE_SP_FKEY%	Use stored procedure foreign key to create primary keys (SQL Server specific)

.AKCOLN, .FKCOLN, and .PKCOLN Macros

Repeat a statement for each alternate, foreign, or primary key column in a table.

Syntax

```
.AKCOLN("statement","prefix","suffix","last_suffix", "condition")
```

```
.FKCOLN("statement","prefix","suffix","last_suffix")
```

```
.PKCOLN("statement","prefix","suffix","last_suffix")
```

Argument	Description
statement	Statement to repeat for each column
prefix	Prefix for each new line
suffix	Suffix for each new line
last suffix	Suffix for the last line
condition	Alternate key code (if condition argument is left empty the macro returns a statement for each alternate key in the table)

Example

In a trigger for the table `TITLEAUTHOR`:

-
  ```
  message .AKCOLN("'%COLUMN% is an alternate key column'","", "",
  "", "AKEY1")
  ```

  generates the following trigger script:

  ```
  message 'TA_ORDER is an alternate key column',
  ```

-
  ```
  message .FKCOLN("'%COLUMN% is a foreign key column'","",",",";")
  ```

  generates the following trigger script:

```
message 'AU_ID is a foreign key column,
TITLE_ISBN is a foreign key column;'
```

- `message .PKCOLN("'%COLUMN% is a primary key column'","",",",";")`

  generates the following trigger script:

  ```
  message 'AU_ID is a primary key column',
      'TITLE_ISBN is a primary key column';
  ```

Note: For columns, these macros only accept the `%COLUMN%` variable.

.ALLCOL Macro

Repeats a statement for each column in a table

Syntax

.ALLCOL("*statement***","***prefix***","***suffix***","***last_suffix***")**

Argument	Description
statement	Statement to repeat for each column
prefix	Prefix for each new line
suffix	Suffix for each new line
last suffix	Suffix for the last line

Example

In a trigger for the table AUTHOR, the following macro:

```
.ALLCOL("%COLUMN% %COLTYPE%","",",",";")
```

generates the following trigger script:

```
AU_ID char(12),
AU_LNAME varchar(40),
AU_FNAME varchar(40),
AU_BIOGRAPH long varchar,
AU_ADVANCE numeric(8,2),
AU_ADDRESS varchar(80),
CITY varchar(20),
STATE char(2),
POSTALCODE char(5),
AU_PHONE char(12);
```

.DEFINE Macro

Defines a variable and initializes its value

Syntax

.DEFINE "*variable***" "***value***"**

Argument	Description
variable	Variable name (without % signs)
value	Variable value (may include another variable surrounded by % signs)

Example

In a trigger for the table AUTHOR, the following macro:

```
.DEFINE "TRIGGER" "T_%TABLE%"
message 'Error: Trigger(%TRIGGER%) of table %TABLE%'
```

generates the following trigger script:

```
message 'Error: Trigger(T_AUTHOR) of table AUTHOR';
```

.DEFINEIF Macro

Defines a variable and initializes its value if the test value is not null

Syntax

.DEFINEIF "*test_value***" "***variable***" "***value***"**

Argument	Description
test_value	Value to test
variable	Variable name (without % signs)
value	Variable value (may include another variable surrounded by % signs)

Example

For example, to define a variable for a default data type:

```
%DEFAULT%
.DEFINEIF "%DEFAULT%" "_DEFLT"" "%DEFAULT%"
Add %COLUMN% %DATATYPE% %_DEFLT%
```

.ERROR Macro

Handles errors.

Syntax

.ERROR (*errno***, "***errmsg***")**

Argument	Description
errno	Error number
errmsg	Error message

Example

```
.ERROR(-20001, "Parent does not exist, cannot insert child")
```

.FOREACH_CHILD Macro

Repeats a statement for each parent-to-child reference in the current table fulfilling a condition.

Syntax

.FOREACH_CHILD ("*condition***")**

"*statement***"**

.ENDFOR

Argument	Description
condition	Reference condition (see below)
statement	Statement to repeat

Condition	Selects
UPDATE RESTRICT	Restrict on update
UPDATE CASCADE	Cascade on update
UPDATE SETNULL	Set null on update
UPDATE SETDEFAULT	Set default on update
DELETE RESTRICT	Restrict on delete
DELETE CASCADE	Cascade on delete
DELETE SETNULL	Set null on delete
DELETE SETDEFAULT	Set default on delete

Example

In a trigger for the table TITLE, the following macro:

```
.FOREACH_CHILD("DELETE RESTRICT")
--  Cannot delete parent "%PARENT%" if children still exist in
"%CHILD%"
.ENDFOR
```

generates the following trigger script:

```
--  Cannot delete parent "TITLE" if children still exist in
"ROYSCHED"
--  Cannot delete parent "TITLE" if children still exist in "SALE"
--  Cannot delete parent "TITLE" if children still exist in
"TITLEAUTHOR"
```

.FOREACH_COLUMN Macro

Repeats a statement for each column in the current table fulfilling a condition.

Syntax

.FOREACH_COLUMN ("*condition***")**

"*statement***"**

.ENDFOR

Argument	Description
condition	Column condition (see below)
statement	Statement to repeat

Condition	Selects
empty	All columns
PKCOLN	Primary key columns
FKCOLN	Foreign key columns
AKCOLN	Alternate key columns
NMFCOL	Non-modifiable columns (columns that have Cannot Modify selected as a check parameter)
INCOLN	Triggering columns (primary key columns, foreign key columns; and non-modifiable columns)

Example

In a trigger for the table TITLE, the following macro:

```
.FOREACH_COLUMN("NMFCOL")
-- "%COLUMN%" cannot be modified
.ENDFOR
```

generates the following trigger script:

```
-- "TITLE_ISBN" cannot be modified
-- "PUB_ID" cannot be modified
```

.FOREACH_PARENT Macro

Repeats a statement for each child-to-parent reference in the current table fulfilling a condition.

Syntax

```
.FOREACH_PARENT ("condition")

"statement"

.ENDFOR
```

Argument	Description
condition	Reference condition (see below)
statement	Statement to repeat

Condition	Selects references defined with ...
empty	All references
FKNULL	Non-mandatory foreign keys
FKNOTNULL	Mandatory foreign keys
FKCANTCHG	Non-modifiable foreign keys

Example

In a trigger for the table SALE, the following macro:

```
.FOREACH_PARENT("FKCANTCHG")
--  Cannot modify parent code of "%PARENT%" in child "%CHILD%"
.ENDFOR
```

generates the following trigger script:

```
--  Cannot modify parent code of "STORE" in child "SALE"
--  Cannot modify parent code of "TITLE" in child "SALE"
```

.INCOLN Macro

Repeats a statement for each primary key column, foreign key column, alternate key column, or non-modifiable column in a table.

Syntax

```
.INCOLN("statement","prefix","suffix","last_suffix")
```

Argument	Description
statement	Statement to repeat for each column
prefix	Prefix for each new line
suffix	Suffix for each new line
last suffix	Suffix for the last line

Example

In a trigger for the table TITLE, the following macro:

```
.INCOLN("%COLUMN% %COLTYPE%","",",",";")
```

generates the following trigger script:

```
TITLE_ISBN char(12),
PUB_ID char(12);
```

.JOIN Macro

Repeats a statement for column couple in a join.

Syntax

```
.JOIN("statement","prefix","suffix","last_suffix")
```

Argument	Description
statement	Statement to repeat for each column
prefix	Prefix for each new line
suffix	Suffix for each new line
last suffix	Suffix for the last line

Example

In a trigger for the table TITLE, the following macro:

```
.FOREACH_PARENT()
where .JOIN("%PK%=%FK%", " and", "", ";")
message 'Reference %REFR% links table %PARENT% to %CHILD%'
 .ENDFOR
```

generates the following trigger script:

```
message 'Reference TITLE_PUB links table PUBLISHER to TITLE
```

Note: For columns, the macro JOIN only accepts the variables %PK%, %AK%, and %FK %.

.NMFCOL Macro

Repeats a statement for each non-modifiable column in a table. Non-modifiable columns have Cannot Modify selected as a check parameter.

Syntax

```
.NMFCOL("statement","prefix","suffix","last_suffix")
```

Argument	Description
statement	Statement to repeat for each column
prefix	Prefix for each new line
suffix	Suffix for each new line
last suffix	Suffix for the last line

Example

In a trigger for the table TITLE, the following macro:

```
.NMFCOL("%COLUMN% %COLTYPE%","",",",";")
```

generates the following trigger script:

```
TITLE_ISBN char(12),
PUB_ID char(12);
```

.CLIENTEXPRESSION and .SERVEREXPRESSION Macros

Uses the client and/or server expression of a business rule in the trigger template, template item, trigger, and procedure script.

Syntax

.CLIENTEXPRESSION(code of the business rule)

.SERVEREXPRESSION(code of the business rule)

Example

The business rule ACTIVITY_DATE_CONTROL has the following server expression:

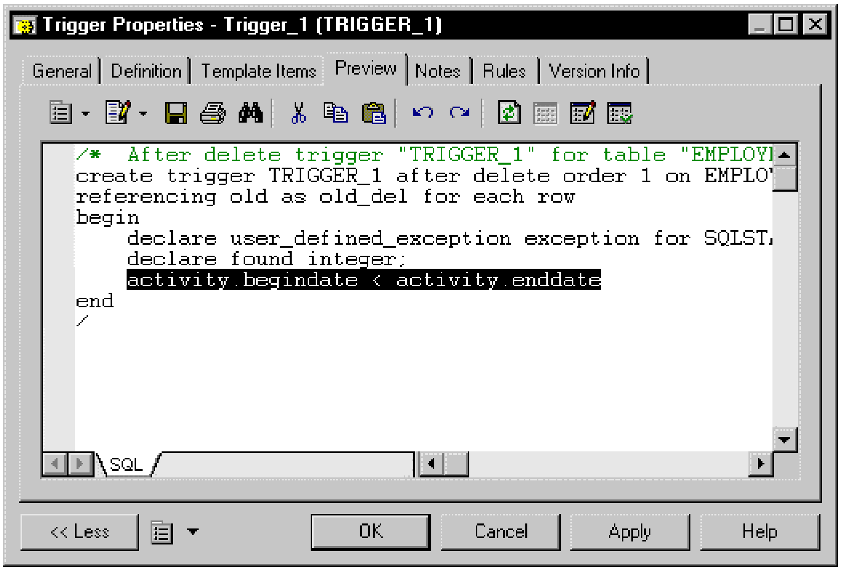
```
activity.begindate < activity.enddate
```

In a trigger based on template AfterDeleteTrigger, you type the following macro in the Definition tab of the trigger:

```
.SERVEREXPRESSION(ACTIVITY_DATE_CONTROL)
```

This generates the following trigger script:

```
activity.begindate < activity.enddate
end
```



```
/*  After delete trigger "TRIGGER_1" for table "EMPLOYI
create trigger TRIGGER_1 after delete order 1 on EMPLO'
referencing old as old_del for each row
begin
    declare user_defined_exception exception for SQLST.
    declare found integer;
    activity.begindate < activity.enddate
end
/
```

.SQLXML Macro

Represents a SQL/XML query in the definition of a trigger, a procedure or a function.

Use one of the following tools:

- The *Insert SQL/XML Macro* tool opens a selection dialog box where you choose a global element from an XML model. The XML model must be open in the workspace, mapped to a PDM, and have the SQL/XML extension file attached. Click OK in the dialog box and the SQLXML macro is displayed in the definition code, with the code of the XML model (optional) and the code of the global element.
- The *Macros* tool, where you select *.SQLXML( )* in the list. The SQLXML macro is displayed empty in the definition code. You must fill the parentheses with the code of an XML model (optional), followed by :: and the code of a global element. The XML model, from which you choose a global element, must be open in the workspace, mapped to a PDM, and have the SQL/XML extension file attached.

After generation, the SQLXML macro is replaced by the SQL/XML query of the global element.

Syntax

```
.SQLXML(code of an XML model::code of a global element)
```

Note: the code of an XML model is optional.

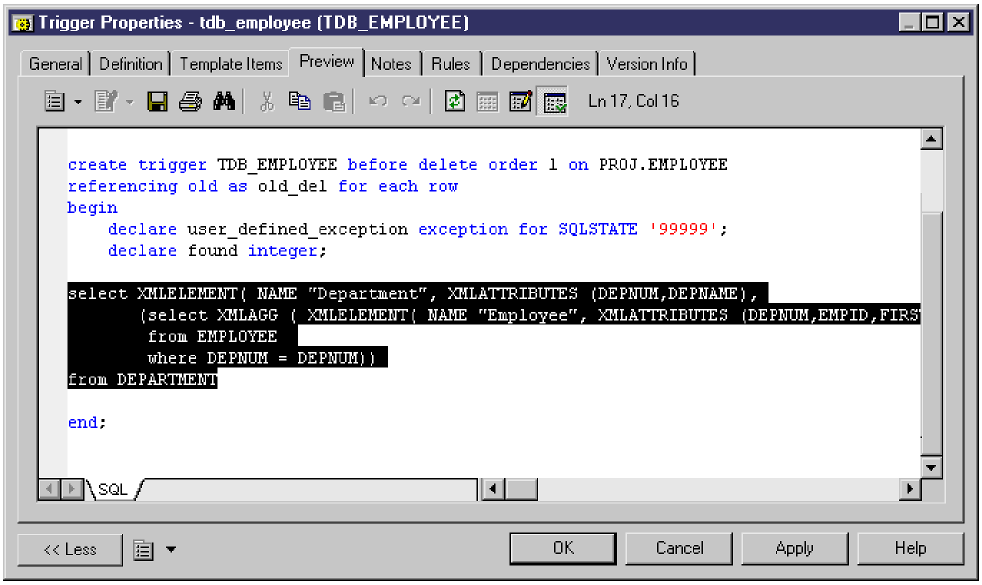
Example

In a trigger for the table EMPLOYEE, the following macro:

```
.SQLXML(CorporateMembership::DEPARTMENT)
```

generates the following trigger script:

```
select XMLELEMENT( NAME "Department", XMLATTRIBUTES
(DEPNUM,DEPNAME),
   (select XMLAGG ( XMLELEMENT( NAME "Employee", XMLATTRIBUTES
(DEPNUM,EMPID,FIRSTNAME,LASTNAME)) )
    from EMPLOYEE
    where DEPNUM = DEPNUM))
from DEPARTMENT
```



```
create trigger TDB_EMPLOYEE before delete order 1 on PROJ.EMPLOYEE
referencing old as old_del for each row
begin
    declare user_defined_exception exception for SQLSTATE '99999';
    declare found integer;

select XMLELEMENT( NAME "Department", XMLATTRIBUTES (DEPNUM,DEPNAME),
       (select XMLAGG ( XMLELEMENT( NAME "Employee", XMLATTRIBUTES (DEPNUM,EMPID,FIRS
        from EMPLOYEE
        where DEPNUM = DEPNUM))
from DEPARTMENT

end;
```

CHAPTER 5 Customizing Generation with GTL

The PowerDesigner Generation Template Language (GTL) is used to extract model object properties as text. GTL is written in *templates* and *generated files* defined under metaclasses in language definition and extension files. It powers generation of code for business process, object-oriented and XML languages, and can be used to define new generations for any model.

When you launch a generation from a model, PowerDesigner generates a file for each instance of each metaclass for which you have defined a generated file (see *Generated Files (Profile)* on page 87) by evaluating the templates it calls and resolving any variables.

GTL is object-oriented, supporting inheritance and polymorphism for reusability and maintainability, and provides macros for testing variables and iterating through collections, etc.

A GTL template can contain text, macros, and variables, and can reference:

- metamodel attributes, such as the name of a class or data type of an attribute
- collections, such as the list of attributes of a class or columns of a table
- other elements of the model, such as environment variables

Note: Though GTL can be used to extend generation in a PDM, the standard generation is primarily defined using a different mechanism (see *Database Generation and Reverse Engineering* on page 122).

Creating a Template and a Generated File

GTL templates are commonly used for generating files. If your template is going to be used in generation, it must be referenced in a generated file.

1. Open your language definition or extension file in the resource editor (see *Opening Resource Files in the Editor* on page 2).
2. If necessary, add a metaclass to the Profile category (see *Metaclasses (Profile)* on page 31) and then right-click it and select **New > Template** (see *Templates (Profile)* on page 86).
3. Enter `helloWorld` as the name of the template and enter the following code in the text box:

```
Hello World!
This template is being generated for the %Name% object.
```

Note: We recommend that you name your templates using headless camelCase, (starting with a lowercase letter), in order to avoid clashes with property and collection names which, by convention use full CamelCase.

4. Right-click the metaclass again, and select **New** > **Generated File** (see *Generated Files (Profile)* on page 87).
5. Enter `myFile` as the name of the generated file, and enter the following code in the text box to call your template:

   ```
   %helloWorld%
   ```
6. Click **OK** to save your changes in the resource file and return to your model.
7. Create an instance of the metaclass on which you defined the template and generated file, open its property sheet, and click the **Preview** tab.
8. Select the **myFile** sub-tab to preview what would be generated for this object.

Extracting Object Properties

Object properties are referenced as variables and enclosed between percent signs: `%`*`variable`*`%`. Variable names are case sensitive, and property names are, by convention, defined in CamelCase.

Properties are extracted as the following types:

- String - returns text.
- Boolean - returns `true` or `false`.
- Object - returns the object ID or `null`.

Example

```
This file is generated for %Name%, which is a %Color% %Shape%.
```

Result:

```
This file is generated for MyObject, which is a Red Triangle.
```

Standard properties defined in the PowerDesigner public metamodel (see *Chapter 8, The PowerDesigner Public Metamodel* on page 345) are referenced using their public names, which are written in CamelCase. You can infer public names for many properties from their labels in object property sheets, but in case of doubt, click the **Property Sheet Menu** button at the bottom of the property sheet and select **Find in Metamodel Objects Help** to review all available properties for the object.

Extended attributes (see *Extended Attributes (Profile)* on page 39) are referenced by their **Name** defined in the resource editor.

Note: To access an extended attribute defined in another extension file attached to the model, prefix the name with the `.D` formatting option. For example:

```
%.D:MyExtAtt%
```

Accessing Collections of Sub-Objects or Related Objects

An OOM contains a collection of classes and classes contain collections of attributes and operations. To iterate over a collection, use the `.foreach_item` macro.

Example

```
%Name% contains:
.foreach_item(Widgets)
    \n\t%Name% (%Color% %Shape%)
.next
```

Result:

```
MyObject contains:
    Widget1 (Red Triangle)
    Widget2 (Yellow Square)
    Widget3 (Green Circle)
```

Standard collections defined in the PowerDesigner public metamodel (see *Chapter 8, The PowerDesigner Public Metamodel* on page 345) are referenced using their public names, which are written in CamelCase. You can infer public names for many collections from their labels in object property sheet tabs, but in case of doubt, click the **Property Sheet Menu** button at the bottom of the property sheet and select **Find in Metamodel Objects Help** to review all available collections for the object.

Extended collections (see *Extended Collections and Compositions (Profile)* on page 48 and *Calculated Collections (Profile)* on page 50) are referenced by their **Name**.

You can use the following keywords to access information about a collection:

Name	Description
`First`	(object) Returns the first element of the collection.
`IsEmpty`	(boolean) Returns `True` if the collection is empty, or `false` if it contains one or more members.
`Count`	(integer) Returns the number of elements in the collection. You can use this keyword for defining criteria based on collection size, for example `Attributes.Count>=10`.

Example

`%Name% is associated with %AttachedRules.Count% business rules, of which the first is %AttachedRules.First.Name%.`
 	
Result:
 	
`myClass is associated with 3 business rules, of which the first is myRule.`

Formatting Your Output

You can change the formatting of variables by embedding formatting options in variable syntax. New lines and tabs are specified using the `\n` and `\t` escape sequences respectively.

```
%[[-][x][.[-]y][options]:]variable%
```

The following variable formatting options are available:

Option	Description

`[-][x].[-]y[M]`	Extracts the first *y* characters or, for `-`*y*, the last *y* characters.
	
	If *x* is specified, and *y* is lower than *x*, then blanks or zeros are added to the right of the extracted characters to fill the width up to *x*. For `-`*x*, the blanks or zeros are added to the left and the output is right-justified.
	
	If the `M` option is appended, then the first *x* characters of the variable are discarded and the next *y* characters are output.
	
	Thus, for an object named `abcdefghijklmnopqrstuvwxyz` (with parentheses present simply to demonstrate padding):
	
	`Template                Output`
	`(%.3:Name%)      gives   (abc)`
	`(%.-3:Name%)     gives   (xyz)`
	`(%10.3:Name%)    gives   (abc       )`
	`(%10.-3:Name%)   gives   (xyz       )`
	`(%-10.3:Name%)   gives   (       abc)`
	`(%-10.-3:Name%)  gives   (       xyz)`
	`(%10.3M:Name%)   gives   (jkl)`

`L[F]`, `U[F]`, and `c`	Converts the output to lowercase or uppercase. If `F` is specified, only the first character is converted. `c` is equivalent to `UF`.
`q` and `Q`	Surrounds the variable with single or double quotes.
`A`	Removes indentation and aligns text on the left border.
`T`	Trims leading and trailing whitespace from the variable.
`H`	Converts number to hexadecimal.

Option	Description
`D`	Returns the human-readable value of an attribute used in the PowerDesigner interface when this value differs from the internal representation. For example, the value of the `Visibility` attribute is stored internally as `+`, but is displayed as `public` in the property sheet. The template `%Visibility%` generates as `+`, but `%.D:Visibility%` generates as `public`. **Note:** You can access extended attributes defined in another extension file by prefixing them with the `.D` option (see *Extracting Object Properties* on page 248).
`X`	Escapes XML forbidden characters.
`E`	[deprecated – use the ! power evaluation operator instead, see *GTL Operators* on page 254].

Examples

`This file is generated for %.UQ:Name%. It has the form of a %.L:Color% %.L:Shape%.`
 	
`This file is generated for "MYGADGET". It has the form of a red triangle.`

The following template is applied to object `abcdefghijklmnopqrstuvwxyz`
 	
`%12.3QMFU:Name%`
 	
Result:
 	
`"Lmn"`

Controlling Line Breaks in Head and Tail Strings

The head and tail strings in a macro block are only generated when necessary. If the block returns nothing then the head and tail strings do not appear, which can help to control the creation of new lines.

Example

The text and new lines in the head and tail of each `.foreach_item` loop are only printed if the collection is not empty. When this template is applied to a class with attributes but no operations, the text `// Operations` and the new lines specified before and after the operations list will not be printed:

```
class "%Code%" {
 .foreach_item(Attributes, // Attributes\n,\n\n)
 %DataType% %Code%
  .if (%InitialValue%)
 = %InitialValue%
  .endif
 .next(\n)
 .foreach_item(Operations, // Operations\n,\n\n)
 %ReturnType% %Code%(...)
 .next(\n)
<Source>
}
```

Result:

```
class "C1" {// Attributes
 int a1 = 10
 int a2
 int a3 = 5
 int a4

<Source>
}
```

Note: To print a blank space between the curly brace and the string `// Attributes`, you must enclose the head string in double-quotes:

```
.foreach_item(Attributes," // Attributes\n",\n)
```

Conditional Blocks

Place text containing a variable between square brackets to have it appear only if the variable resolves to a non-null value.

You can also use a form similar to C and Java ternary expressions to print a string if the variable is true or not null:

```
[variable ? ifNotNull]
```

You can optionally include a string to print if the variable is evaluated to false, null, or the empty string:

```
[variable ? ifNotNull :ifNull]
```

Examples

`Attribute %Code%[ = %InitialValue%];`
 	
Result:
 	
`Attribute A1 =0;`
`Attribute A2 =100;`
`Attribute A3;`
`Attribute A4 =10;`

`The class %Name% is [%Abstract%?Abstract:Concrete].`
 	
Result if the **Abstract** property is selected:
 	
`The class myClass is Abstract.`
 	
Result if the **Abstract** property is not selected:
 	
`The class myClass is Concrete.`

Accessing Global Variables

You can insert information such as your user name and the current date with global variables.

Name	Description
`%ActiveModel%`	(object) Returns the UID of the model. Use `%ActiveModel.Name%` to obtain the name of the model.
`%GenOptions%`	(struct) Returns the model generation options.
`%PreviewMode%`	(boolean) Returns `true` in the **Preview** tab, `false` when generated to a file.
`%CurrentDate%`	(string) Returns the current system date and time formatted using local settings.
`%CurrentUser%`	(string) Returns the current user login.
`%NewUUID%`	(string) Returns a new universally unique identifier.

Example

`This file was generated from %ActiveModel.Name% by %CurrentUser% on %CurrentDate%.`
Result:
`This file was generated from My Model by jsmith on Tuesday, November 06, 2012 4:06:41 PM.`

GTL Operators

GTL supports standard arithmetic and logical operators along with some advanced template operators.

The following standard arithmetical and logical operators are supported, where *x* and *y* can be numbers or templates resolving to numbers:

Operator	Description
=	Assignment operator.
== and !=	Equal to and not equal to operators.
> and <	Greater than and less than operators.
>= and <=	Greater than or equal to and less than or equal to operators.
&& and ||	Logical AND and logical OR operators.
%+(*x*,*y*)%	Addition operator.
%-(*x*,*y*)%	Subtraction operator.
%*(*x*,*y*)%	Multiplication operator.
%/(*x*,*y*)%	Division operator.
%&(*x*,*y*)%	Logical bitfield `and` operator

In this example, the template in the left column produces the output on the right:

Template	Results

```
Base number=   %Number%
Number+1=      %+(Number,1)%
Number-1=      %-(Number,1)%
Number*2=      %*(Number,2)%
Number/2=      %/(Number,2)%
Number&1=      %&(Number,1)%
```
	```
	Base number=   4
	Number+1=      5
	Number-1=      3
	Number*2=      8
	Number/2=      2
	Number&1=      0
	```

The following advanced template operators are also supported:

Operator	Description

*	Dereferencing operator - Corresponds to a double evaluation, returning a template instead of text, using the syntax:
	`%*template [(P1,P2...)]%`
	For information about template parameters, see *Passing Parameters to a Template* on page 262.
	In the following example, a local variable is returned normally and in a dereferenced form:
	`.set_value(C, Code)`
	`%C%`
	`%*C%`
	Result:
	`Code`
	`%Code%`

!	Power evaluation operator - Evaluates the results of the evaluation of the variable as a template.
	In the following example, a local variable is returned normally and in a power-evaluated form:
	`.set_value(C, %%MyAttribute%%)`
	`%C%`
	`%!C%`
	Result:
	`%MyAttribute%`
	`Red`
	The ! operator may be applied any number of times. For example:
	`%!!t%`
	This outputs the results of the evaluation of the evaluation of the evaluation of template `t`.

Operator	Description

?	Existence operator - Tests whether a template, local variable, or property is present, and returns `false` if it is not.
	
	For example:
	
	`.set_value (myVariable, 20, new)`
	`%myVariable?%`
	`.unset (myVariable)`
	`%myVariable?%`
	
	Result:
	
	`true`
	`false`

+	Visibility operator - Tests whether an object property is visible in the interface, and returns `false` if it is not. For example, to test if the **Type** field is displayed in the **General** tab of a database property sheet in a DMM (meaning that a Replication Server® extension file is attached to the model), enter the following: `%Database.Type+%`

Translation Scope

The initial scope of a template is always the metaclass on which it is defined. All standard and extended attributes, collections, and templates defined on the active object metaclass and its parents are visible, but only one object is active at any given time.

Examples

The following template is applied to a package `P1`, which contains a class `C1`, which contains operations `O1` and `O2`, which each contain parameters `P1` and `P2`. The scope changes, affecting the value of the `%Name%` variable, as each collection is traversed. The `Outer` keyword is used to return temporarily to previous scopes:

```
%Name%
.foreach_item(Classes)
    \n\t*%Name% in %Outer.Name%
   .foreach_item(Operations)
       \n\t*%Name% in %Outer.Name% in %Outer.Outer.Name%
      .foreach_item(Parameters)
          \n\t\t*%Name% in %Outer.Name% in %Outer.Outer.Name% in
%Outer.Outer.Outer.Name%
      .next
   .next
.next
```

Result:

```
P1
    *C1 in P1
    *O1 in C1 in P1
        *P1 in O1 in C1 in P1
        *P2 in O1 in C1 in P1
    *O2 in C1 in P1
        *P1 in O2 in C1 in P1
        *P2 in O2 in C1 in P1
```

The `Outer` scope is restored when you leave a `.foreach_item` block. Nested scopes form a hierarchy that can be viewed as a tree, with the top level scope being the root. Use `Parent` instead of `Outer` to climb above the scope of the original object. For example, nothing will be output if the following template is applied to the parameter `P1`:

```
%Name% in %Outer.Name% in %Outer.Outer.Name%
```

However, this template will produce output:

```
%Name% in %Parent.Name% in %Parent.Parent.Name%
```

Result:

```
P1 in O1 in C1
```

Shortcut Translation

Shortcuts are dereferenced during translation, so that the scope of the target object replaces the scope of the shortcut. This is different from VB Script where shortcut translation retrieves the shortcut itself. You can use the `%IsShortcut%` variable to test whether an object is a shortcut, and the `Shortcut` keyword to access the properties of the shortcut itself.

Template
In this example, the template is applied to an OOM package `P1` containing two classes and two shortcuts to classes in `P2`:

```
.foreach_item(Classes)
\n*Class %Code% [%IsShortcut% ? From package %Package.Name% : Local
Object]
.next
```

Result:

```
*Class C1  Local Object
*Class C2  Local Object
*Class C3  From package P2
*Class C4  From package P2
```

Note: If your model contains shortcuts to objects in another model that is not open, a dialog box invites you to open the target model. You can use the `.set_interactive_mode` macro to change this behavior (see *.set_interactive_mode Macro* on page 280).

Escape Sequences

GTL supports a number of escape sequences to simplify the layout of your templates and generated files, and to make reserved characters accessible.

The following escape sequences can be used inside templates:

Escape sequence	Description
\n	New line. For examples of using new lines in macro blocks, see *Controlling Line Breaks in Head and Tail Strings* on page 252.
\t	Tab
\\	Backslash
\ at end of line	Continuation character (ignores the new line)
. at beginning of line	Comment. Ignores the line.

Escape sequence	Description
.. at beginning of line	Dot character (to generate a macro).
%%	Percent character.

Calling Templates

You can call a template from a generated file or from another template by entering its name surrounded by percentage signs. Object properties, collections, and local and global variables are called in the same way. At generation time, a template call is replaced by the template content, which is then resolved to its final textual value.

Examples:

- `%Name%` - Calls the object's **Name** property
- `%myTemplate%` - Calls the `%myTemplate%` template
- `%CurrentDate%` - Calls the `%CurrentDate%` global variable (see *Accessing Global Variables* on page 253)

Breaking templates into concise units and calling them at generation time helps with readability and reuse. For example, you can define a commonly-used condition in one template and reference it in multiple other templates:

Example

The `%isInner%` template is defined as:

```
.bool (%ContainerClassifier%!=null)
```

The `%QualifiedCode%` template calls the `%isInner%` template to test if the class is an inner class:

```
.if (%isInner%)
    %ContainerClassifier.QualifiedCode%::%Code%
.else
    %Code%
.endif
```

Result:

```
C2::C1
```

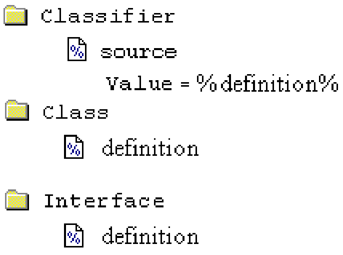
The `%QualifiedCode%` template is applied to the `C1` class, which is an inner class to `C2`.

Inheritance and Polymorphism

Templates are defined on a particular metaclass in a language definition file or extension and are inherited by and available to the children of the metaclass. For example, a template defined on the Classifier metaclass is available to templates or generated files defined on the Class and Interface metaclasses.

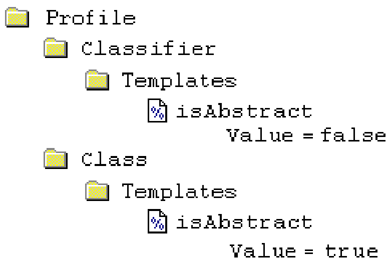
GTL supports the following OO concepts as part of inheritance:

- *Polymorphism* - The choice of the template to be evaluated is made at translation-time. A template defined on a classifier can access templates defined on its children (class, interface). In the following example, the content of `%definition%` depends on whether a class or an interface is being processed:



```
Classifier
    source
      Value = %definition%
Class
    definition

Interface
    definition
```

- *Template overriding* - A template defined on a given metaclass can be overridden by a template of the same name defined on a child class. In the following example the template defined on the Classifier metaclass is overridden by the one defined on the Class metaclass:



```
Profile
   Classifier
      Templates
         isAbstract
               Value = false
   Class
      Templates
         isAbstract
               Value = true
```

  You can view the overridden parent by right-clicking the child template and selecting **Go to Super-Definition**. You can specify the use of the parent template by prefixing the template call with the `::` qualifying operator. For example: `%Classifier::isAbstract%`.

- *Template overloading* - You can overload your template definitions and test for different conditions. Templates can also be defined under criteria (see *Criteria (Profile)* on page 38) or stereotypes (see *Stereotypes (Profile)* on page 35), and the corresponding conditions are combined. At translation-time, each condition is evaluated and the appropriate template (or, in the event of no match, the default template) is applied. For example:

```
full-template-name = {syntax1} <template-name>                                |

                     {syntax2} <template-name>'<<' stereotype '>>'      |

                     {syntax3} <template-name>'<' <simple-condition> '>'

template-name      = <text>
```

You can define the same template multiple times in the hierarchy of a language definition file and extensions files, and PowerDesigner will resolve it using inheritance rules. For example, the `myLang` OOM language definition file and the `myExtension` extension file each contain a template `%t%` defined on each of the `Classifier` and `Class` metaclasses:

myLang Language Definition File	myExtension Extension File
• Classifier: • `myFile` generated file • `%t%` template • Class: • `%t%` template	• Classifier: • `myOtherFile` generated file • `%t%` template • Class: • `%t%` template

The `Class` and `Interface` metaclasses both inherit from the `Classifier` metaclass, and each will generate a `myFile` and a `myOtherFile`.

The following template calls are possible in `myLang/Classifier/myFile` (which cannot access the templates in `myExtension`):

Template Call in myFile	Template Called
`%t%` or `%myLang::t%`	`myLang/Class/t`
`%Classifier::t%` or `%myLang::Classifier::t%`	`myLang/Classifier/t`

The following template calls are possible in `myExtension/Classifier/myOtherFile` (which can access both its own templates and those in `myLang`):

Template Call in myOtherFile	Template Called
`%t%` or `%myExtension::t%`	`myExtension/Class/t`
`%Classifier::t%` or `%myExtension::Classifier::t%`	`myExtension/Classifier/t`
`%myLang::t%` or `%myLang::Class::t%`	`myLang/Class/t`
`%myLang::Classifier::t%`	`myLang/Classifier/t`

Note: For an extension file to reach templates defined in a language definition file, the **Complement language generation** property in the extension must be selected (see *Extension File Properties* on page 12).

Passing Parameters to a Template

You can pass parameters to a template, using the syntax:`%t(p1,p2...)%`.

Parameter values cannot contain any `%` characters (you cannot pass a template), and are separated by commas. They are retrieved in the template using local variables with the names `@1, @2, ...`.

Examples

The following template call:

```
%myTemplate(fine,sunny,24,12)%
```

calls `%myTemplate%`:

```
The weather today is %@1% and %@2%, with a high of %@3% and a low of
%@4%.
```

Result:

```
The weather today is fine and sunny, with a high of 24 and a low of
12.
```

Examples

The template `%Attributes%` is defined as follows:

```
.foreach_item(Attributes)
 .if (%Visibility% == %@1%)
 %DataType% %Code%
 .endif
.next(\n)
```

The template `%AttributeList%` calls `%Attributes%` three times, passing a different visibility value each time to loop over only the attributes that have this visibility:

```
Class "%Code%" attributes:
// Public
%attributes(+)%

// Protected
%attributes(#)%

// Private
%attributes(-)%
```

Result:

```
Class "C1" attributes :
// Public
 int height
 int width

// Protected
 int shape

// Private
 int cost
 int price
```

Recursive Templates

A template can call itself, but such a template should contain some kind of criteria or scope change to avoid an infinite loop.

Example

Class `C1` is inner to class `C2`, which is in turn inner to `C3`. The template `%topContainerCode%` tests whether the present classifier is inner to another, and if so, calls itself on the container classifier to perfom the same test until it reaches a classifier that is not inner, at which point it prints the code of the top container:

```
.if (%isInner%)
    %ContainerClassifier.topContainerCode%
.else
    %Code%
.endif
```

Result:

```
C3
```

GTL-Specific Metamodel Extensions

A number of calculated attributes and collections are provided as GTL-specific extensions to the metamodel.

The following calculated attributes are metamodel extensions specific to GTL:

Metaclass	GTL-Specific Attributes
PdCommon.BaseObject	• isSelected (boolean) - True if the object is part of the selection in the generation dialog • isShorctut (boolean) - True if the object was accessed by dereferencing a shortcut
PdCommon.BaseModel	• GenOptions (struct) - Gives access to user-defined generation options
PdOOM.*	• ActualComment (string) - Cleaned–up comment (with /**, /*, */ and // removed)
PdOOM.Association	• RoleAMinMultiplicity (string) • RoleAMaxMultiplicity (string) • RoleBMinMultiplicity (string) • RoleBMaxMultiplicity (string)

Metaclass	GTL-Specific Attributes
PdOOM.Attribute	• MinMultiplicity (string) • MaxMultiplicity (string) • Overridden (boolean) • DataTypeModifierPrefix (string) • DataTypeModifierSuffix (string) • @<tag> [Java-specific] (string) - Javadoc@<tag> extended attribute with additional formatting
PdOOM.Class	• MinCardinality (string) • MaxCardinality (string) • SimpleTypeAttribute [XML-specific] • @<tag> [Java-specific] (string) - Javadoc@<tag> extended attribute with additional formatting
PdOOM.Interface	• @<tag> [Java-specific] (string) - Javadoc@<tag> extended attribute with additional formatting
PdOOM.Operation	• DeclaringInterface (object) • GetSetAttribute (object) • Overridden (boolean) • ReturnTypeModifierPrefix (string) • ReturnTypeModifierSuffix (string) • @<tag> [Java-specific] (string) - Javadoc@<tag> extended attribute with additional formatting (especially for @throws, @exception, @params)
PdOOM.Parameter	• DataTypeModifierPrefix (string) • DataTypeModifierSuffix (string)

The following calculated collections are metamodel extensions specific to GTL:

Metaclass name	Collection name
PdCommon.BaseModel	Generated <metaclass-name> List - Collection of all objects of type <metaclass-name> that are part of the selection in the generation dialog
PdCommon. BaseClassifier-Mapping	SourceLinks
PdCommon. BaseAssociation-Mapping	SourceLinks

GTL Macro Reference

GTL supports macros to express template logic, and to loop on object collections. Macro keywords are prefixed by a . (dot) character, which must be the first non-blank character in the line, and you must respect the use of line breaks in the macro syntax.

Note: Macro parameters can be delimited by double quotes, and this is required if the parameter value includes commas, braces, leading or trailing blanks. The escape sequence for double quotes inside a parameter value is `\"`. When the macro parameters specify that a parameter is of type *simple template*, this means that it can contain text, variables, and conditional blocks, but no macros. Parameters of type *complex template* can additionally include macros.

The following macros are available:

- *Conditional and loop / iterative macros*:
  - *.if Macro* on page 277 - evaluates conditions.
  - *.foreach_item Macro* on page 273 – iterates on object collections.
  - *.foreach_line Macro* on page 275 – iterates on lines of a multi-line text block.
  - *.foreach_part Macro* on page 276 – iterates on parts of a string.
  - *.break Macro* on page 268 – breaks a loop.
- *Formatting and string manipulation macros*:
  - *.lowercase and .uppercase Macros* on page 279 - change the case of a text block.
  - *.convert_name and .convert_code Macros* on page 269 - convert codes into names or names into codes.
  - *.delete and .replace Macros* on page 270 - perform operations on substrings.
  - *.unique Macro* on page 283 - filters redundant lines from a text block.
  - *.block Macro* on page 267 - adds a header and a footer to a text block.
- *Generation command macros* - for use when writing GTL in the context of the execution of a generation command:
  - *.vbscript Macro* on page 284 - embed VB script code inside a template.
  - *.execute_vbscript Macro* on page 272 - launch vbscripts.
  - *.execute_command Macro* on page 271 - launch executables.
  - *.abort_command Macro* on page 267 - stop command execution.
  - *.change_dir and .create_path Macros* on page 268 - change directory or create a path.
  - *.log Macro* on page 279 - write log messages.
- *Miscellaneous macros*:
  - *.set_object, .set_value, and .unset Macros* on page 281 - create local objects or variables.
  - *.comment and .// Macro* on page 269 - inserts a comment in a template.

- *.object and .collection Macros* on page 280 - returns a collection of objects based on the specified scope and condition.
- *.object and .collection Macros* on page 280 - return an object or collection based on the specified scope and condition.
- *.bool Macro* on page 268 - evaluates a condition.
- *.set_interactive_mode Macro* on page 280 – defines whether the GTL execution must interact with the user.
- *.error and .warning Macros* on page 271

.abort_command Macro

This macro stops a generation command.

Example

```
.if %_JAVAC%
  .execute_command (%_JAVAC%,%FileName%)
.else
  .abort_command
.endif
```

For information about generation commands, see *Generation Category* on page 114.

.block Macro

This macro wraps a block of output with a header and/or a footer, if the output is not empty.

```
.block [(head)]
    block-input
.endblock[(tail)]
```

The following parameters are available:

Parameter	Description
head	[optional] Generated only if **block-input** is not empty. Type: Simple template
block-input	Specifies the text to output between the head and tail. Type: Complex template
tail	[optional] Generated only if **block-input** is not empty. Type: Simple template

Example	Result

`.block (<b>)`
`%Comment%`
`.endblock (</b>)`
	`<b>My comment is in bold!<b>`
	
	Note: The `<b>` tags would not be generated if no comment were entered for a particular object.

.bool Macro

This macro returns `true` or `false` depending on the value of the condition specified.

```
.bool (condition)
```

The following parameters are available:

Parameter	Description
condition	Specifies the condition to be evaluated. Type: Condition

Example	Result
`.bool(%.3:Code%= =ejb)`	`true`

.break Macro

This macro can be used to break out of `.foreach` loops.

Example

```
.set_value(_hasMain, false, new)
.foreach_item(Operations)
 .if (%Code% == main)
  .set_value(_hasMain, true)
  .break
 .endif
.next
%_hasMain%
```

.change_dir and .create_path Macros

These macros change the current directory or create the specified path as part of a generation command.

```
.change_dir (path)
```

```
.create_path (path)
```

The following parameters are available:

Parameter	Description
path	Specifies the directory to go to or to create. Type: Simple template (escape sequences ignored)

Example	Result
`.change_dir(C:\temp)`	Changes the path to write to to `C:\temp`.
`.create_path(C:\temp\mydir)`	Creates the new directory `C:\temp\mydir`.

For information about generation commands, see *Generation Category* on page 114.

.comment and .// Macro

These macros are used to insert comments in a template. Lines starting with `.//` or `.comment` are ignored during generation.

Example

`.// This is a comment`
`.comment This is also a comment`

.convert_name and .convert_code Macros

These macros convert the object name to its code (or vice versa).

Use the following syntax to convert a name to a code:

```
.convert_name (expression[,"separator"[,"delimiters"],case])
```

Use the following syntax to convert a code to a name:

```
.convert_code (expression[,"separator"[,"delimiters"]])
```

The following parameters are available:

Parameter	Description
expression	Specifies the text to be converted. For .convert_name, this is generally the `%Name%` variable and may include a suffix or prefix. Type: Simple template
separator	[optional] Character generated each time a separator declared in **delimiters** is found in the code. For example, "_" (underscore). Type: Text

Parameter	Description
delimiters	[optional] Specifies the different delimiters likely to exist in the input code or name, and which will be replaced by **separator**. You can declare several separators, for example "_ " and "-" Type: Text
case	[optional for `.convert_name` only] Specifies the case into which to convert the code. You can choose between: • `firstLowerWord` - First word in lowercase, first letters of subsequent words in uppercase • `FirstUpperChar` - First character of all words in uppercase • `lower_case` - All words in lowercase and separated by an underscore • `UPPER_CASE` - All words in uppercase and separated by an underscore

.delete and .replace Macros

These macros delete or replace all instances of the given string in the text input.

```
.delete (string)
    block-input
.enddelete
```

```
.replace (string,new-string)
    block-input
.endreplace
```

The following parameters are available:

Parameter	Description
string	Specifies the string to be deleted. Type: Text
new-string	[.replace only] Specifies the string with which to replace **string**. Type: Text
block-input	Specifies the text to be parsed for instances of the **string** to delete or replace. Type: Complex template

Examples	Result

`.delete(Get)`
`    GetCustomerName`
`.enddelete`
	`CustomerName`

Examples	Result

`.replace(Get,Set)`
`GetCustomerName`
`.endreplace`
	`SetCustomerName`

`.replace(" ", _)`
`Customer Name`
`.endreplace`
	`Customer_Name`

.error and .warning Macros

These macros are used to output errors and warnings during translation. Errors stop generation, while warnings are purely informational and can be triggered when an inconsistency is detected while applying the template on a particular object. The messages are displayed in both the object **Preview** tab and the **Output** window.

```
.error message
```

```
.warning message
```

The following parameters are available:

Parameter	Description
message	Specifies the text of the message. Type: Simple template

Example
`.error no initial value supplied for attribute %Code% of class %Parent.Code%`

.execute_command Macro

This macro is launches executables as part of a generation command. If there is a failure for any reason (executable not found or output sent to `stderr`), then command execution is stopped.

```
.execute_command (cmd [,args [,mode]])
```

The following parameters are available:

Parameter	Description
cmd	Specifies the path to the executable Type: Simple template (escape sequences ignored)

Parameter	Description
args	[optional] Specifies arguments for the executable. Type: Simple template (escape sequences ignored)
mode	[optional] Specifies the execution mode.You can choose from: • `cmd_ShellExecute` - runs as an independent process • `cmd_PipeOutput` - blocks until completion, and shows the executable output in the output window

Example
`.execute_command(notepad, file1.txt, cmd_ShellExecute)`

For information about generation commands, see *Generation Category* on page 114.

.execute_vbscript Macro

This macro is used to execute a VB script specified in a separate file as part of a generation command.

```
.execute_vbscript (vbs-file [,script-parameter])
```

The following parameters are available:

Parameter	Description
vbs-file	Specifies the path to the VB script. Type: Simple template (escape sequences ignored)
script-parameter	[optional] Passed to the script through the `ScriptInputParameters` global property. Type: Simple template

Example
`.execute_vbscript(C:\samples\vbs\login.vbs, %username%)` The result of the script is available in the `ScriptResult` global property (see *Manipulating Models, Collections, and Objects (Scripting)* on page 314). The active object of the current translation scope can be accessed through the `ActiveSelection` collection as `ActiveSelection.Item(0)`.

For information about generation commands, see *Generation Category* on page 114.

.foreach_item Macro

This macro iterates over a collection of sub-objects or related objects.

```
.foreach_item (collection [,head [,tail [,filter [,order]]]])
    output
.next [(separator)]
```

The following parameters are available:

Parameter	Description
collection	Specifies the collection over which to iterate. Type: Simple template
head	[optional] Specifies text to be generated before the output, unless the collection is empty. Type: Text
tail	[optional] Specifies text to be generated after the output, unless the collection is empty. Type: Text
filter	[optional] Specifies a filter to apply to the collection before iteration. Type: Simple condition
order	[optional] Specifies the order in which the collection will be iterated in the format: `%Item1.property% <= %Item2.property%` When the comparison evaluates to true, `%Item1%` will be placed after `%Item2%`. By default, the collection is ordered alphabetically by name. Type: Simple condition
output	Specifies the text to output for each item in the collection. Type: Complex template
separator	[optional] Specifies text to be generated between each instance of **output**. Type: Text

Note: If parameter values contain commas, braces, or leading or trailing blanks, they must be delimited with double-quotes. To escape double-quotes inside a parameter value, use `\"`.

Examples

Simple list:

```
.foreach_item(Attributes)
    *%Code% (%DataType%)[ = %InitialValue%];
.next(\n)
```

Result:

```
    *available (boolean) = true;
    *actualCost (int);
    *baseCost (int);
    *color (String);
    *height (int) = 10;
    *width (int) = 5;
    *name (int);
```

With head and tail:

```
.foreach_item(Attributes,Attributes:\n,\n\nEnd of Attribute List)
    *%Code% (%DataType%)[ = %InitialValue%];
.next(\n)
```

Result:

```
Attributes:
*available (boolean) = true;
*actualCost (int);
*baseCost (int);
*color (String);
*height (int) = 10;
*width (int) = 5;
*name (int);

End of Attribute List
```

With filter:

```
.foreach_item(Attributes,,,%.1:Code%==a)
    *%Code% (%DataType%)[ = %InitialValue%];
.next(\n)
```

Result:

```
    *available (boolean) = true;
    *actualCost (int);
```

Examples
With reverse alphabetical ordering: `.foreach_item(Attributes,,,, %Item1.Code% <= %Item2.Code% )` `*%Code% (%DataType%)[ = %InitialValue%];` `.next(\n)` Result: `*width (int) = 5;` `*name (int);` `*height (int) = 10;` `*color (String);` `*baseCost (int);` `*available (boolean) = true;` `*actualCost (int);`

.foreach_line Macro

This macro iterates over the lines of the multiline block of text using the special `%CurrentLine%` local variable.

```
.foreach_line (input [,head [,tail]])
    output
.next [(separator)]
```

The following parameters are available:

Parameter	Description
input	Specifies the text over which to iterate. Type: Simple template
head	[optional] Specifies text to be generated before the output, unless there is no output. Type: Text
tail	[optional] Specifies text to be generated after the output, unless there is no output. Type: Text
output	Specifies the text to output for each line in the input. Type: Complex template
separator	[optional] Specifies text to be generated between each line of **output**. Type: Text

Example

`.foreach_line(%Comment%,"/**\n","\n*/")`
`* %CurrentLine%`
`.next("\n")`
 	
Result:
 	
`/**`
`* This is my comment.`
`* It is a Java style documentation comment.`
`* It spans several lines.`
`*/`

.foreach_part Macro

This macro iterates over the parts of a string divided by a delimiter using the special `%CurrentPart%` local variable.

```
.foreach_part (input [,"delimiter" [,head [,tail]]])
    output
.next[(separator)]
```

The following parameters are available:

Parameter	Description
input	Specifies the text over which to iterate. Type: Simple template
delimiter	Specifies the sub-string that divides the input into parts. You can specify multiple characters including ranges. For example `[A-Z]` specifies that any capital letter acts as a delimiter. By default, the delimiter is set to `' -_,\t'` (space, dash, underscore, comma, or tab). **Note:** The delimiter must be surrounded by single quotes if it contains a space. Type: Text
head	[optional] Specifies text to be generated before the output, unless there is no output. Type: Text
tail	[optional] Specifies text to be generated after the output, unless there is no output. Type: Text
output	Specifies the text to output for each part in the input. Type: Complex template

Parameter	Description
separator	[optional] Specifies text to be generated between each part of **output**. Type: Text

For example:

Examples

This template is applied to `My class`:
`.foreach_part (%Name%)`
`%.FU:CurrentPart%`
`.next`
 	
Result:
`MyClass`

This template is applied to `My class`:
`.foreach_part (%Name%,' -_',tbl_)`
`%.L:CurrentPart%`
`.next(_)`
 	
Result:
`tbl_my_class`

This template is applied to `MyClass`:
`.foreach_part (%Name%,[A-Z])`
`%.L:CurrentPart%`
`.next(-)`
 	
Result:
`my-class`

.if Macro

This macro is used for conditional generation.

```
.if[not] condition
        output
    [(.elsif[not] condition
        output)*]
    [.else
        output]
.endif [(tail)]
```

The following parameters are available:

Parameter	Description
condition	Specifies the condition to evaluate, in the form: `variable [operator comparison]` Where *comparison* may be : • Text, or a simple template • `true` or `false` • `null` or `notnull` If no operator and condition are specified, the condition evaluates to true unless the value of the variable is false, null, or the empty string. If **variable** and **comparison** are not integers, the operators perform a string comparison that takes into account embedded numbers. For example: `Class_10 > Class_2` You can chain conditions together using the `and` or `or` logical operators. Type: Simple template
output	Specifies the output if the condition is true. Type: Complex template
tail	[optional] Specifies text to be generated after the output, unless the output is empty. Type: Text

Examples

Simple `.if` block:

```
.if %Abstract%
        This class is abstract.
.endif
```

Result (if the **Abstract** property is selected):

```
This class is abstract.
```

With two conditions and an `.else` clause:

```
.if (%Abstract%==false) && (%Visibility%=="+")
        This class is public and concrete.
    .else
This is not a public, concrete class.
.endif
```

Result (if the **Abstract** property is not selected and the **Visibility** property is set to `Public`):

```
This class is public and concrete.
```

Examples

With an `.elseif` clause:

```
.if (%Abstract%==false) && (%Visibility%=="+")
        This class is public and concrete.
.elsif (%Visibility%=="+")
        This class is public.
    .else
This is not a public, concrete class.
.endif
```

.log Macro

This macro logs a message to the **Output** window **Generation** tab as part of a generation command.

```
.log message
```

Example

```
.log undefined environment variable: JAVAC
```

For information about generation commands, see *Generation Category* on page 114.

.lowercase and .uppercase Macros

These macros convert text blocks to the specified case.

```
.lowercase
    block-input
.endlowercase
```

```
.uppercase
    block-input
.enduppercase
```

The following parameters are available:

Parameter	Description
block-input	Specifies the text to convert. Type: Complex template

Example	Result

`.lowercase`
`    %Comment%`
`.endlowercase`
	Applied to
	`This is my comment.`
	Produces:
	`this is my comment.`

.object and .collection Macros

These macro return a single object OID or a collection of objects as a concatenation of semi-colon terminated OIDs, and are generally used to create templates returning objects for use by other templates.

```
.collection (scope [,filter])
```

```
.object (scope [,filter])
```

The following parameters are available:

Parameter	Description
scope	Specifies the collection over which to iterate. Type: simple-template returning a collection scope
filter	[optional] Specifies a filter condition to filter the collection. Type: simple-template

Examples

`.object(Attributes, (%.1:Code%>= a) and (%.1:Code% <= e))`
Result:
`C73C03B7-CD73-466A-B323-0B90B67E82FC`

`.collection(Attributes, (%.1:Code%>= a) and (%.1:Code% <= e))`
Result:
`C73C03B7-CD73-466A-B323-0B90B67E82FC;77E3F55C-`
`CF24-440F-84E7-5AA7B3399C00;F369CD8C-0C16-4896-9C2D-0CD2F80D6980;0`
`0ADD959-0705-4061-BF77-BB1914EDC018;`

.set_interactive_mode Macro

This macro is used to define if the GTL execution must interact with the user or not.

```
.set_interactive_mode(mode)
```

The following parameters are available:

Parameter	Description
mode	Specifies the level of interaction required. You can choose between: • `im_Batch` - Suppresses dialog boxes and always uses default values. For example, if your model contains external shortcuts and the target model for the shortcuts is closed, this mode will automatically open the model without user interaction. • `im_Dialog` - Displays information and confirmation dialog boxes that require user interaction for the execution to keep running. • `im_Abort` - Suppresses dialog boxes and aborts execution if a dialog is encountered.

.set_object, .set_value, and .unset Macros

These macros are used to define a local variable of object (local object) or value type or to unset them.

Use the following syntax to create a local object:

```
.set_object ( [scope.] name [,object-ref [,mode]])
```

Use the following syntax to create a local variable:

```
.set_value ( [scope.] name, value [,mode] [,unescape])
```

Use the following syntax to remove a local object or variable:

```
.unset ( [scope.] name)
```

The following parameters are available:

Parameter	Description
scope	[optional] Specifies the qualifying scope. If no scope is set, then the scope is the object with the current scope. Use the `this` keyword to explicitly give a scope of the current object, or `Parent` to give a scope of the parent object. Type: Simple-template returning an object or a collection scope
name	Specifies the name of the object or variable, which you can reference elsewhere in the template in the form of `%name%`. Type: Simple-template
object-ref	[.set_object only - optional] Specifies an object reference. If no reference is specified or an empty string is given, the variable is a reference to the active object in the current translation scope. Type: [*scope*.]*object-scope*]

Parameter	Description
value	[.set_value only] Specifies the value to give to the variable. Type: Simple template (escape sequences ignored)
mode	[optional] Specifies the mode of creation. You can choose between: • new - Forces the (re)-definition of the variable in the current scope. Recommended when a variable with the same name may already be defined in a previous scope. • update – [default] If a variable with the same name already exists, update the existing variable. Otherwise define a new one. • newifundef - Define the variable in the current scope if it has not been defined in an outer scope. Otherwise do nothing.
unescape	[.set_value only - optional] Specifies to interpret escaped characters such as `\n` in the supplied value. By default, such characters are uninterpreted.

Examples:

Examples

`.set_object(Attribute1, Attributes.First)`
`.set_value(FirstAttributeCode, %Attributes.First.Code%)`
`%FirstAttributeCode% (OID: %Attribute1%)`
 	
Result:
 	
`a1 (OID: 63442F85-48DF-42C8-92C1-0591F5D34525)`

`.set_value(this.key, %Code%-%ObjectID%)`
 	
Result:
 	
`C1-40D8F396-EE29-4B7B-8C78-E5A0C5A23325`

`.set_value(i, 1, new)`
`%i?%`
`.unset(i)`
`%i?%`
 	
Result:
 	
`true`
`false`
 	
The first call to `%i?%` outputs `true` as the variable `i` is defined, and the second outputs `false`, because it has been unset.

Examples

```
.set_value(oneline, "line1\nline2")
.set_value(twolines,"line3\nline4",, unescape)
%oneline%
%twolines%
```

Result:

```
line1\nline2
line3
line4
```

Note: You can use the dereferencing operator, `*` (see *GTL Operators* on page 254), to convert the value of a variable set with the `.set_value` macro to a template name. For example, the following code is equivalent to `%Code%.`:

```
.set_value(i, Code)
%*i%
```

.unique Macro

This macro outputs a block in which each line of the text generated is unique, and is often used for calculating imports, includes, typedefs, or forward declarations in languages such as Java, C++ or C#.

```
.unique
    block-input
.endunique[(tail)]
```

The following parameters are available:

Parameter	Description
block-input	Specifies the text block to be processed. Type: Complex template
tail	[optional] Specifies text to be generated after the output, unless the collection is empty. Type: Text

Example

```
.unique
    import java.util.*;
    import java.lang.String;
    %imports%
.endunique
```

.vbscript Macro

This macro is used to embed VBScript code inside a template as part of a generation command. The result of the script is available as the `ScriptResult` array

```
.vbscript [(script-param-list)]
    block-input
.endvbscript [(tail)]
```

The following parameters are available:

Parameter	Description
script-param-list	Specifies the parameters to pass to the script through the `ScriptInputArray` table. Type: List of simple-template arguments separated by commas
block-input	Specifies theVBscript to run. Type: Text
tail	Appended to the output, if there is one Type: Text

Examples

This simple script accepts the two words `hello` and `world` as input parameters, and returns them as a single string with a space in between them:

```
.vbscript(hello, world)
ScriptResult = ScriptInputArray(0) + " " + ScriptInputArray(1)
.endvbscript
```

Result:

```
hello world
```

Examples

This script accepts an attribute code, reviews it against all the attribute codes in the current model, and appends a `1` to it if it matches any other code:

```
.set_value(_code,%@1%,new)
.vbscript(%_code%)
   Dim attrCode
   attrCode = ScriptInputArray(0)

   While (attrFound(attrCode))
      attrCode = attrCode + "1"
   Wend

   Function attrFound(attrCode)
      Dim found, attr
      found = False
      For Each attr in ActiveSelection.Item(0).Attributes
         If attr.Code = attrCode Then
            found = True
            Exit For
         End If
      Next

      For Each attr in ActiveSelection.Item(0).InheritedAttri-
butes
         If attr.Code = attrCode Then
            found = True
            Exit For
         End If
      Next
      attrFound = found
   End Function

   ScriptResult = attrCode
.endvbscript
```

Note: The active object of the current translation scope is accessed as `ActiveSelec-tion.Item(0)` (see *Manipulating Models, Collections, and Objects (Scripting)* on page 314).

For information about generation commands, see *Generation Category* on page 114.

GTL Syntax and Translation Errors

Error messages stop the generation of the file in which errors have been found, these errors are displayed in the **Preview** tab of the corresponding object property sheet.

Error messages have the following format:

```
target::catg-path full-template-name(line-number)
active-object-metaclass active-object-code):
    error-type error-message
```

You may encounter the following syntax errors:

Syntax error message	Description and correction
condition parsing error	Syntax error in a boolean expression
expecting .endif .else with no matching .if .endif with no matching .if	Add an `.endif` or `.if` (see *.if Macro* on page 277).
expecting .next .next with no matching .foreach	Add an appropriate `.next` or `.foreach` to the collection block (for example, see *.foreach_item Macro* on page 273).
expecting .end%s	Add an appropriate `.end` to the macro block (for example, see *.unique Macro* on page 283).
.end%s with no matching .%s	Add an appropriate .*`macro`* to the `.end`*`macro`* (for example, see *.vbscript Macro* on page 284).
missing or mismatched parentheses	Correct any mismatched parentheses.
unexpected parameters: *extra-params*	Remove any unnecessary parameters
unknown macro	Replace with a valid macro (see *GTL Macro Reference* on page 266).
.execute_command incorrect syntax	The correct syntax is displayed in the Preview tab, or in the Output window (see *.execute_command Macro* on page 271).
Change_dir incorrect syntax	See *.change_dir and .create_path Macros* on page 268.
convert_name incorrect syntax convert_code incorrect syntax	See *.convert_name and .convert_code Macros* on page 269.
set_object incorrect syntax set_value incorrect syntax	See *.set_object, .set_value, and .unset Macros* on page 281.
execute_vbscript incorrect syntax	See *.execute_vbscript Macro* on page 272.

Translation errors are evaluation errors on a variable when evaluating a template:

Translation error message	Description and correction
unresolved collection: *collection*	Unknown collection (see *Accessing Collections of Sub-Objects or Related Objects* on page 249).

Translation error message	Description and correction
unresolved member: *member* null object expecting object variable: *object*	Unknown member, null object member, or expecting a string instead of an object (see *Extracting Object Properties* on page 248).
no outer scope	Invalid use of the `Outer` keyword (see *Translation Scope* on page 257).
VBScript execution error	VB script error (see *.vbscript Macro* on page 284).
Deadlock detected	Deadlock due to an infinite loop.

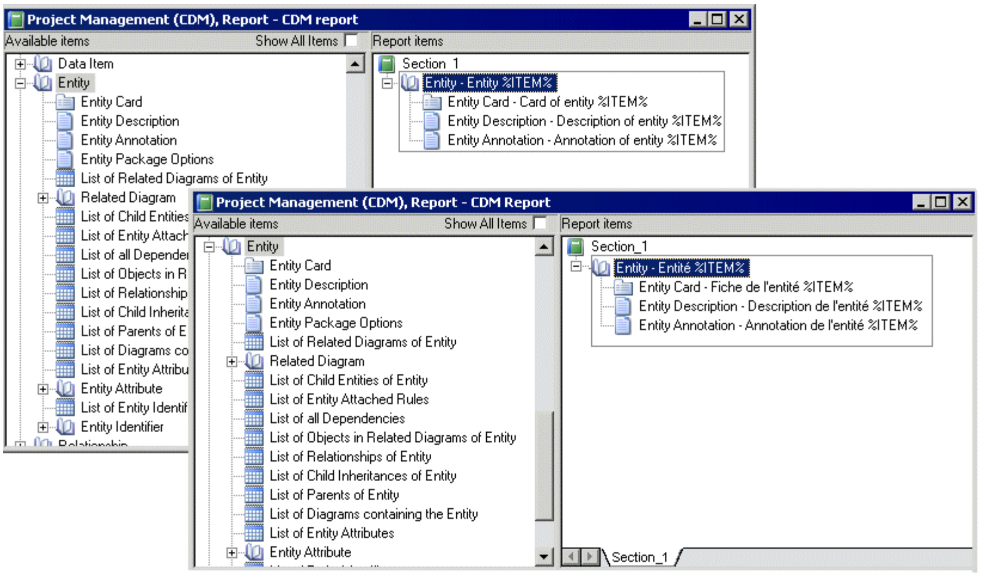
CHAPTER 6

Translating Reports with Report Language Files

When you create a report, you select a report language, which contains all the framing text used in the generation of the report for the selected language, such as report section titles, types of model objects, and their properties. PowerDesigner ships with support for English (default), French, and simplified and traditional Chinese. You can edit these files, or use them as the basis for creating your own files for translations into other languages.

Report language files have an .xrl extension and are stored in `install_dir/Resource Files/Report Languages`. To view the list of report languages, select **Tools > Resources > Report Languages**. For information about the tools available in resource file lists, see *Chapter 1, PowerDesigner Resource Files* on page 1.

In the following example, Entity Card, Entity Description, and Entity Annotation are shown in English and French as they will appear in the Report items pane:


Project Management (CDM), Report - CDM report
Available items
Show All Items
Report items
Section_1
Entity - Entity %ITEM%
Entity Card - Card of entity %ITEM%
Entity Description - Description of entity %ITEM%
Entity Annotation - Annotation of entity %ITEM%
Project Management (CDM), Report - CDM Report
Entity - Entité %ITEM%
Entity Card - Fiche de l'entité %ITEM%
Entity Description - Description de l'entité %ITEM%
Entity Annotation - Annotation de l'entité %ITEM%
Entity
Entity Card
Entity Description
Entity Annotation
Entity Package Options
List of Related Diagrams of Entity
Related Diagram
List of Child Entities of Entity
List of Entity Attached Rules
List of all Dependencies
List of Objects in Related Diagrams of Entity
List of Relationships of Entity
List of Child Inheritances of Entity
List of Parents of Entity
List of Diagrams containing the Entity
List of Entity Attributes
Entity Attribute
Data Item

The report language files use GTL templates (see *Chapter 5, Customizing Generation with GTL* on page 247) to factorize the work of translation. Report Item Templates interact with your translations of the names of model objects and Linguistic Variables (that handle syntactic peculiarities such as plural forms and definite articles) to automatically generate all the textual elements in a report and dramatically reduce (by around 60%) the number of strings that must be translated in order to render reports in a new language.

For example the French report title `Liste des données de l'entité MyEntity` is automatically generated as follows:

- the List - object collections report item template (see *Profile/Report Item Templates Category* on page 305) is translated as:

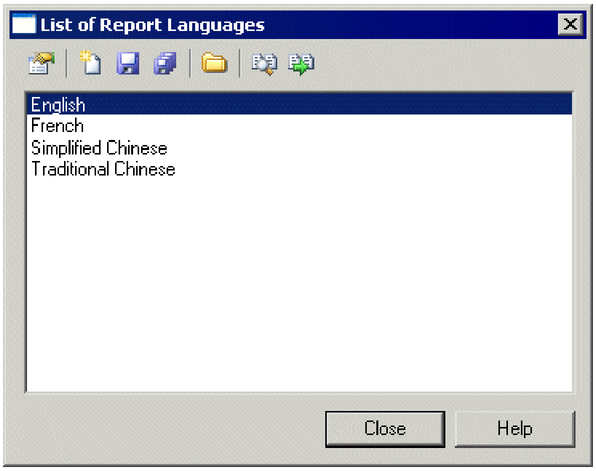
  ```
  Liste des %@Value% %ParentMetaClass.OFTHECLSSNAME% %%PARENT%%
  ```

  in which the following variables are resolved:
  - `%@Value%` - resolves to the object type of the metaclass (see *Object Attributes Category* on page 300), `données`.
  - `%ParentMetaClass.OFTHECLSSNAME% %%PARENT%%` - resolves to the object type of the parent metaclass, as generated by the `OFTHECLSSNAME` linguistic variable (see *Profile/Linguistic Variables Category* on page 302), `l'entité`.
  - `%%PARENT%%` - resolves to the name of the specific object (see *Object Attributes Category* on page 300), `MyEntity`.

Opening a Report Language File

You can review and edit report language files in the Resource Editor.

1. Select **Tools** > **Resources** > **Report** Languages to open the List of Report Languages, which lists all the available .xrl files:



2. Select a report language and click the **Properties** tool to open it in the Resource Editor.

Note: You can open the .xrl file attached to a report open in the Report Editor by selecting **Report** > **Report Properties**, and clicking the **Edit Current Language** tool beside the

Language list. You can change the report language by selecting another language in the list.

For more information about the tools available in the List of Report Languages, see *Chapter 1, PowerDesigner Resource Files* on page 1.

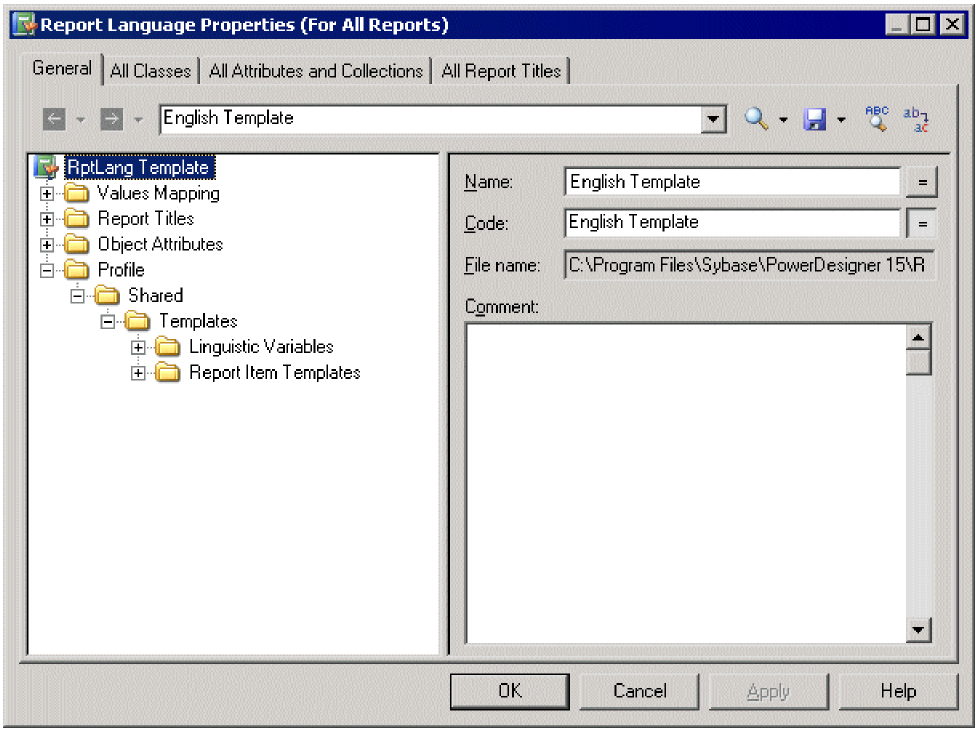
Creating a Report Language File for a New Language

You can translate reports and other text items used to generate PowerDesigner reports into a new language.

1. Select **Tools > Resources > Report Languages** to open the List of Report Languages, which shows all the available report language resource files.
2. Click the **New** tool, and enter the name that you want to appear in the List of Report Languages.
3. [optional] Select a report language in the **Copy from** list.
4. Click **OK** to open the new file in the Report Language Editor.
5. Open the Values Mapping category, and translate each of the keyword values (see *Values Mapping Category* on page 293).
6. Open the **Profile > Linguistic Variables** category to create the grammar rules necessary for the correct evaluation of the report item templates (see *Profile/Linguistic Variables Category* on page 302).
7. Open the **Profile > Report Items Templates** category, and translate the various templates (see *Profile/Report Item Templates Category* on page 305). As you translate, you may discover additional linguistic variables that you should create.
8. Click the **All Classes** tab to view a sortable list of all the metaclasses available in the PowerDesigner metamodel (see *All Classes Tab* on page 301). Translate each of the metaclass names.
9. Click the **All Attributes and Collections** tab to view a sortable list of all the attributes and collections available in the PowerDesigner metamodel (see *All Attributes and Collections Tab* on page 302). Translate each of the attribute and collection names.
10. Click the **All Report Titles** tab, and review the automatically generated report titles (see *All Report Titles Tab* on page 299). This tab may take several seconds to display.
11. Click the **Save** tool, and click **OK** to close the Report Language Editor. The report language file is now ready to be attached to a report.

Report Language File Properties

All report language files can be opened in the Resource Editor, and have the same basic category structure.



Name: English Template

Code: English Template

File name: C:\Program Files\Sybase\PowerDesigner 15\R

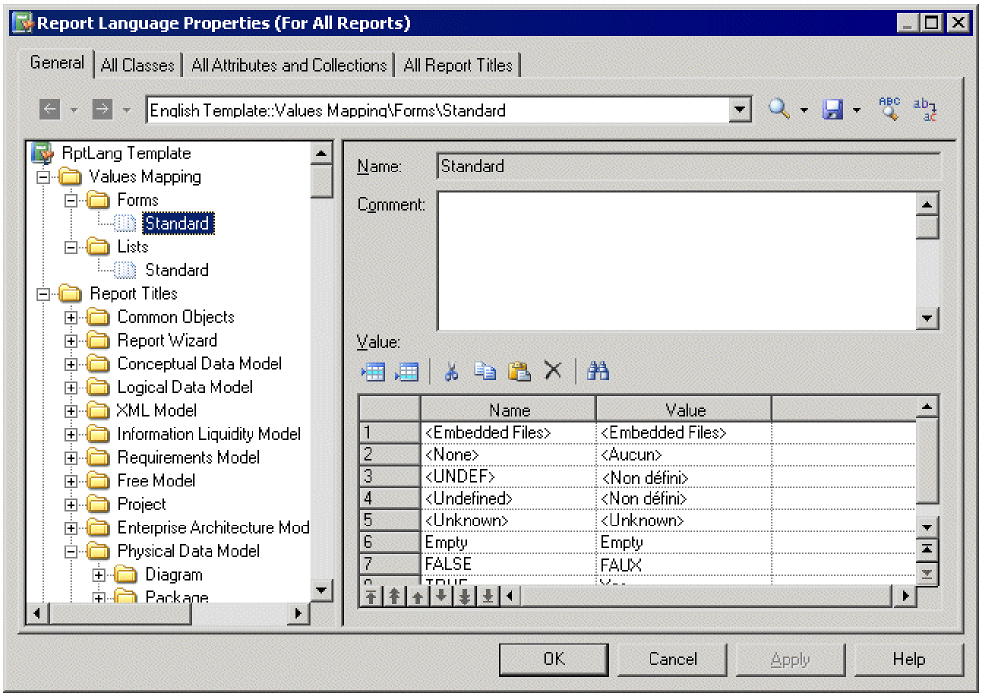
Comment:

The root node of each file contains the following properties:

Property	Description
Name	Specifies the name of the report language.
Code	Specifies the code of the report language.
File Name	[read-only] Specifies the path to the .xrl file.
Comment	Specifies additional information about the report language.

Values Mapping Category

The Values Mapping category contains a list of keywords values (such as Undefined, Yes, False, or None) for object properties displayed in cards, checks, and lists. You must enter a translation in the Value column for each keyword in the Name column:



English Template::Values Mapping\Forms\Standard

Name: Standard

Comment:

Value:

	Name	Value
1	<Embedded Files>	<Embedded Files>
2	<None>	<Aucun>
3	<UNDEF>	<Non défini>
4	<Undefined>	<Non défini>
5	<Unknown>	<Unknown>
6	Empty	Empty
7	FALSE	FAUX

This category contains the following sub-categories:

Sub-category	Description
Forms	Contains a Standard mapping table for keywords of object properties in cards and checks, which is available to all models. You have to provide translations for keywords values in the Value column. Example: Embedded Files.
Lists	Contains a Standard mapping table for keywords of object properties in lists, which is available to all models. You have to provide translations for keywords values in the Value column. Example: True.

You can create new mapping tables containing keywords values specific to particular types of model objects.

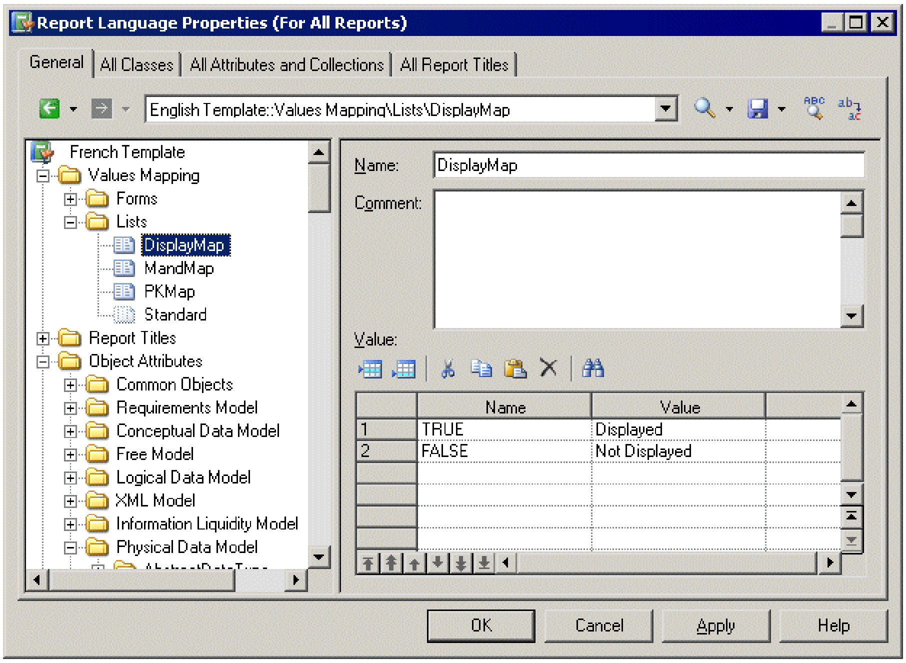
Example: Creating a Mapping Table, and Attaching It to a Specific Model Object

You can override the values in the Standard mapping tables for a specific model object by creating a new mapping table, and attaching it to the object.

In the following example, the DisplayMap mapping table is used to override the Standard mapping table for PDM columns to provide custom values for the Displayed property, which controls the display of the selected column in the table symbol. This situation can be summarized as follows:

Name	Value
TRUE	Displayed
FALSE	Not Displayed

1. Open the **Values Mapping > Lists category**.
2. Right-click the Lists category, select **New > Map Item** to create a new list, and open its property sheet.
3. Enter DisplayMap in the Name field, enter the following values in the Value list, and click Apply:
   - Name: TRUE, Value: Displayed.
   - Name:FALSE, Value: Not Displayed.



English Template::Values Mapping\Lists\DisplayMap

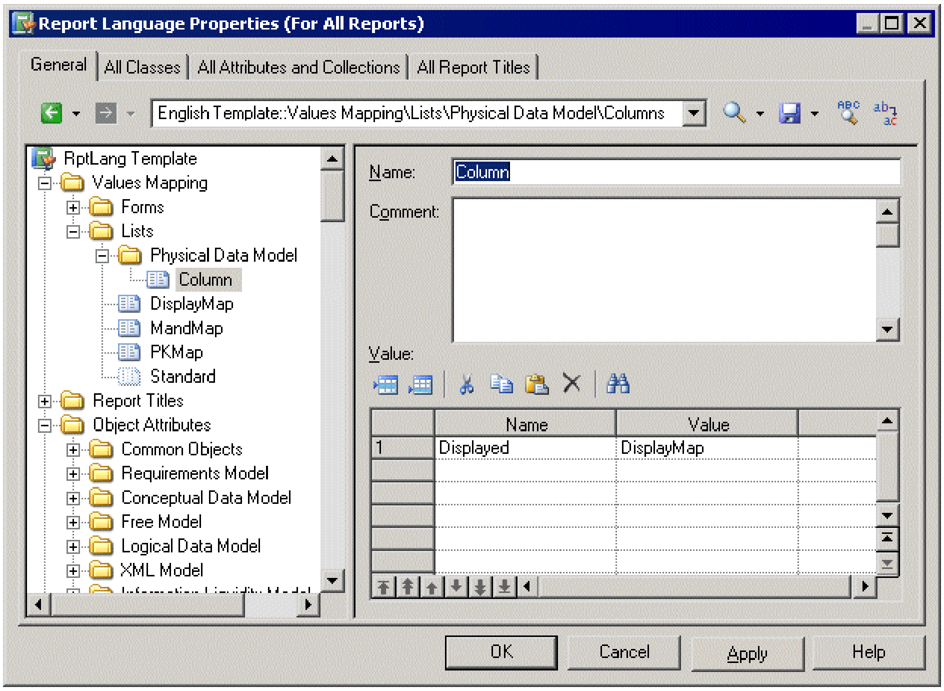
Name: DisplayMap

Comment:

Value:

	Name	Value
1	TRUE	Displayed
2	FALSE	Not Displayed

4. Right-click the Lists category, select **New** > **Category**, name the category Physical Data Model, and click Apply.
5. To complete the recreation of the PDM Object Attributes tree, right-click the new Physical Data Model category, select **New** > **Map Item**, name the category Column, and click Apply.
6. Click the Name column to create a value and enter Displayed, which is the name of the PDM column attribute (property).
7. Click the Value column and enter DisplayMap to specify the mapping table to use for that attribute.



	Name	Value
1	Displayed	DisplayMap

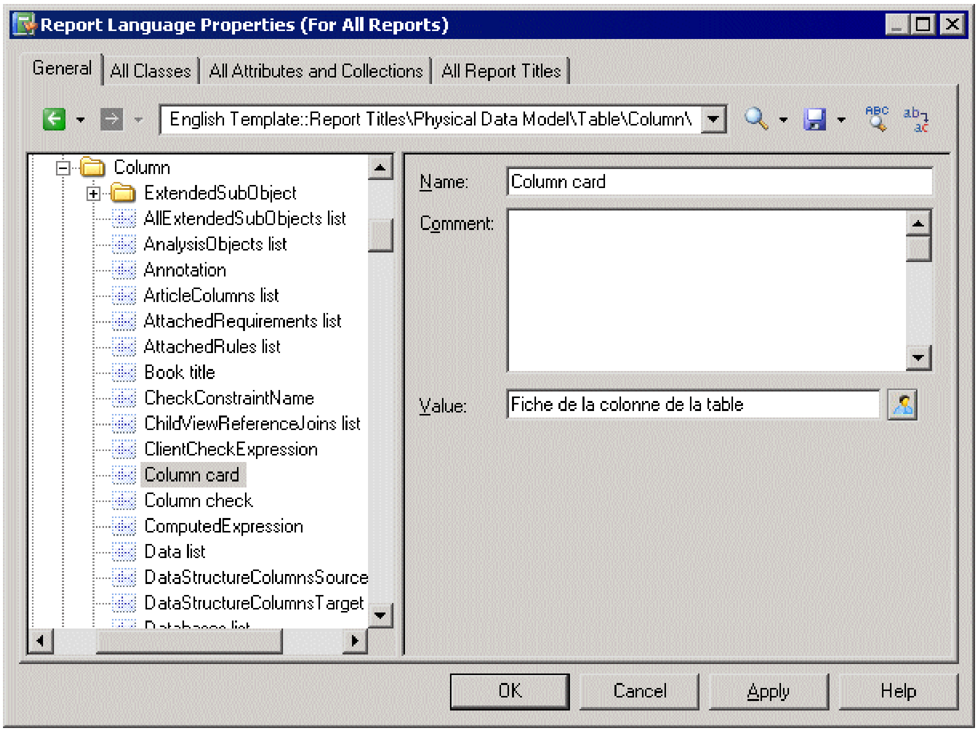
8. Click Apply to save your changes. When you generate a report, the Displayed property will be shown using the specified values:

1 List of table columns

Name	*Code*	*Displayed*
id	id	Displayed
name	name	Not Displayed
size	size	Not Displayed
supplier	supplier	Not Displayed
quantity	quantity	Displayed
unit_price	unit_price	Displayed

Report Titles Category

The Report Titles category contains translations for all the possible report titles that appear in the Available Items pane in the Report Editor, those that are generated with the Report Wizard, and other miscellaneous text items.


Report Language Properties (For All Reports)
General
All Classes
All Attributes and Collections
All Report Titles
English Template::Report Titles\Physical Data Model\Table\Column\
Column
ExtendedSubObject
AllExtendedSubObjects list
AnalysisObjects list
Annotation
ArticleColumns list
AttachedRequirements list
AttachedRules list
Book title
CheckConstraintName
ChildViewReferenceJoins list
ClientCheckExpression
Column card
Column check
ComputedExpression
Data list
DataStructureColumnsSource
DataStructureColumnsTarget
OK
Cancel
Apply
Help

Name: Column card

Comment:

Value: Fiche de la colonne de la table

This category contains the following sub-categories:

Sub-category	Description
Common Objects	Contains the text items available to all models. You must provide translations of these items here. Example: HTMLNext provides the text for the Next button in an HTML report.
Report Wizard	Contains the report titles generated with the Report Wizard. You must provide translations of these items here. Example: Short description title provides the text for a short description section when you generate a report with the Report Wizard.

Sub-category	Description
[Models]	Contain the report titles and other text items available to each model. These are automatically generated, but you can override the default values. Example: DataTransformationTasks list provides the text for the data transformation tasks list of a given transformation process in the Data Movement Model.

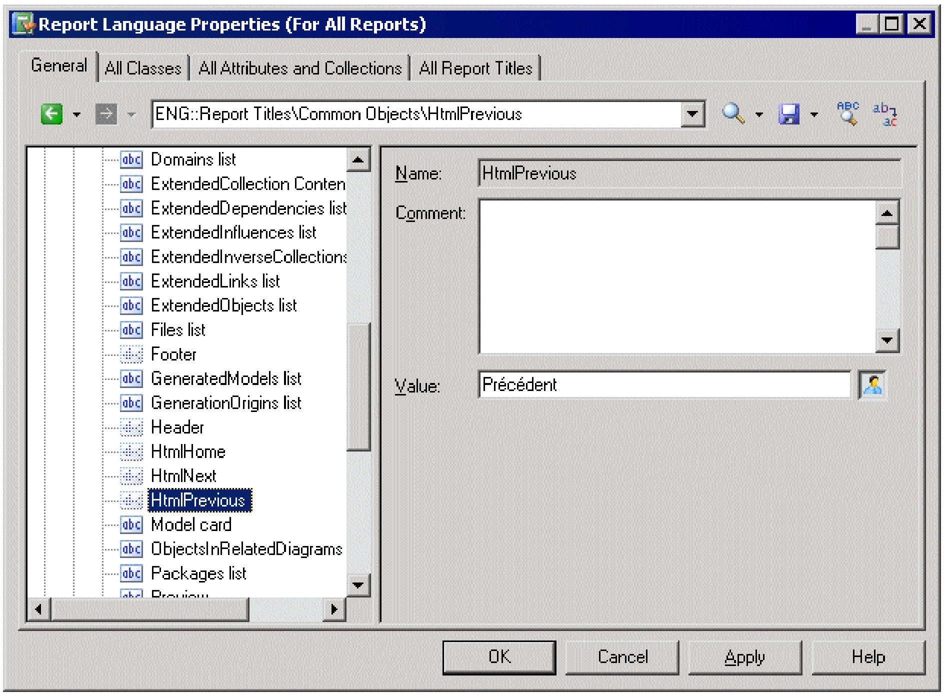
By default (with the exception of the Common Objects and Report Wizard sub-categories) these translations are automatically generated from the templates in the Profile category (see *Profile/Report Item Templates Category* on page 305). You can override the automatically generated values by entering your own text in the **Localized name** field, which will depress the **User-Defined** button to indicate that the value is no longer generated.

Note: The **All Report Titles** tab (see *All Report Titles Tab* on page 299) displays the same translations shown in this category in a simple, sortable list form. You may find it more convenient to check and, where appropriate, to override generated translations on this tab.

Example: Translating the HTML Report Previous Button

The HTML report **Previous** button is a common object available to all models, and located in the Common Objects category. You must translate this text item manually along with the other items in this, and the Report Wizard categories.

1. Open the **Report Titles** > **Common Objects** category.
2. Click the `HtmlPrevious` entry to display its properties, and enter a translation in the **Value** box. The **User-Defined** button is depressed to indicate that the value is no longer generated.


Report Language Properties (For All Reports)

ENG::Report Titles\Common Objects\HtmlPrevious

- Domains list
- ExtendedCollection Conten
- ExtendedDependencies list
- ExtendedInfluences list
- ExtendedInverseCollection:
- ExtendedLinks list
- ExtendedObjects list
- Files list
- Footer
- GeneratedModels list
- GenerationOrigins list
- Header
- HtmlHome
- HtmlNext
- HtmlPrevious
- Model card
- ObjectsInRelatedDiagrams
- Packages list

Name: HtmlPrevious

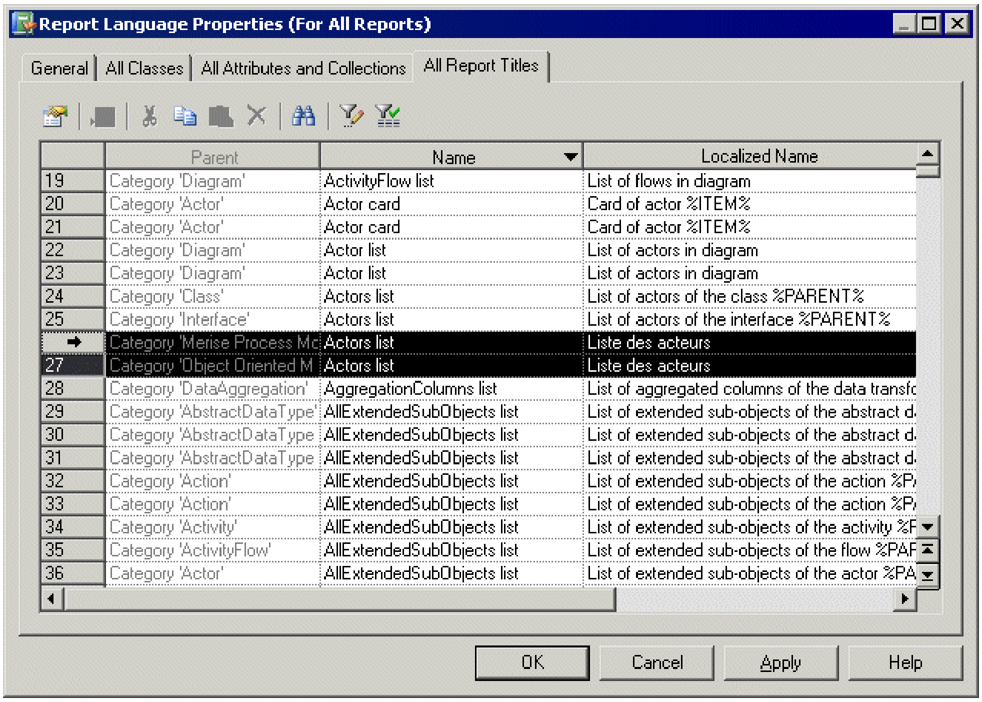
Comment:

Value: Précédent

3. Click **Apply** to save your changes.

All Report Titles Tab

The Report Titles tab lists all the report titles and other miscellaneous text items available in the Report Titles category on the General tab, but the flat structure makes it more convenient to work with.

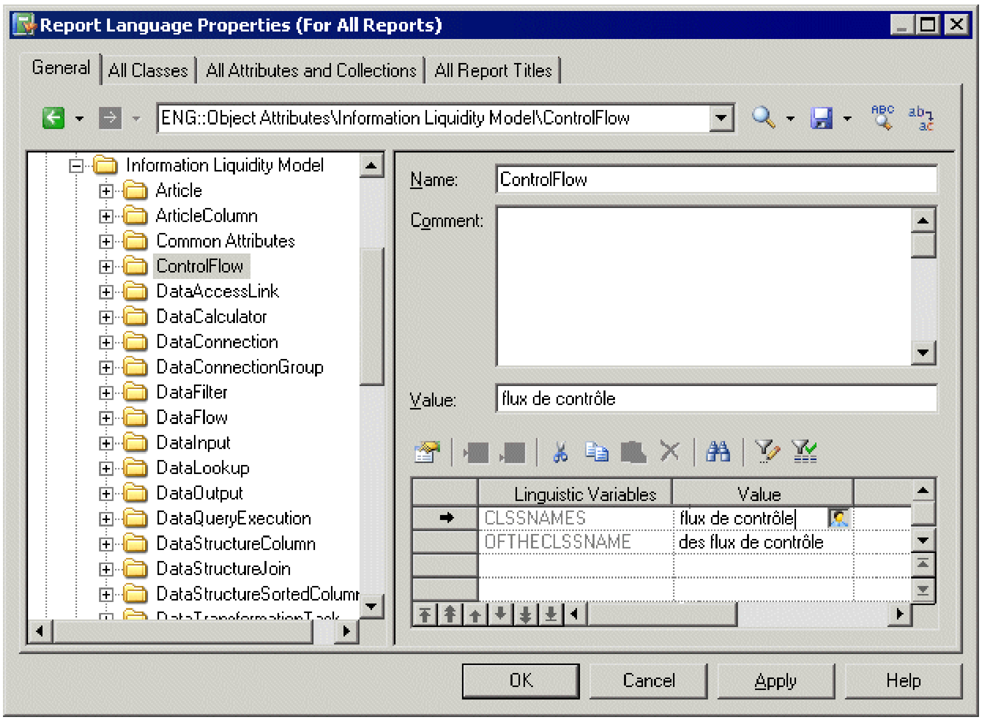

Report Language Properties (For All Reports)
General
All Classes
All Attributes and Collections
All Report Titles
OK
Cancel
Apply
Help

	Parent	Name	Localized Name
19	Category 'Diagram'	ActivityFlow list	List of flows in diagram
20	Category 'Actor'	Actor card	Card of actor %ITEM%
21	Category 'Actor'	Actor card	Card of actor %ITEM%
22	Category 'Diagram'	Actor list	List of actors in diagram
23	Category 'Diagram'	Actor list	List of actors in diagram
24	Category 'Class'	Actors list	List of actors of the class %PARENT%
25	Category 'Interface'	Actors list	List of actors of the interface %PARENT%
➜	Category 'Merise Process Mc	Actors list	Liste des acteurs
27	Category 'Object Oriented M	Actors list	Liste des acteurs
28	Category 'DataAggregation'	AggregationColumns list	List of aggregated columns of the data transfo
29	Category 'AbstractDataType'	AllExtendedSubObjects list	List of extended sub-objects of the abstract d
30	Category 'AbstractDataType	AllExtendedSubObjects list	List of extended sub-objects of the abstract d
31	Category 'AbstractDataType	AllExtendedSubObjects list	List of extended sub-objects of the abstract d
32	Category 'Action'	AllExtendedSubObjects list	List of extended sub-objects of the action %P
33	Category 'Action'	AllExtendedSubObjects list	List of extended sub-objects of the action %P
34	Category 'Activity'	AllExtendedSubObjects list	List of extended sub-objects of the activity %F
35	Category 'ActivityFlow'	AllExtendedSubObjects list	List of extended sub-objects of the flow %PAF
36	Category 'Actor'	AllExtendedSubObjects list	List of extended sub-objects of the actor %PA

For each report listed in the **Name** column, you can review or override a translation in the **Localized Name** column. You can sort the list to group similarly-named objects, and translate identical items together by selecting multiple lines.

Object Attributes Category

The Object Attributes category contains all the metaclasses, collections and attributes available in the PowerDesigner metamodel, organized in tree form:



Report Language Properties (For All Reports)

General | All Classes | All Attributes and Collections | All Report Titles

ENG::Object Attributes\Information Liquidity Model\ControlFlow

- Information Liquidity Model
  - Article
  - ArticleColumn
  - Common Attributes
  - ControlFlow
  - DataAccessLink
  - DataCalculator
  - DataConnection
  - DataConnectionGroup
  - DataFilter
  - DataFlow
  - DataInput
  - DataLookup
  - DataOutput
  - DataQueryExecution
  - DataStructureColumn
  - DataStructureJoin
  - DataStructureSortedColumn

Name: ControlFlow

Comment:

Value: flux de contrôle

	Linguistic Variables	Value
➜	CLSSNAMES	flux de contrôle
	OFTHECLSSNAME	des flux de contrôle

OK | Cancel | Apply | Help

This category contains the following sub-categories:

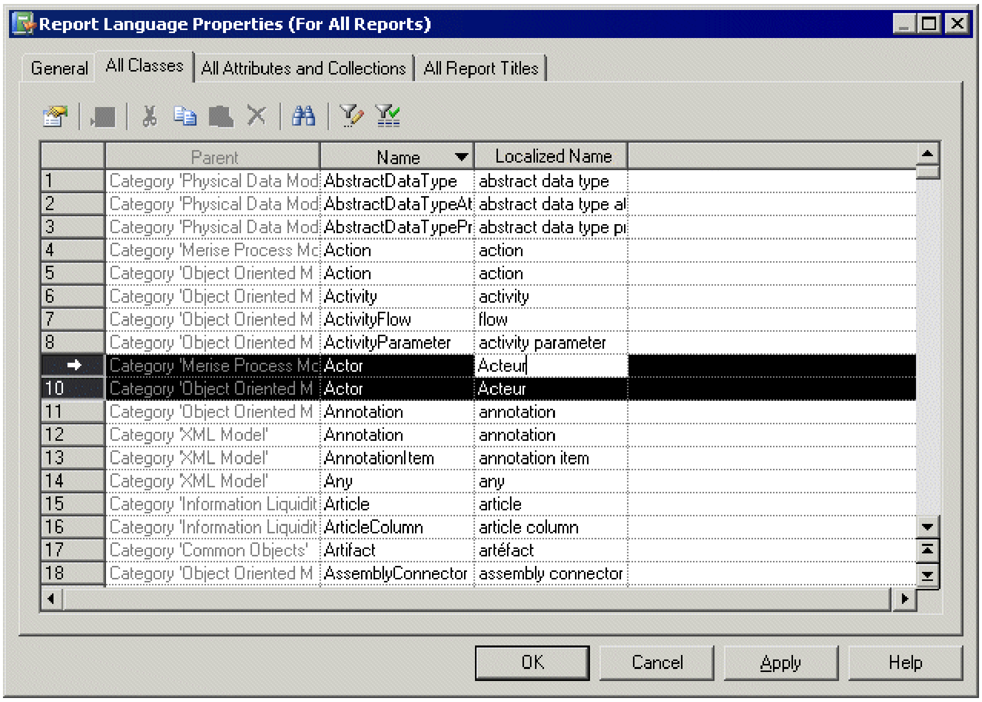
Sub-category	Description
[Models]	Contain text items for metaclasses, collections and attributes available to each model, for which you must provide translations. Example: Action provides the text for an attribute of a process in the Business Process Model.
Common Objects	Contains text items for metaclasses, collections and attributes available to all models, for which you must provide translations. Example: Diagram provides the text for a diagram in any model.

For each item the name is given, and you must provide a translation in the **Localized name** field. This value is retrieved by the templates you have specified in the Profile category to generate default report titles (see *Report Titles Category* on page 296).

For metaclasses only, the linguistic variables you have specified (see *Profile/Linguistic Variables Category* on page 302) are listed along with the results of their application to the translations given in the **Localized name** field. If necessary, you can override the automatically generated values by entering your own text in the **Value** column, which will depress the **User-Defined** button to indicate that the value is no longer generated.

All Classes Tab

The All Classes tab lists all the metaclasses available in the Object Attributes category on the General tab but the flat structure makes it more convenient to work with.

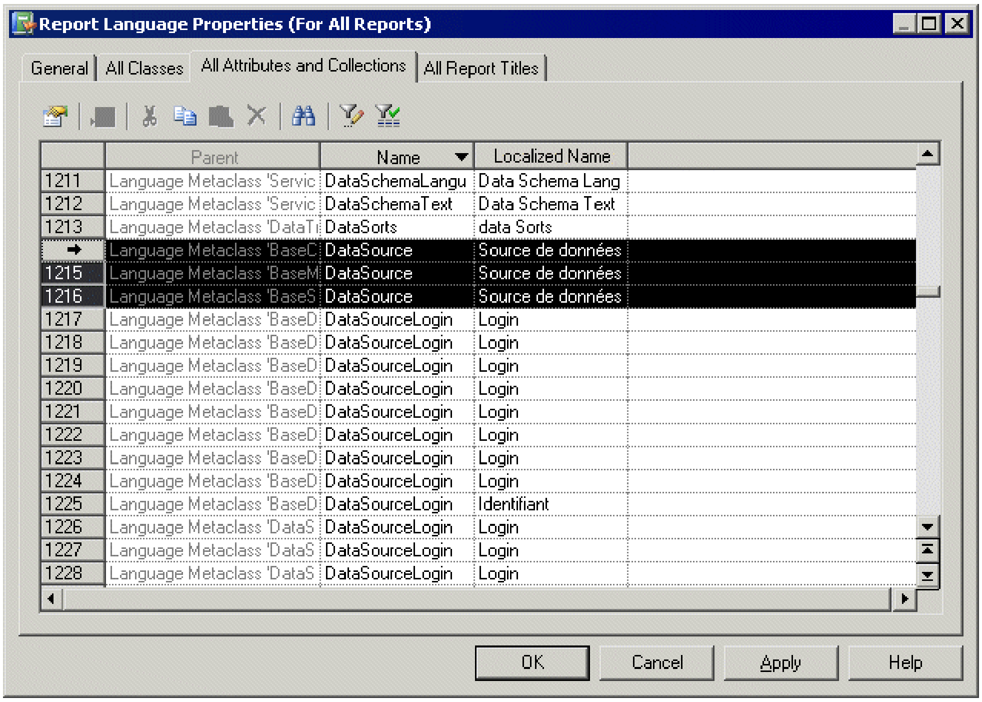

Report Language Properties (For All Reports)
General
All Classes
All Attributes and Collections
All Report Titles
OK
Cancel
Apply
Help

	Parent	Name	Localized Name
1	Category 'Physical Data Mod	AbstractDataType	abstract data type
2	Category 'Physical Data Mod	AbstractDataTypeAt	abstract data type at
3	Category 'Physical Data Mod	AbstractDataTypePr	abstract data type pr
4	Category 'Merise Process Mc	Action	action
5	Category 'Object Oriented M	Action	action
6	Category 'Object Oriented M	Activity	activity
7	Category 'Object Oriented M	ActivityFlow	flow
8	Category 'Object Oriented M	ActivityParameter	activity parameter
➡	Category 'Merise Process Mc	Actor	Acteur
10	Category 'Object Oriented M	Actor	Acteur
11	Category 'Object Oriented M	Annotation	annotation
12	Category 'XML Model'	Annotation	annotation
13	Category 'XML Model'	AnnotationItem	annotation item
14	Category 'XML Model'	Any	any
15	Category 'Information Liquidit	Article	article
16	Category 'Information Liquidit	ArticleColumn	article column
17	Category 'Common Objects'	Artifact	artéfact
18	Category 'Object Oriented M	AssemblyConnector	assembly connector

For each metaclass listed in the **Name** column, you must enter a translation in the **Localized Name** column. You can sort the list to group similarly-named objects, and translate identical items together by selecting multiple lines.

All Attributes and Collections Tab

The All Attributes and Collections lists all the collections and attributes available in the Object Attributes category on the General tab, but the flat structure makes it more convenient to work with.


Report Language Properties (For All Reports)
General
All Classes
All Attributes and Collections
All Report Titles
OK
Cancel
Apply
Help

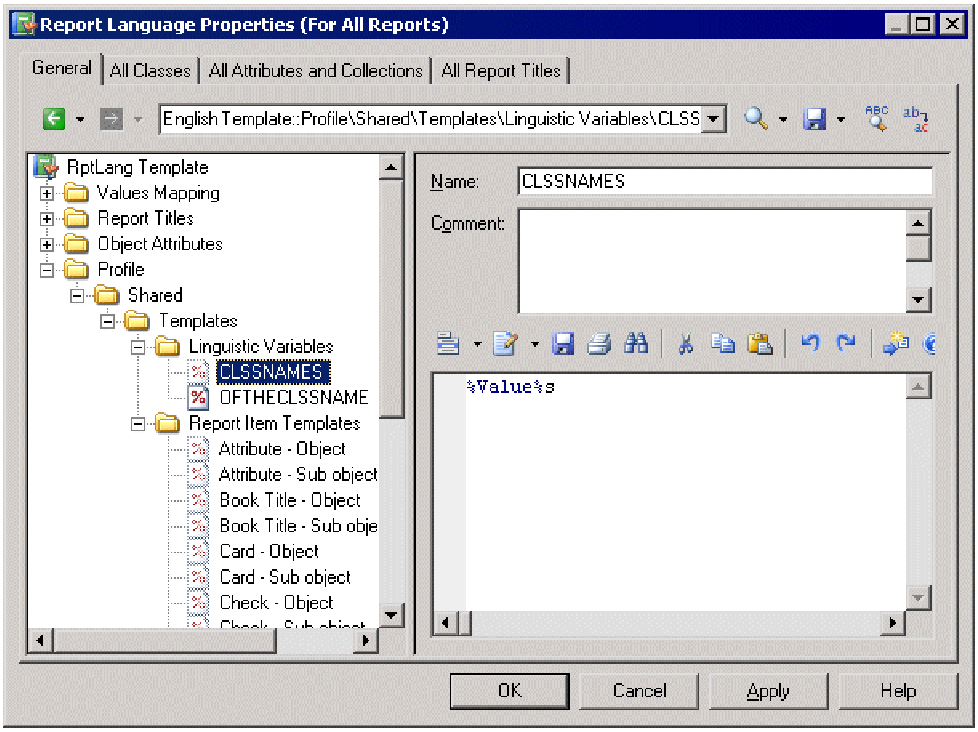
	Parent	Name	Localized Name
1211	Language Metaclass 'Servic	DataSchemaLangu	Data Schema Lang
1212	Language Metaclass 'Servic	DataSchemaText	Data Schema Text
1213	Language Metaclass 'DataTı	DataSorts	data Sorts
➔	Language Metaclass 'BaseC	DataSource	Source de données
1215	Language Metaclass 'BaseM	DataSource	Source de données
1216	Language Metaclass 'BaseS	DataSource	Source de données
1217	Language Metaclass 'BaseD	DataSourceLogin	Login
1218	Language Metaclass 'BaseD	DataSourceLogin	Login
1219	Language Metaclass 'BaseD	DataSourceLogin	Login
1220	Language Metaclass 'BaseD	DataSourceLogin	Login
1221	Language Metaclass 'BaseD	DataSourceLogin	Login
1222	Language Metaclass 'BaseD	DataSourceLogin	Login
1223	Language Metaclass 'BaseD	DataSourceLogin	Login
1224	Language Metaclass 'BaseD	DataSourceLogin	Login
1225	Language Metaclass 'BaseD	DataSourceLogin	Identifiant
1226	Language Metaclass 'DataS	DataSourceLogin	Login
1227	Language Metaclass 'DataS	DataSourceLogin	Login
1228	Language Metaclass 'DataS	DataSourceLogin	Login

For each attribute or collection listed in the **Name** column, you must enter a translation in the **Localized Name** column. You can sort the list to group similarly-named objects, and translate identical items together by selecting multiple lines.

Profile/Linguistic Variables Category

The Linguistic Variables category contains templates, which specify grammar rules to help build the report item templates.

Examples of grammar rules include the plural form of a noun, and the correct definite article that must precede a noun (see *Profile/Report Item Templates Category* on page 305).



English Template::Profile\Shared\Templates\Linguistic Variables\CLSS

Name: CLSSNAMES

Comment:

```
%Value%s
```

Specifying appropriate grammar rules for your language, and inserting them into your report item templates will dramatically improve the quality of the automatic generation of your report titles. You can create as many variables as your language requires.

Each linguistic variable and the result of its evaluation is displayed for each metaclass in the Object Attributes category (see *Object Attributes Category* on page 300).

The following are examples of grammar rules specified as linguistic variables to populate report item templates in the French report language resource file:

- GENDER – Identifies as feminine a metaclass name %Value%, if it finishes with "e" and as masculine in all other cases:

```
.if (%.-1:@Value% == e)
F
.else
M
.endif
```

For example: la table, la colonne, le trigger.

- CLSSNAMES – Creates a plural by adding "x" to the end of the metaclass name %Value %, if it finishes with "eau" or "au" and adds "s" in all other cases:

```
.if (%.-3:@Value% == eau) or (%.-2:@Value% == au)
%@Value%x
```

```
.else
%@Value%s
.endif
```

For example: les tableaux, les tables, les entités.

- THECLSSNAME – Inserts the definite article before the metaclass name %Value% by inserting " l' ", if it begins with a vowel, "le" if it is masculine, and "la" if not:

```
.if (%.1U:@Value% == A) or (%.1U:@Value% == E) or (%.1U:@Value% == I)
or (%.1U:@Value% == O) or (%.1U:@Value% == U)
l'%@Value%
.elsif (%GENDER% == M)
le %@Value%
.else
la %@Value%
.endif
```

For example: l'association, le package, la table.

- OFTHECLSSNAME – Inserts the preposition "de" plus the definite article before the metaclass name %Value%,if it begins with a vowel or if it is feminine, otherwise "du".

```
.if (%.1U:@Value% == A) or (%.1U:@Value% == E) or (%.1U:@Value% == I)
or (%.1U:@Value% == O) or (%.1U:@Value% == U) or (%GENDER% == F)
de %THECLSSNAME%
.else
du %@Value%
.endif
```

For example: de la table, du package.

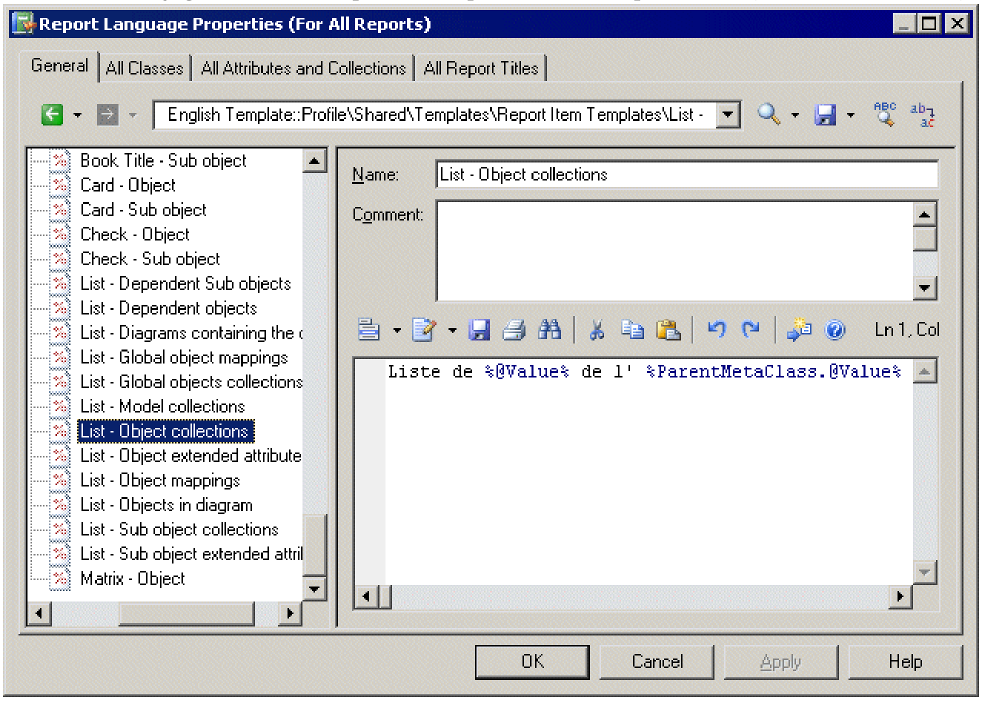
- OFCLSSNAME – Inserts the preposition " d' " before the metaclass name %Value%,, if it begins with a vowel, otherwise "de".

```
.if (%.1U:@Value% == A) or (%.1U:@Value% == E) or (%.1U:@Value% == I)
or (%.1U:@Value% == O) or (%.1U:@Value% == U)
d'%@Value%
.else
de %@Value%
.endif
```

For example: d'association, de table.

Profile/Report Item Templates Category

The Report Item Templates category contains a set of templates that, in conjunction with the translations that you will provide for metaclass, attribute and collection names, are evaluated to automatically generate all the possible report titles for report items (book, list, card etc.)


Report Language Properties (For All Reports)
General
All Classes
All Attributes and Collections
All Report Titles
English Template::Profile\Shared\Templates\Report Item Templates\List -
Book Title - Sub object
Card - Object
Card - Sub object
Check - Object
Check - Sub object
List - Dependent Sub objects
List - Dependent objects
List - Diagrams containing the
List - Global object mappings
List - Global objects collections
List - Model collections
List - Object collections
List - Object extended attribute
List - Object mappings
List - Objects in diagram
List - Sub object collections
List - Sub object extended attri
Matrix - Object
Name:
Comment:
Ln 1, Col
OK
Cancel
Apply
Help

Name: List - Object collections

```
Liste de %@Value% de l' %ParentMetaClass.@Value%
```

You must provide translations for each template by entering your own text. Variables (such as `%text%`) must not be translated.

For example the template syntax for the list of sub-objects contained within a collection belonging to an object is the following:

```
List of %@Value% of the %ParentMetaClass.@Value% %%PARENT%%
```

When this template is evaluated, the variable `%@Value%` is resolved to the value of the localized name for the object, `%ParentMetaClass.@Value%` is resolved to the value of the localized name for the parent of the object, and `%%PARENT%%` is resolved to the name for the parent of the object.

In this example, you translate this template as follows:

- Translate the non-variable items in the template. For example:
- Create a linguistic variable named `OFTHECLSSNAME` to specify the grammar rule used in the template (see *Profile/Linguistic Variables Category* on page 302).

This template will be reused to create report titles for all the lists of sub-objects contained within a collection belonging to an object.

Note: You cannot create or delete templates.

CHAPTER 7 Scripting PowerDesigner

When working with large or multiple models, it can be tedious to perform repetitive tasks, such as modifying objects using global rules, importing or generating new formats, or checking models. Such operations can be automated through scripts.

You can access and modify any PowerDesigner object using Java, VBScript, C#, or many other languages. In this chapter, we focus primarily on writing VBScript to execute in PowerDesigner's Edit/Run Script dialog, but you can also call add-ins from PowerDesigner menus (see *Launching Scripts and Add-Ins from Menus* on page 340) or script the PowerDesigner application via OLE automation (see *OLE Automation and Add-Ins* on page 334).

The following script illustrates the basic syntax of VBScript applied to manipulating PowerDesigner models and objects, including:

- Declaration of local variable
- Assignment of value to a local variable (with the specific case of object)
- Condition operator: `If Then` / `Else` / `End If`
- Iteration on a list: `For Each` / `Next`
- Definition and call of a procedure: `Sub`
- Definition and call of a function: `Function`
- Error handling using `On Error` statements

```
' This is a VBScript comment.
Dim var ' Declaration of a local variable
var = 1 ' Value assignment for simple type
Set var = ActiveModel ' Value assignment for an object. ActiveModel
is a PowerDesigner global property
If not var is Nothing Then ' Condition on an object, testing if it is
'null'
   Dim objt ' Declaration of another local variable
   For Each objt In ActiveModel.Children ' Loop on the Children
object collection
      DescribeObject objt ' Procedure call with objt as a parameter
(without parentheses). The procedure is defined below.
   Next
Else
   output "There is no active model" ' Output is a PowerDesigner
procedure that writes text to the Output window
End If

' This is a procedure - a method that does not return a value
Sub DescribeObject(objt)
   Dim desc ' A variable declaration inside the procedure
   desc = ComputeObjectLabel(objt) ' A function call with objt as
parameter (with parentheses). The function is defined below.
```

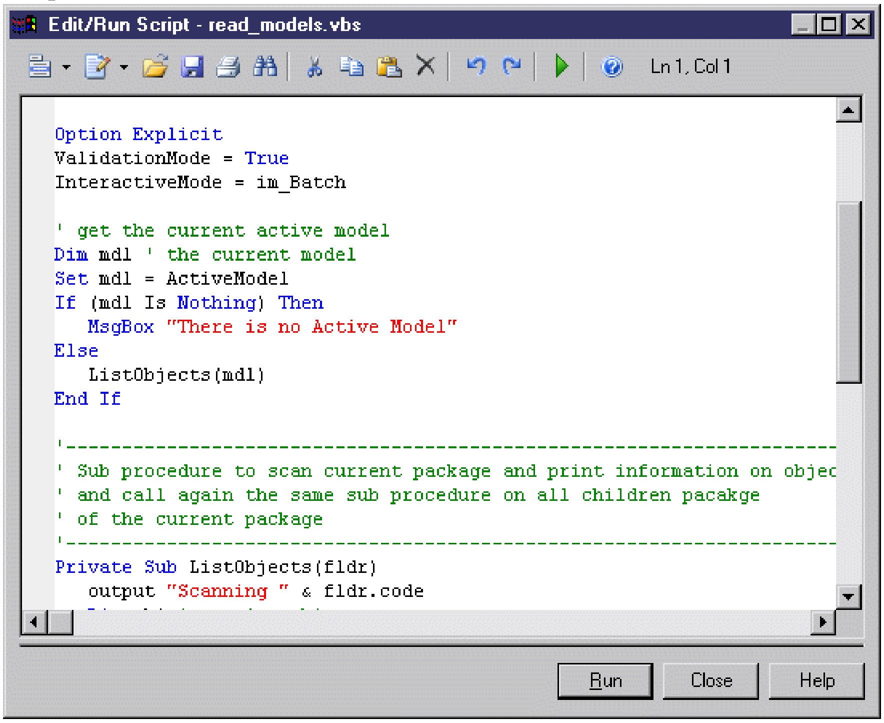
```
                             ' We retrieve the value returned by the
function in the variable desc
   output desc ' Displays the object description in the output
End Sub

' This is a function - a method that returns a value
Function ComputeObjectLabel(objt)
   Dim label ' Declare a local variable to store the object label
   label = "" ' Initialize the label variable with a default value
   If objt is nothing then
      label = "There is no object"
   ElseIf objt.IsShortcut() then ' IsShortcut is a PowerDesigner
function available on objects
     label = objt.Name & " (shortcut)" ' Concatenation of two strings
   Else
      On Error Goto 0 ' Disables script execution abort on error
      label = objt.Name ' Assigns the object's Name property to the
local variable
      On Error Resume Next ' Reactivates script execution error
   End If
  ComputeObjectLabel = label ' The value is returned by assigning an
implicit variable with same name than the function
End Function
```

Note: VBScript can also be used to create custom checks, event handlers, transformations, and methods in an extension file (see *Chapter 2, Extension Files* on page 9) and embedded in or called from GTL templates (see *.execute_vbscript Macro* on page 272 and *.vbscript Macro* on page 284).

The examples in this chapter are intended to introduce the basic concepts and techniques for controlling PowerDesigner by script. For complete documentation of the PowerDesigner metamodel, select **Help > Metamodel Objects Help**. For full documentation of VBScript, see the *Microsoft MSDN site*.

Running Scripts in PowerDesigner

You can run VBScript scripts in your PowerDesigner client by selecting **Tools** > **Execute Commands** to open the **Edit/Run Script** dialog. Output from the script is printed to the **Output** window.



```
Option Explicit
ValidationMode = True
InteractiveMode = im_Batch

' get the current active model
Dim mdl ' the current model
Set mdl = ActiveModel
If (mdl Is Nothing) Then
   MsgBox "There is no Active Model"
Else
   ListObjects(mdl)
End If

'----------------------------------------------------------------------
' Sub procedure to scan current package and print information on objec
' and call again the same sub procedure on all children pacakge
' of the current package
'----------------------------------------------------------------------
Private Sub ListObjects(fldr)
   output "Scanning " & fldr.code
```

The following tools are available on the **Edit/Run Script** dialog toolbar:

Tools	Description
	Editor Menu [Shift+F11] - Contains the following commands: • **New [Ctrl+N]** - Reinitializes the field by removing all the existing content. • **Open... [Ctrl+O]** - Replaces the content of the field with the content of the selected file. • **Insert... [Ctrl+I]** - Inserts the content of the selected file at the cursor. • **Save [Ctrl+S]** - Saves the content of the field to the specified file. • **Save As...** - Saves the content of the field to a new file. • **Select All [Ctrl+A]** - Selects all the content of the field. • **Find... [Ctrl+F]** - Opens a dialog to search for text in the field. • **Find Next... [F3]** - Finds the next occurence of the searched for text. • **Find Previous... [Shift+F3]** - Finds the previous occurence of the searched for text. • **Replace... [Ctrl+H]** - Opens a dialog to replace text in the field. • **Go To Line... [Ctrl+G]** - Opens a dialog to go to the specified line. • **Toggle Bookmark [Ctrl+F2]** Inserts or removes a bookmark (a blue box) at the cursor position. Note that bookmarks are not printable and are lost if you refresh the tab • **Next Bookmark [F2]** - Jumps to the next bookmark. • **Previous Bookmark [Shift+F2]** - Jumps to the previous bookmark.
	Edit With [Ctrl+E] - Opens the previewed code in an external editor. Click the down arrow to select a particular editor or **Choose Program** to specify a new editor. Editors specified here are added to the list of editors available at **Tools** > **General Options** > **Editors**.
	Save [Ctrl+S] - Saves the content of the field to the specified file.
	Print [Ctrl+P] - Prints the content of the field.
	Find [Ctrl+F] - Opens a dialog to search for text.
	Cut [Ctrl+X], **Copy [Ctrl+C]**, and **Paste [Ctrl+V]** - Perform the standard clipboard actions.
	Clear - Deletes the script in the dialog.
	Undo [Ctrl+Z] and **Redo [Ctrl+Y]** - Move backward or forward through edits. Multiple levels of Undo and Redo are supported but , if you run a script that modifies objects in several models, you must use the Undo or Redo commands in each of the models called by the script.

Tools	Description
▶	**Run [F5]** - Runs the script. Output is printed to the **Output** window. If a compilation error occurs, a message box is displayed, a brief error description appears in the dialog's **Result** pane, and the cursor is set at the error position. You can catch errors using the `On Error Resume Next` statement, unless the script is called in the `im_Abort` interactive mode (see *.set_interactive_mode Macro* on page 280).
?	**Find in Metamodel Objects Help [Ctrl+F1]** - Opens the PowerDesigner metamodel objects help file, which provides detailed information about all the attributes, collections, and methods available for each metaclass.

VBScript File Samples

PowerDesigner ships with a set of script samples, that you can use as a basis to create your own scripts, and which are located in the `VB Scripts` folder of the PowerDesigner installation directory. These scripts are intended to show you the range of tasks you can perform on PowerDesigner models using VBScript.

Warning! You should always make a backup copy of the sample script before making changes to it.

Model Scan Sample

The following script browses any model, looping through any packages and listing the objects contained in them:

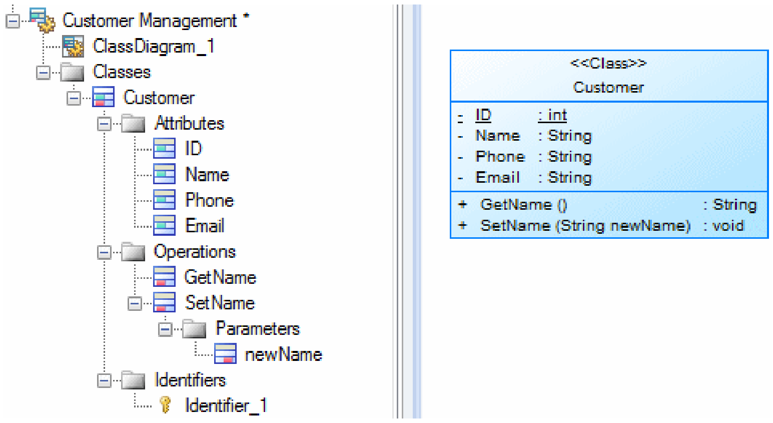
```
Option Explicit ' Forces each variable to be declared
'before assignment
InteractiveMode = im_Batch ' Supresses the display of dialogs
' get the current active model
Dim diag
Set diag = ActiveDiagram ' the current diagram
If (diag Is Nothing) Then
 MsgBox "There is no Active Diagram"
Else
 Dim fldr
 Set Fldr = diag.Parent
 ListObjects(fldr)
End If
' Sub procedure to scan current package and print information on
' objects from current package and call again the same sub
procedure
' on all child packages
Private Sub ListObjects(fldr)
 output "Scanning " & fldr.code
 Dim obj ' running object
 For Each obj In fldr.children
  ' Calling sub procedure to print out information on the object
  DescribeObject obj
 Next
 ' go into the sub-packages
 Dim f ' running folder
 For Each f In fldr.Packages
  'calling sub procedure to scan children package
  ListObjects f
 Next
End Sub
' Sub procedure to print information on current object in output
Private Sub DescribeObject(CurrentObject)
 if CurrentObject.ClassName ="Association-Class link" then exit sub
 'output "Found "+CurrentObject.ClassName
 output "Found "+CurrentObject.ClassName+" """+CurrentObject.Name
+""", Created by "+CurrentObject.Creator+" On
"+Cstr(CurrentObject.CreationDate)
End Sub
```

Model Creation Sample

The following script creates a new OOM model, then creates a class with attributes and operations:

```
ValidationMode = True 'Forces PowerDesigner to validate
' actions and return errors in the event of a forbidden action
InteractiveMode = im_Batch ' Supresses PowerDesigner dialogs
' Main function
' Create an OOM model with a class diagram
Dim Model
Set model = CreateModel(PdOOM.cls_Model, "|Diagram=ClassDiagram")
model.Name = "Customer Management"
model.Code = "CustomerManagement"
' Get the class diagram
Dim diagram
Set diagram = model.ClassDiagrams.Item(0)
' Create classes
CreateClasses model, diagram
' Create classes function
Function CreateClasses(model, diagram)
 ' Create a class
 Dim cls
 Set cls = model.CreateObject(PdOOM.cls_Class)
 cls.Name = "Customer"
 cls.Code = "Customer"
 cls.Comment = "Customer class"
 cls.Stereotype = "Class"
 cls.Description = "The customer class defines the attributes and
behaviors of a customer."
 ' Create attributes
 CreateAttributes cls
 ' Create methods
 CreateOperations cls
 ' Create a symbol for the class
 Dim sym
 Set sym = diagram.AttachObject(cls)
 CreateClasses = True
End Function
```

```
' Create attributes function
Function CreateAttributes(cls)
 Dim attr
 Set attr = cls.CreateObject(PdOOM.cls_Attribute)
 attr.Name = "ID"
 attr.Code = "ID"
 attr.DataType = "int"
 attr.Persistent = True
 attr.PersistentCode = "ID"
 attr.PersistentDataType = "I"
 attr.PrimaryIdentifier = True
 Set attr = cls.CreateObject(PdOOM.cls_Attribute)
 attr.Name = "Name"
 attr.Code = "Name"
 attr.DataType = "String"
 attr.Persistent = True
 attr.PersistentCode = "NAME"
 attr.PersistentDataType = "A30"
 Set attr = cls.CreateObject(PdOOM.cls_Attribute)
 attr.Name = "Phone"
 attr.Code = "Phone"
 attr.DataType = "String"
 attr.Persistent = True
 attr.PersistentCode = "PHONE"
 attr.PersistentDataType = "A20"
 Set attr = cls.CreateObject(PdOOM.cls_Attribute)
 attr.Name = "Email"
 attr.Code = "Email"
 attr.DataType = "String"
 attr.Persistent = True
 attr.PersistentCode = "EMAIL"
 attr.PersistentDataType = "A30"
 CreateAttributes = True
End Function
' Create operations function
Function CreateOperations(cls)
 Dim oper
 Set oper = cls.CreateObject(PdOOM.cls_Operation)
 oper.Name = "GetName"
 oper.Code = "GetName"
 oper.ReturnType = "String"
 Dim body
 body = "{" + vbCrLf
 body = body + " return Name;" + vbCrLf
 body = body + "}"
 oper.Body = body
 Set oper = cls.CreateObject(PdOOM.cls_Operation)
 oper.Name = "SetName"
 oper.Code = "SetName"
 oper.ReturnType = "void"
 Dim param
 Set param = oper.CreateObject(PdOOM.cls_Parameter)
 param.Name = "newName"
 param.Code = "newName"
 param.DataType = "String"
 body = "{" + vbCrLf
 body = body + " Name = newName;" + vbCrLf
 body = body + "}"
 oper.Body = body
 CreateOperations = True
End Function
```



Manipulating Models, Collections, and Objects (Scripting)

You can manipulate the contents of a model by creating or opening it and then descending from the model root through collections of objects. A number of global properties, functions, and constants are available in any context and provide entry points for your scripts.

The following global properties provide access to the Workspace and models it contains:

- `ActiveWorkspace` - Retrieves the current Workspace.
- `ActiveModel`, `ActivePackage`, and `ActiveDiagram` - Retrieves the model, package, or diagram with current focus.
- `ActiveSelection` - Read-only collection of the objects selected in the active diagram.
- `Models` - Read-only collection of models open in the current Workspace.
- `RepositoryConnection` - Retrieves the current repository connection (see *Manipulating the Repository (Scripting)* on page 327).

The following global functions are commonly used to create or open models and perform actions upon them:

- `CreateModel()` and `OpenModel()` - Create and open a model (see *Creating and Opening Models (Scripting)* on page 315).
- `Output()` - Prints text to the **Script** tab of PowerDesigner's **Output** window.
- `IsKindOf()` - Tests the metaclass of the object.
- `ExecuteCommand()` - Launches an external application

- `EvaluateNamedPath()` and `MapToNamedPath()` - Manage named paths in model files.
- `BeginTransaction()`, `CancelTransaction()`, and `EndTransaction()` - Start, cancel, and commit transactions.

The following global constants provide information about the instance of PowerDesigner:

- `UserName` - Retrieves the user login name.
- `Version` - Returns the PowerDesigner version.
- `HomeDirectory` - Returns the application home directory.
- `RegistryHome` - Returns the application registry home path.
- `Viewer` - Returns True if the running application is a Viewer version that has limited features.
- `ValidationMode` - By default, PowerDesigner performs various checks to validate your actions and gives an error in the case of a forbidden action. You can set `ValidationMode = False` (which turns off validation rules such as name uniqueness or link extremities) to improve performance or if your algorithm temporarily requires an invalid state.
- `InteractiveMode` - Specifies the level of interaction required. You can choose between:
  - `im_Batch` [default] - Suppresses dialog boxes and always uses default values. For example, if your model contains external shortcuts and the target model for the shortcuts is closed, this mode will automatically open the model without user interaction.
  - `im_Dialog` - Displays information and confirmation dialog boxes that require user interaction for the execution to keep running.
  - `im_Abort` - Suppresses dialog boxes and aborts execution if a dialog is encountered.
- `ShowMode` [OLE-specific] - Checks or changes the visibility status of the main application window. Returns `True` if the application main window is visible and not minimized.
- `Locked` [OLE-specific] - When set to `True`, ensures that PowerDesigner continues to run even after an OLE client disconnects.

For detailed information about all the global properties, constants, and functions, select **Help** > **MetaModel Objects Help** and navigate to `Basic Elements`.

Creating and Opening Models (Scripting)

You create models and open existing models using the `CreateModel()` and `OpenModel()` global functions. The model with the current focus is accessible via the `ActiveModel` global property, and the models currently open in the workspace are available from the `Models` global collection.

This script creates a new OOM targeting the Analysis language, creates some classes in it, displays them in the diagram, and then saves the model and closes it:

```
Dim NewModel
set NewModel = CreateModel(PdOOM.Cls_Model, "Language=Analysis|
Diagram=ClassDiagram|Copy")
If NewModel is Nothing then
 msgbox "Failed to create UML Model", vbOkOnly, "Error" ' Display an
error message
Else
 output "The UML model has been created" ' Display a message in
Output
 NewModel.SetNameAndCode "MyOOM", "MyOOM" 'Initialize model name and
code
 For idx = 1 to 12 'Create classes and display them
  Set obj=NewModel.Classes.CreateNew()
  obj.SetNameAndCode "C" & idx, "C" & idx
  Set sym=ActiveDiagram.AttachObject (obj)
 Next
 ActiveDiagram.AutoLayoutWithOptions(2)
 NewModel.Save "c:\temp\MyOOM.oom" ' Save the model
 NewModel.Close ' Close the model
 Set NewModel = Nothing ' Release last reference to object to free
memory
End If
```

This script verifies that the previously created model exists, and then opens it in the workspace:

```
Dim MyModel, FileName
FileName = "c:\temp\MyOOM.oom"
On Error Resume Next ' Avoid generic scripting error message
Set MyModel = OpenModel(FileName)
If MyModel is nothing then ' Display an error message box
 msgbox "Failed to open Model:" + vbCrLf + FileName, vbOkOnly,
"Error"
Else ' Display a message in Output
 output "The OOM has been opened."
End If
```

Browsing and Modifying Collections (Scripting)

Most metamodel navigation is performed by descending from the model root through collections of objects to collections of sub-objects or associated objects. An OOM contains a collection of classes and classes contain collections of attributes and operations. You can obtain information about and browse the members of a collection through scripting, as well as adding, removing, and moving objects in the collection.

To browse the members of a collection, navigate to the parent object and then use a `For each` loop. This script prints the names of all the tables in an open PDM:

```
Dim MyModel
Set MyModel=ActiveModel
For each t in MyModel.Tables
    Output "* " & t.Name
Next
```

When you browse a collection, both full objects in the collection and any shortcuts will be retrieved.

Note: For information about accessing collections defined in extensions, see *Creating and Accessing Extensions (Scripting)* on page 331.

The following kinds of collections appear in the metamodel:

- Compositions - contain objects that will be deleted if the parent is deleted. For example, the `PdPDM/Tables` and `PdPDM/Table/Columns` collections are compositions.
- Aggregations - reference objects that will continue to exist if the parent is deleted. For example, the `PdCommon/NamedObject/AttachedRules` collection (inherited by most objects) is an aggregation.
- Unordered collections - contain objects with no significant order. For example, the `PdCDM/Entity/Relationships` collection is unordered.
- Ordered collections - contain objects where the user chooses the order. For example, the `PdPDM/Table/Columns` collection is ordered.
- Read-only collections - can only be browsed. For example, the global `Models` collection (all open models) is read-only.

The following properties are available for all collections:

- `Count` - Retrieves the number of objects in the collection.
- `Item[(`**index**`)]` - Retrieves the specified item in the collection as an object. `Item(0)` is the first object (and the default) and `Item(-1)` is the last object.
- `MetaCollection` - Retrieves the metadefinition of the collection as an object.
- `Kind` - Retrieves the type of objects the collection can contain.
- `Source` - Retrieves the object on which the collection is defined.

The following methods are available for modifying writeable collections:

- `CreateNew([`**kind**`]` and `CreateNewAt(`**index**`[,`**kind**`])` - [compositions only] Creates a new object at the end of the collection or at the specified **index** (default, -1). The **kind** parameter (for example, `PdPDM.cls_Table`) is only needed if the collection supports multiple kinds of objects.
- `Add(`**object**`)` - Inserts the specified **object** at the end of the collection.
- `Insert([`**index**`][, `**object**`])` - Inserts the specified **object** in the collection at the specified **index** position (default, -1).
- `Move(`**index2**`, `**index1**`)` - Moves the object at position **index1** to position **index2** in the collection.
- `Remove(`**object**`[, delete = y|n])` and `RemoveAt([`**index**`][, delete = y|n])` - Removes the specified **object** or the object at the specified **index** (default, -1) from the collection. For aggregations, you can additionally specify to delete the object (objects removed from a composition are always deleted).

- `Clear([delete = y|n])` - Removes all objects from the collection and optionally deletes them.

The following script:

- Creates a PDM,
- Creates objects in the model's `Tables` and `BusinessRules` unordered composition collections, and
- Adds some objects to table `T1`'s `AttachedRules` ordered aggregation collection and then manipulates that collection:

```
Dim MyModel, t, r, sym
set MyModel = CreateModel(PdPDM.Cls_Model,"DBMS=SYASA12")
MyModel.SetNameAndCode "MyPDM" , "MyPDM"
'Create tables and rules
For idx = 1 to 12
   Set t=MyModel.Tables.CreateNew()
   t.SetNameAndCode "T" & idx, "T" & idx
   Set sym=ActiveDiagram.AttachObject (t)
   Set r=MyModel.BusinessRules.CreateNew()
   r.SetNameAndCode "BR" & idx, "BR" & idx
Next
ActiveDiagram.AutoLayoutWithOptions(2)
'Attach rules to Table 1
   Dim MyTable
   Set MyTable=MyModel.FindChildByName("T1",cls_table)
   For idx = 1 to 10
      MyTable.AttachedRules.Add(MyModel.FindChildByName("BR" &
(idx),cls_businessrule))
   Next
'Print list of rules attached to Table 1
Output "Rules Attached to T1 (" & MyTable.AttachedRules.Count & ")"
For each r in MyTable.AttachedRules
    Output "* " & r.Name
Next
'Modify attached rules by insertion, move and removal
MyTable.AttachedRules.Insert 3,
MyModel.FindChildByName("BR12",cls_businessrule)
MyTable.AttachedRules.Move 5,0
MyTable.AttachedRules.Remove(MyModel.FindChildByName("BR6",cls_busi
nessrule))
'Print modified list of rules
Output "Modified Rules Attached to T1 (" &
MyTable.AttachedRules.Count & ")"
For each r in MyTable.AttachedRules
    Output "* " & r.Name
Next
```

Accessing and Modifying Objects and Properties (Scripting)

You can access and modify any PowerDesigner object and its properties by script. Objects include not only standard design objects (such as tables, classes, processes, and columns), but also diagrams and symbols and functional objects (such as a report or repository). An object belongs to a metaclass of the PowerDesigner metamodel and inherits properties, collections and methods from its metaclass.

Root objects, such as models, are accessed using global properties and functions (see *Manipulating Models, Collections, and Objects (Scripting)* on page 314), while standard objects are accessed by browsing collections (see *Browsing and Modifying Collections (Scripting)* on page 316) or individually through the following methods:

- `FindChildByName(`**"Name",Kind**`[`**,OptionalParams**`]`
- `FindChildByCode(`**"Code",Kind**`[`**,OptionalParams**`]`
- `FindChildByPath(`**"Path",Kind**`[`**,OptionalParams**`]`

The following parameters are available:

Parameter	Description
Name / **Code** / **Path**	Specifies the name or code of, or the path to the object. For example, to find the column `Address` in the table `Customer` in the package `Sales` from the context of the model node, you could search by name `Address` or by path `Sales/Customer/Address`.
Kind	Specifies the metaclass of the object to find in the form `cls_`*`PublicName`*. For example, to find a column, select `cls_Column`. These metaclass ids are unique within their model library but, in cases such as packages, which appear in multiple types of models, you must prefix the id with the name of the module (`PdOOM.cls_Package`). When you create a model, you must use the module prefix (for example `PdPDM.cls_Model`).
OptionalParams	The following parameters are optional: • **"Stereotype"** - Specifies that the object to find must bear the specified stereotype. • **"LastFound"** - Specifies to begin the search after this object. This parameter is used when several objects have the same path value, and can be used to launch a find in a while loop that uses the previous match as the last found parameter. • **CaseSensitive=y|n** - [default: y] Specifies that the search is case sensitive. • **IncludeShortcuts** - [default: n] Specifies that shortcuts can be found. • **UseCodeInPlaceOfName** - [ByPath, default: n] Specifies that the object can be found by its code (Default=n). • **PathSeparator** - [ByPath, default= /, \, or ::)] Specifies the character to separate nodes in the path.

You can get standard attribute values using the dot notation (**object.attribute**) or using the following methods:

- `GetAttribute(`**"attribute"**`)` - retrieves the value stored for the attribute
- `GetAttributeText(`**"attribute"**`)` - retrieves the value displayed for the attribute

You can set attribute values using the dot notation (**object.attribute**=**value**) or using the following methods:

- `SetAttribute` **"attribute", value**
- `SetAttributeText` **"attribute", "value"**

Note: For information about getting and setting extended attribute values see *Creating and Accessing Extensions (Scripting)* on page 331

The following script opens a sample OOM, finds a class by name and a parameter by path, and then prints and modifies some of their properties:

```
Dim MyModel, C, P
'Open model file
Set MyModel=OpenModel(EvaluateNamedPath("%_EXAMPLES%\" & "UML2
Sample.oom"))
'Obtain class and parameter
Set C=MyModel.FindChildByName("OrderManager",cls_Class)
Set P=Mymodel.FindChildByPath("SecurityManager/CheckPassword/
login",PdOOM.cls_Parameter)

'Print initial values
Output "Initial Values:"
PrintProperties C, P
'Modify values
C.Comment="This class controls orders."
C.SetAttributeText "Visibility", "private"
P.Name="LoginName"
'Print revised values
Output "Revised Values:"
PrintProperties C, P

'Procedure for printing values
Sub PrintProperties(MyClass, MyParam)
 output "Class: " & MyClass.Name
 output vbTab & "Comment: " & MyClass.Comment
 output vbTab & "Visibility: " &
MyClass.GetAttributeText("Visibility")
 output vbTab & "Persisted as: " &
MyClass.GetAttributeText("PersistentGenerationMode")
 output "Parameter: " & MyParam.Parent & "." & MyParam.Name
 output vbTab & "Data type: " & MyParam.DataType
 output vbTab & "Parameter type: " &
MyParam.GetAttributeText("ParameterType")
End Sub
```

Creating Objects (Scripting)

You should generally create objects via the collection under the parent object using the `CreateNew()` method. The `CreateObject(`*`kind`*`)` method is also available on model objects.

This script creates a class in an OOM, sets some of its properties, and then creates an attribute under the class, in each case creating the objects inside collections:

```
Dim MyModel
Set MyModel = ActiveModel
Dim MyClass
' Create a class
Set MyClass = MyModel.Classes.CreateNew()
If MyClass is nothing Then
  ' Display an error message box
   msgbox "Fail to create a class", vbOkOnly, "Error"
Else
  output "The class has been created."
  ' Set Name, Code, Comment, Stereotype and Final attributes
  MyClass.SetNameAndCode "Customer", "cust"
  MyClass.Comment = "Created by script"
  MyClass.Stereotype = "MyStereotype"
  MyClass.Final = true
  ' Create an attribute inside the class
  Dim MyAttr
  Set MyAttr = MyClass.Attributes.CreateNew()
  If not MyAttr is nothing Then
   output "The attribute has been created."
   MyAttr.SetNameAndCode "Name", "custName"
   MyAttr.DataType = "String"
  ' Reset the variable in order to avoid memory leaks
  End If
 End If
```

You can also create objects using the `CreateObject(`*`kind`*`)` method. This script creates a class inside an OOM and sets some of its properties:

```
Dim MyModel
Set MyModel = ActiveModel
Dim MyClass
' Create a class
Set MyClass = MyModel.CreateObject(cls_Class)
MyClass.SetNameAndCode "Another Class", "Class2"
MyClass.Comment = "Created by CreateObject"
```

When creating a link object, you must define its extremities. This script creates two classes and joins them by an association link:

```
Dim MyModel
Set MyModel = ActiveModel
Dim MyFirstClass, MySecondClass, MyAssociation
' Create classes
Set MyFirstClass = MyModel.Classes.CreateNew()
MyFirstClass.SetNameAndCode "Class1", "C1"
Set MySecondClass = MyModel.Classes.CreateNew()
  MySecondClass.SetNameAndCode "Class2", "C2"
' Create association
Set MyAssociation = MyModel.Associations.CreateNew()
MyAssociation.Name = "A1"
' Define its extremities
Set MyAssociation.Object1 = MyFirstClass
Set MyAssociation.Object2 = MySecondClass
```

Displaying, Formatting, and Positioning Symbols (Scripting)

When you create an object, it will not appear in a diagram unless you use the `AttachObject()` or `AttachLinkObject()` method. Symbols are objects in their own right that can be accessed via collections on the parent object or diagram. You can position a symbol using the `Position()` method and change its format using the `LineWidth` and other formatting attributes.

The following script creates two classes, joins them by an association link, and displays all three symbols in the active diagram:

```
Dim MyModel, MyDiagram, C1, C2, A1
Set MyModel = ActiveModel
Set MyDiagram = ActiveDiagram
' Create classes
Set C1 = MyModel.Classes.CreateNew()
C1.SetNameAndCode "C1", "C1"
Set C2 = MyModel.Classes.CreateNew()
  C2.SetNameAndCode "C2", "C2"
' Display class symbols
MyDiagram.AttachObject(C1)
MyDiagram.AttachObject(C2)
' Create association
Set A1 = MyModel.Associations.CreateNew()
A1.SetNameAndCode = "A1", "A1"
' Define its extremities
Set A1.Object1 = C1
Set A1.Object2 = C2
' Display Association symbol
MyDiagram.AttachLinkObject(A1)
```

The following script creates an EAM and four architecture areas, aligns them in a square, and formats the top-left area:

```
Dim NewModel, idx, obj, sym
set NewModel = CreateModel(PdEAM.Cls_Model,
"Diagram=CityPlanningDiagram")
NewModel.SetNameAndCode "MyEAM" , "MyEAM"
For idx = 1 to 4
   Set obj=NewModel.ArchitectureAreas.CreateNew()
   obj.SetNameAndCode "A" & idx, "A" & idx
   Set sym=ActiveDiagram.AttachObject (obj)
   sym.width=30000
   sym.height=20000
Next
dim A1, A2, A3, A4, X1, Y1
set A1 =
NewModel.FindChildByName("A1",cls_architecturearea).Symbols.Item(0)
set A2 =
NewModel.FindChildByName("A2",cls_architecturearea).Symbols.Item(0)
set A3 =
NewModel.FindChildByName("A3",cls_architecturearea).Symbols.Item(0)
set A4 =
NewModel.FindChildByName("A4",cls_architecturearea).Symbols.Item(0)
```

```
X1 = A1.Position.X
Y1 = A1.Position.Y
' Move symbols for them to be adjacent
A2.Position = NewPoint(X1 + A1.Width, Y1)
A3.Position = NewPoint(X1, Y1 - A1.Height)
A4.Position = NewPoint(X1 + A1.Width, Y1 - A1.Height)
A1.DashStyle = 2
A1.LineWidth = 3
```

Deleting Objects (Scripting)

You can delete objects using the `Delete` method.

The following script creates a new CDM, populates it with entities and relationships, and then deletes entity `E5` and relationship `R8`:

```
Dim MyModel, obj, sym, idx
set MyModel = CreateModel(PdCDM.Cls_Model)
MyModel.SetNameAndCode "MyCDM" , "MyCDM"
'Create entities
For idx = 1 to 12
   Set obj=MyModel.Entities.CreateNew()
   obj.SetNameAndCode "E" & idx, "E" & idx
   Set sym=ActiveDiagram.AttachObject (obj)
Next
'Create relationships
For idx = 2 to 11
   Set obj=MyModel.Relationships.CreateNew()
   obj.SetNameAndCode "R" & idx-1, "R" & idx-1
   Set obj.Object1 = MyModel.FindChildByName("E" &
(idx-1),cls_entity)
   Set obj.Object2 = MyModel.FindChildByName("E" & (idx
+1),cls_entity)
   Set sym=ActiveDiagram.AttachLinkObject (obj)
Next
ActiveDiagram.AutoLayoutWithOptions(2)
'Delete objects
MyModel.FindChildByName("E5",cls_entity).Delete
MyModel.FindChildByName("R8",cls_relationship).Delete
```

Creating an Object Selection (Scripting)

You can create a selection of objects using the `CreateSelection()` method. You can perform actions on the selection such as changing properties or format or moving them to another package.

The following script creates a PDM, populates it with tables and then makes a selection of tables and moves them into a package:

```
Dim MyModel, obj, sym
set MyModel = CreateModel(PdPDM.Cls_Model,"DBMS=SYASA12")
MyModel.SetNameAndCode "MyPDM" , "MyPDM"
'Create tables
For idx = 1 to 12
   Set obj=MyModel.Tables.CreateNew()
   obj.SetNameAndCode "T" & idx, "T" & idx
   Set sym=ActiveDiagram.AttachObject (obj)
Next
ActiveDiagram.AutoLayoutWithOptions(2)
'Create package
Dim MyPackage
Set MyPackage=MyModel.Packages.CreateNew()
MyPackage.SetNameAndCode "P1", "P1"
ActiveDiagram.AttachObject (MyPackage)
'Create selection
Dim MySelection
Set MySelection = ActiveModel.CreateSelection
For idx = 1 to 5
   MySelection.Objects.Add(MyModel.FindChildByName("T" &
(idx*2),cls_table))
Next
'Move selection to package
MySelection.MoveToPackage(MyPackage)
```

To add all the tables to the selection, use the `AddObjects` method:

```
MySelection.AddObjects MyModel,cls_table
```

To remove an object from the selection, use the `Remove` method:

```
MySelection.Objects.Remove(MyModel.FindChildByName("T6",cls_table))
```

Controlling the Workspace (Scripting)

You can access the current workspace using the `ActiveWorkspace` global property, open, save, and close workspaces, and add folders and documents to it.

The following script constructs a simple folder structure in a workspace and adds and creates several models in it:

```
Option Explicit
' Close existing workspace and save it to Temp
Dim workspace, curentFolder
Set workspace = ActiveWorkspace
workspace.Load "%_EXAMPLES%\mywsp.sws"
Output "Saving current workspace to ""Example directory :
"+EvaluateNamedPath("%_EXAMPLES%\temp.sws")
workspace.Save "%_EXAMPLES%\Temp.SWS"
workspace.Close
workspace.Name = "VBS WSP"
workspace.FileName = "VBSWSP.SWS"
workspace.Load "%_EXAMPLES%\Temp.SWS"
dim Item, subitem
for each Item in workspace.children
 If item.IsKindOf(PdWsp.cls_WorkspaceFolder) Then
  ShowFolder (item)
  renameFolder item,"FolderToRename", "RenamedFolder"
  deleteFolder item,"FolderToDelete"
  curentFolder = item
 ElsIf item.IsKindOf(PdWsp.cls_WorkspaceModel) Then
 ElsIf item.IsKindOf(PdWsp.cls_WorkspaceFile) Then
 End if
next
 Dim subfolder
'insert folder in root
 Set subfolder =
workspace.Children.CreateNew(PdWsp.cls_WorkspaceFolder)
 subfolder.name = "Newfolder(VBS)"
 'insert folder in root at pos 6
 Set subfolder = workspace.Children.CreateNewAt(5,
PdWsp.cls_WorkspaceFolder)
 subfolder.name = "Newfolder(VBS)insertedAtPos5"'
 ' add a new folder in this folder
 Set subfolder =
subfolder.Children.CreateNew(PdWsp.cls_WorkspaceFolder)
 subfolder.name = "NewSubFolder(VBS)"
 subfolder.AddDocument EvaluateNamedPath("%_EXAMPLES%\pdmrep.rtf")
 subfolder.AddDocument EvaluateNamedPath("%_EXAMPLES%\cdmrep.rtf")
 subfolder.AddDocument EvaluateNamedPath("%_EXAMPLES%\project.pdm")
 subfolder.AddDocument EvaluateNamedPath("%_EXAMPLES%\demo.oom")
 dim lastmodel
 set lastmodel = subfolder.AddDocument
(EvaluateNamedPath("%_EXAMPLES%\Ordinateurs.fem"))
 lastmodel.open
 lastmodel.name = "Computers"
 lastmodel.close
 'detaching model from workspace
 lastmodel.delete
workspace.Save "%_EXAMPLES%\Final.SWS"
```

For more information about properties and methods available on the workspace, select **Help** > **MetaModel Objects Help** and navigate to `Libraries/PdWSP/Workspace`.

Creating Shortcuts (Scripting)

You create a shortcut in a model using the `CreateShortcut()` method.

The following script acts on an OOM and creates a shortcut of the class `C1` from package `P1` in package `P2`:

```
Dim obj, shortcut, recipient
' Get class to shortcut
Set obj = ActiveModel.FindChildByPath("P1/C1",cls_Class)
' Get package to create shortcut in
Set recipient = ActiveModel.FindChildByPath("P2",PdOOM.cls_Package)
' Create shortcut
Set shortcut = obj.CreateShortcut(recipient)
If not shortcut is nothing then
  output "The class shortcut has been successfully created"
End If
```

The following script creates a shortcut of the class `C1` from model `O1` package `P1` directly under model `O2`:

```
Dim targetmodel, usingmodel, obj, shortcut
For each m in Models
   Output m.Name
   If m.Name="O1" then 'Get model with object to shortcut
      Set targetmodel=m
   End If
   If m.Name="O2" then 'Get model to create shortcut in
      Set usingmodel=m
   End If
Next
' Get object to shortcut
Set obj = targetmodel.FindChildByPath("P1/C1",cls_Class)
' Create shortcut
Set shortcut = obj.CreateShortcut(receivingmodel)
If not shortcut is nothing then
  output "The class shortcut has been successfully created"
End If
```

Creating Mappings Between Objects (Scripting)

You can create data sources in a model and from there create mappings from source objects in other models to objects in the first model using scripts.

The following script creates an OOM and a PDM, populates them with classes and tables, then creates a data source in the OOM, associates the PDM with it and creates mappings:

```
Dim MyOOM, MyPDM
'Create an OOM and a PDM
set MyOOM = CreateModel(PdOOM.Cls_Model, "|Language=Analysis|
Diagram=ClassDiagram|Copy")
MyOOM.SetNameAndCode "MyOOM", "OOM"
set MyPDM = CreateModel(PdPDM.Cls_Model, "|DBMS=Sybase SQL Anywhere
12|Copy")
MyPDM.SetNameAndCode "MyPDM", "PDM"
 'Create classes and tables
 For idx = 1 to 6
   Set c=MyOOM.Classes.CreateNew()
   c.SetNameAndCode "Class" & idx, "C" & idx
   Set t=MyPDM.Tables.CreateNew()
   t.SetNameAndCode "Table" & idx, "T" & idx
Next
'Create a data source in the OOM and add the PDM as its source
Dim ds, m1
Set ds = MyOOM.DataSources.CreateNew()
ds.SetNameAndCode "MyPDM", "PDM"
ds.AddSource MyPDM

'Create a mapping between C1 and T6
set m1 = ds.CreateMapping(MyOOM.FindChildByName("Class1",cls_class))
m1.AddSource MyPDM.FindChildByName("Table6",cls_table)
' Retrieve mappings for each class in the OOM
 For each c in MyOOM.Classes
   Dim m, sc
   set m = ds.GetMapping(c)
   If not m is nothing then
      Output c.Name & vbtab & "Mapped to: "
      for each sc in m.SourceClassifiers
         output vbtab & vbtab & "- " & sc.Name
      next
   Else
      Output c.Name & vbtab & "No mapping defined."
   End if
Next
```

For more information about objects mapping, see *Core Features Guide > Linking and Synchronizing Models > Object Mappings*.

Creating and Generating Reports (Scripting)

You can create a report, browse its contents, and generate it as HTML or RTF using scripting.

To create a report, use the `CreateReport()` method on a model. For example:

```
Dim model
Set model = ActiveModel
model.CreateReport("MyReport")
```

To browse the reports in a model, use the `Reports` collection. For example:

```
Dim model
Set model = ActiveModel
For each m in model.Reports
    Output m.Name
Next
```

To generate a report as RTF or HTML, use the `GenerateRTF()` or `GenerateHTML()` method:

```
set m = ActiveModel
For each r in m.Reports
 filename = "C:\temp\" & r.Name & ".htm"
 r.GenerateHTML (filename)
Next
```

Manipulating the Repository (Scripting)

You can connect to the repository and check documents into and out of it by script and iterate on the latest versions of repository documents through the `RepositoryConnection` object. You can manage repository folders and branches and LDAP and SMTP servers and the repository password policy, but you cannot manipulate repository users and groups.

The following script opens a repository connection, creates a new PDM and checks it in, and then loops over the creation of tables, and further consolidations, before closing the connection:

```
Dim rc
Set rc = RepositoryConnection
rc.Open "REPOSITORYNAME", "USER", "PW", "DBUSER", "DBPW"
Output "Before consolidation"
ListChildren rc
Dim NewModel
Set NewModel = CreateModel(PdPDM.Cls_Model, "|Language=SYASIQ1540")
NewModel.Name = "My PDM"
NewModel.ConsolidateNew rc
For i = 1 to 5
   For j = 1 to 5
      NewModel.Tables.CreateNew()
   Next
   NewModel.Consolidate
Next
Output "After consolidation"
ListChildren rc
rc.Close

Sub ListChildren(rc)
For each c in rc.ChildObjects
   Output c.Name & "(Modified: " & c.ModificationDateInRepository &
")"
Next
End Sub
```

To check out a model, use the `CheckOut` method.

For detailed information about the members, collections, and methods available for scripting the repository, select **Help > MetaModel Objects Help** and navigate to `Libraries/PdRMG`.

Generating a Database (Scripting)

You can generate a PDM as a SQL script or directly to a live database connection using the `GenerateDatabase()` method. You can generate test data with the `GenerateTestData()` method.

The following script fragment opens an example PDM and then calls procedures to generate various scripts:

```
Dim GenDir, MyModel
GenDir = "C:\temp\"
Set MyModel=OpenModel(EvaluateNamedPath("%_EXAMPLES%\" &
"project.pdm"))

GenerateDatabaseScripts MyModel 'Generate a SQL script to create the
database
ModifyModel MyModel 'Modify each table in the model
GenerateAlterScripts MyModel - Generate alter scripts to modify the
database
GenerateTestDataScript MyModel - generate test data to load into the
database
```

This procedure generates a SQL script to create the database:

```
Sub GenerateDatabaseScripts(m)
   Dim opts
   Set opts = m.GetPackageOptions()
   InteractiveMode = im_Batch ' Avoid displaying generation window
   opts.GenerateODBC = False ' Force sql script generation rather
than ODBC
   opts.GenerationPathName = GenDir
   opts.GenerationScriptName = "MyScript.sql"
   m.GenerateDatabase ' Launch the Generate Database feature
End Sub
```

To generate to a live database connection, you would connect to the database (using the `ConnectToDatabase()` method) and then set the `GenerateODBC` property to `true`.

Note: For more information about the generation options, select **Help > MetaModel Objects Help** and navigate to `Libraries/PdPDM/BasePhysicalPackageOptions`.

This procedure modifies the model by adding a new column to each table:

```
Sub ModifyModel(m)
 dim pTable, pCol
 For each pTable in m.Tables
  Set pCol = pTable.Columns.CreateNew()
  pCol.SetNameAndCode "az" & pTable.Name, "AZ" & pTable.Code
  pCol.Mandatory = False
 Next
End Sub
```

This procedure generates an alter script to modify the database:

```
Sub GenerateAlterScripts(m)
 Dim pOpts
 Set pOpts = m.GetPackageOptions()
 InteractiveMode = im_Batch ' Avoid displaying generate window
' set generation options using model package options
 pOpts.GenerateODBC = False ' Force sql script generation rather than
ODBC
 pOpts.GenerationPathName = GenDir
 pOpts.DatabaseSynchronizationChoice = 0 'force already saved apm as
source
 pOpts.DatabaseSynchronizationArchive = GenDir & "model.apm"
 pOpts.GenerationScriptName = "MyAlterScript.sql"
 m.ModifyDatabase ' Launch the Modify Database feature
End Sub
```

This procedure generates test data to load to the database:

```
Sub GenerateTestDataScript(m)
 Dim pOpts
 Set pOpts = m.GetPackageOptions()
 InteractiveMode = im_Batch ' Avoid displaying generate window
' set generation options using model package options
 pOpts.TestDataGenerationByODBC = False ' Force sql script generation
rather than ODBC
 pOpts.TestDataGenerationDeleteOldData = False
pOpts.TestDataGenerationPathName = GenDir
 pOpts.TestDataGenerationScriptName = "MyTestData.sql"
m.GenerateTestData ' Launch the Generate Test Data feature
End Sub
```

Reverse Engineering a Database (Scripting)

You can connect to a database using the `ConnectToDatabase()` method, and reverse engineer the schema to a PDM using `ReverseDatabase()`.

To connect to a database via a user or system data source, define a constant in the form `"ODBC:`**datasourcename**`"` . For example:

```
Const cnxDSN = "ODBC:ASA 9.0 sample"
```

To use a data source file, define a constant with the full path to the DSN file. For example:

```
Const cnxDSN = "\\romeo\public\DATABASES\_filedsn
\sybase_asa9_sample.dsn"
```

This script creates a new PDM, connects to a database via a system data source, sets reverse options and reverses all objects to the PDM:

```
' Define ODBC data source and PDM file
Const cnxDSN = "ODBC:MyDatabase"
Const cnxUSR = "MyUser"
Const cnxPWD = "MyPassword"
Const filename = "C:\temp\MyReversedDB.pdm"

Dim pModel, pOpt
' Create model with appropriate DBMS
Set pModel=CreateModel(PdPDM.cls_Model, "|DBMS=Sybase SQL Anywhere
12")
' Hide dialogs
InteractiveMode = im_Batch

' Connect to the database
 pModel.ConnectToDatabase cnxDSN, cnxUSR, cnxPWD
' Set reverse options to reverse all listed objects via ODBC
 Set pOpt = pModel.GetPackageOptions()
 pOpt.ReversedScript = False
 pOpt.ReverseAllTables = true
 pOpt.ReverseAllViews = true
 pOpt.ReverseAllStorage = true
 pOpt.ReverseAllTablespace = true
 pOpt.ReverseAllDomain = true
 pOpt.ReverseAllUser = true
 pOpt.ReverseAllProcedures = true
 pOpt.ReverseAllTriggers = true
 pOpt.ReverseAllSystemTables = true
 pOpt.ReverseAllSynonyms = true

' Reverse database to model and then save model
```

```
pModel.ReverseDatabase
pModel.save(filename)
```

Creating and Accessing Extensions (Scripting)

You can create extensions by script to define additional properties, new metaclasses, forms, and any other type of extension to the standard metamodel.

The following example creates an EAM, then creates an extension inside it, defines a new type of object called `tablet` derived from the `MobileDevice` metaclass, and creates an extended attribute and new custom form for it:

```
Dim MyModel, MyExt, MyStype, MyExAtt, MyForm, FormDef
set MyModel =
CreateModel(PdEAM.Cls_Model,"Diagram=TechnologyInfrastructureDiagra
m")
MyModel.SetNameAndCode "MyEAM" , "MyEAM"
'Create extension
Set MyExt = MyModel.ExtendedModelDefinitions.CreateNew()
MyExt.Name = "MyExtension"
MyExt.Code = "MyExtension"
'Create stereotype
Set MyStype = MyExt.AddMetaExtension(PdEAM.Cls_MobileDevice,
Cls_StereotypeTargetItem)
MyStype.Name = "Tablet"
MyStype.UseAsMetaClass = true
'Create extended atrribute
Set MyExAtt =
MyStype.AddMetaExtension(Cls_ExtendedAttributeTargetItem)
MyExAtt.Name = "TabletType"
MyExAtt.Label = "Type"
MyExAtt.DataType = "12" ' (String) For a full list of values,
' see ExtendedAttributeTargetItem in the Metamodel objects help
MyExAtt.ListOfValues = "iPad;Android;Playbook;Windows8"
MyExAtt.Value = "iPad"
'Create form to replace General tab
Set MyForm = MyStype.AddMetaExtension(Cls_FormTargetItem)
MyForm.Name = "ReplaceGeneral"
MyForm.FormType = "GENERAL"
'Assemble form definition
FormDef = "<Form><StandardNameAndCode Attribute=""NameAndCode"" />"
& vbcrlf
FormDef = FormDef + "<StandardAttribute Attribute=""Comment"" />" &
vbcrlf
FormDef = FormDef + "<ExtendedAttribute Attribute=""TabletType"" />"
& vbcrlf
FormDef = FormDef + "<StandardAttribute Attribute=""KeywordList""  /
></Form>"
MyForm.Value = FormDef
```

You can get and set extended attribute values using the following methods:

- `GetExtendedAttribute("`**resource.attribute**`")`

- `GetExtendedAttributeText(`**"resource.attribute"**`)`
- `SetExtendedAttribute` **"resource.attribute" "value"**
- `SetExtendedAttributeText` **"resource.attribute" "value"**

You can access collections defined in an extension using the following methods:

- `GetCollectionByStereotype(`**"stereotype"** - for new types of objects defined in an target or extension file (see *Creating New Metaclasses with Stereotypes* on page 37).
- `GetExtendedCollection(`**"resource.collection"**`)` - for extended collections and compositions (see *Extended Collections and Compositions (Profile)* on page 48).
- `GetCalculatedCollection(`**"resource.collection"**`)` - for calculated collections (see *Calculated Collections (Profile)* on page 50).
- `GetCollectionByName(`**"resource.collection"**`)` -for any kind of collection.

The following script uses the `GetCollectionByStereotype()` method to access the collection of tablets and the `SetExtendedAttribute` method to set the tablet type:

```
Dim col, obj
'The collection of tablets is not directly accessible
set col = ActiveModel.GetCollectionByStereotype("Tablet")
'Create an array to hold the values to assign to tablet properties
Dim myArray(3)
myArray(0) = "Tablet1, T1, PlayBook"
myArray(1) = "Tablet2, T2, Android"
myArray(2) = "Tablet3, T3, iPad"
myArray(3) = "Tablet4, T4, iPad"
CreateObjects col, myArray

'Procedure to assign values to properties
Sub CreateObjects(compColl, dataArray)
   For Each line In dataArray
      Dim myProps
      myProps = split(line, ",")
      set obj = compColl.CreateNew()
      obj.Name = myProps(0)
      obj.Code = myProps(1)
        'Special syntax for setting extended attribute
      obj.SetExtendedAttribute "MYEXT.TabletType", myProps(2)
   Next
End Sub
```

Accessing Metadata (Scripting)

You can explore the structure of the PowerDesigner metamodel as a standalone model or starting from object instances in your model.

For general information about accessing and navigating in the metamodel, see *Chapter 8, The PowerDesigner Public Metamodel* on page 345. Metaclasses (such as `CheckModelInternalMessage` and `FileReportItem`) that are not accessible by script are visible in Metamodel.oom, but bear the `<<notScriptable>>` stereotype and are not listed in the Metamodel Object Help file.

You can access metaclasses, metaattributes, and metacollections by iterating over collections descending from the `MetaModel` root or individually through the following methods:

- GetMetaClassByPublicName (**name**) - to access a metaclass by its public name.
- GetMetaMemberByPublicName (**name**) - to access a metaattribute or a metacollection by its public name

The following script traverses the metamodel by library and lists each concrete class:

```
for each l in MetaModel.Libraries
   for each c in l.Classes
      if c.Abstract = false then
         Output l.PublicName + "." + c.PublicName
      end if
   next
next
```

The following script locates the `BaseClass` root and shows the first two levels of inheritance under it:

```
set root = MetaModel.GetMetaClassByPublicName("PdCommon.BaseObject")
for each c in root.Children
   output c.PublicName
   for each cc in c.Children
      output "    " + cc.PublicName
   next
next
```

The following script obtains a table in a PDM, and then shows the metaclass of which the object is an instance, the parent metaclass and metalibrary to the metaclass, and all the attributes and collections that are available on that metaclass:

```
Dim object
Set object = ActiveModel.FindChildByName("myTable",cls_Table)
Output "Object: " + object.Name

Dim metaclass
Set metaclass = object.MetaClass
Output "Metaclass: " + metaclass.PublicName
Output "Parent: " + metaclass.Parent.PublicName
Output "Metalibrary: " + metaclass.Library.PublicName
Output "Attributes:"
For each attr in metaclass.attributes
   Output " - " + attr.PublicName
Next
Output "Collections:"
For each coll in metaclass.collections
   Output " - " + coll.PublicName
Next
```

Properties and collections are read-only for all metamodel objects.

OLE Automation and Add-Ins

OLE Automation provides a way to communicate with PowerDesigner from another application using the COM architecture. You can write a program using any language that supports COM, such as Word or Excel macros, VB, C++, or PowerBuilder.You can create executables that call PowerDesigner or add-ins that are called by PowerDesigner.

VBScript programs that run from within PowerDesigner and OLE Automation programs are very similar, but OLE requires you to work through a PowerDesigner application object, and to use stronger typing. You must:

- Create an instance of the PowerDesigner Application object and release it when your script terminates:

  ```
   Dim PD As PdCommon.Application
  Set PD = CreateObject("PowerDesigner.Application")
  'Enter script here
  'Once script is finished, release PD object
  Set PD = Nothing
  ```

  If PowerDesigner is currently running, this instance will be used; otherwise a new instance will be launched. If you do not specify a version number, the most recent version is used. To specify a specific version, use the syntax:

  ```
  Set PD = CreateObject("PowerDesigner.Application.version")
  ```
- Prefix all global properties and functions (see *Manipulating Models, Collections, and Objects (Scripting)* on page 314) with the PowerDesigner Application object. For example, to access the model with focus using a PowerDesigner application object called `PD`, use the following syntax:

  ```
  PD.ActiveModel
  ```
- Specify object types whenever possible. For example, instead of simply using `Dim cls`, you should use:

  ```
  Dim cls as PdOOM.Class
  ```

  If your model contains shortcuts, we recommend that you use the following syntax to avoid runtime errors when the target model is closed:

  ```
  Dim obj as PdCommon.IdentifiedObject
  ```
- Adapt the object class ID syntax to the language when you create object. For VBScript, VBA and VB and other languages that support enumeration defined outside a class, you can use the syntax:

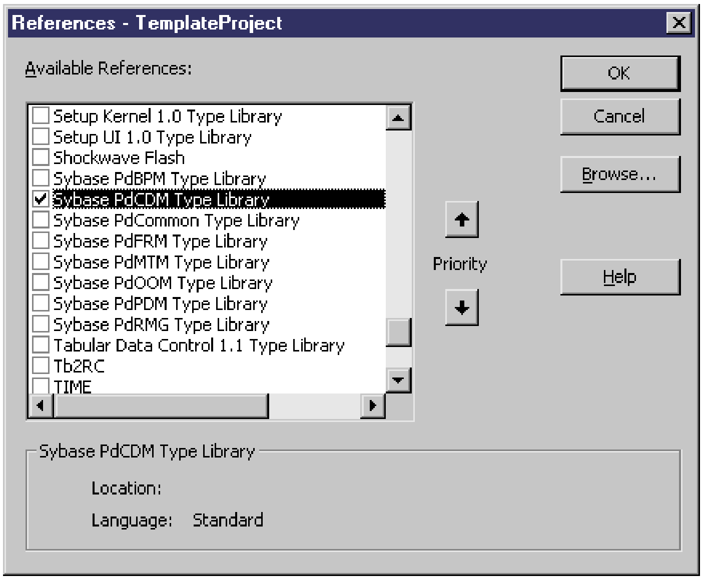
  ```
  Dim cls  as PdOOM.Class
  Set cls = model.CreateObject(PdOOM.cls_Class)
  ```

  For C# and VB.NET, you can use the following syntax (where `PdOOM_Classes` is the name of the enumeration):

  ```
  Dim cls As PdOOM.Class
  Set cls = model.CreateObject(PdOOM.PdOOM_Classes.cls_Class)
  ```

For other languages such as JavaScript or PowerBuilder, you have to define constants that represent the objects you want to create. For a complete list of class ID constants, see file VBScriptConstants.vbs in the PowerDesigner OLE Automation directory.

- Add references to the object type libraries you need to use. For example, in a VBA editor, select **Tools** > **References**:


References - TemplateProject
Available References:
Setup Kernel 1.0 Type Library
Setup UI 1.0 Type Library
Shockwave Flash
Sybase PdBPM Type Library
Sybase PdCDM Type Library
Sybase PdCommon Type Library
Sybase PdFRM Type Library
Sybase PdMTM Type Library
Sybase PdOOM Type Library
Sybase PdPDM Type Library
Sybase PdRMG Type Library
Tabular Data Control 1.1 Type Library
Tb2RC
TIME
Priority
OK
Cancel
Browse...
Help
Sybase PdCDM Type Library
Location:
Language: Standard

This script is launched from outside PowerDesigner, creates an instance of the PowerDesigner Application object, and then uses it to create two OOMs through OLE Automation:

```
'* Purpose:  This script displays the number of classes defined in an
OOM in the output window.
Option Explicit
' Main function
Sub VBTest()
 ' Defined the PowerDesigner Application object
 Dim PD As PdCommon.Application
 ' Get the PowerDesigner Application object
 Set PD = CreateObject("PowerDesigner.Application")
' Get the current active model
 Dim model As PdCommon.BaseModel
 Set model = PD.ActiveModel
 If model Is Nothing Then
  MsgBox "There is no current model."
 ElsIf Not model.IsKindOf(PdOOM.cls_Model) Then
  MsgBox "The current model is not an OOM model."
 Else
  ' Display the number of classes
  Dim nbClass
  nbClass = Model.Classes.Count
  PD.Output "The model '" + model.Name + "' contains " +
CStr(nbClass) + " classes."
' Create a new OOM
  Dim model2 As PdOOM.Class
  Set model2 = PD.CreateModel(PdOOM.cls_Model)
  If Not model2 Is Nothing Then
   ' Copy the author name
   model2.Author = Model.Author
   ' Display a message in the output window
   PD.Output "Successfully created the model '" + model2.Name + "'."
  Else
   MsgBox "Cannot create an OOM."
  End If
 End If
' Release the PowerDesigner Application object
 Set PD = Nothing
End Sub
```

OLE Automation samples for different languages are provided in the OLE Automation directory within your PowerDesigner installation directory.

Creating an ActiveX Add-in

You can create ActiveX add-ins to provide additional features to PowerDesigner, and call them through menu items.

To operate as a PowerDesigner add-in, the ActiveX add-in must implement the `IPDAddIn` interface, which defines the following methods, invoked by PowerDesigner to dialog with menus and execute the commands defined by the add-in:

- `HRESULT Initialize([in] IDispatch * pApplication)` and `HRESULT Uninitialize()` - The `Initialize()` method initializes communication between PowerDesigner and the add-in. PowerDesigner provides a pointer to its application object, defined in the PdCommon type library, which allows you to access the PowerDesigner environment (output window, active model etc.). The `Uninitialize()` method is called when PowerDesigner is closed to release all global variables and clean all references to PowerDesigner objects.
- `BSTR ProvideMenuItems([in] BSTR sMenu, [in] IDispatch *pObj)` - is invoked each time PowerDesigner needs to display a menu, and returns an XML text that describes the menu items to display. It is called once without an object parameter at the initialization of PowerDesigner to fill the **Import** and **Reverse** menus. When you right-click a symbol in a diagram, this method is called twice: once for the object and once for the symbol. Thus, you can create a method that is only called on graphical contextual menus.

  The DTD for menu definition is as follows:

  ```
  <!ELEMENT Menu (Command | Separator | Popup)*>
  <!ELEMENT Command>
  <!ATTLIST Command
      Name    CDATA    #REQUIRED
      Caption    CDATA    #REQUIRED>
  <!ELEMENT Separator>
  <!ELEMENT PopUp (Command | Separator | Popup)*>
  <!ATTLIST PopUp
      Caption    CDATA    #REQUIRED>
  ```

For example:

```
ProvideMenuItems ("Object", pModel)
```

returns the following text:

```
<Menu>
<Popup Caption="&Perforce">
    <Command Name="CheckIn" Caption="Check &In"/>
    <Separator/>
    <Command Name="CheckOut" Caption="Check &Out"/>
</POPUP>
</MENU>
```

- `BOOL IsCommandSupported([in] BSTR sMenu, [in] IDispatch * pObject, [in] BSTR sCommandName)` - allows you to dynamically disable commands defined in a menu. The method must return true to enable a command and false to disable it.
- `HRESULT DoCommand(in BSTR sMenu, in IDispatch *pObj, in BSTR sCommandName)` - implements the execution of a command designated by its name. For example:

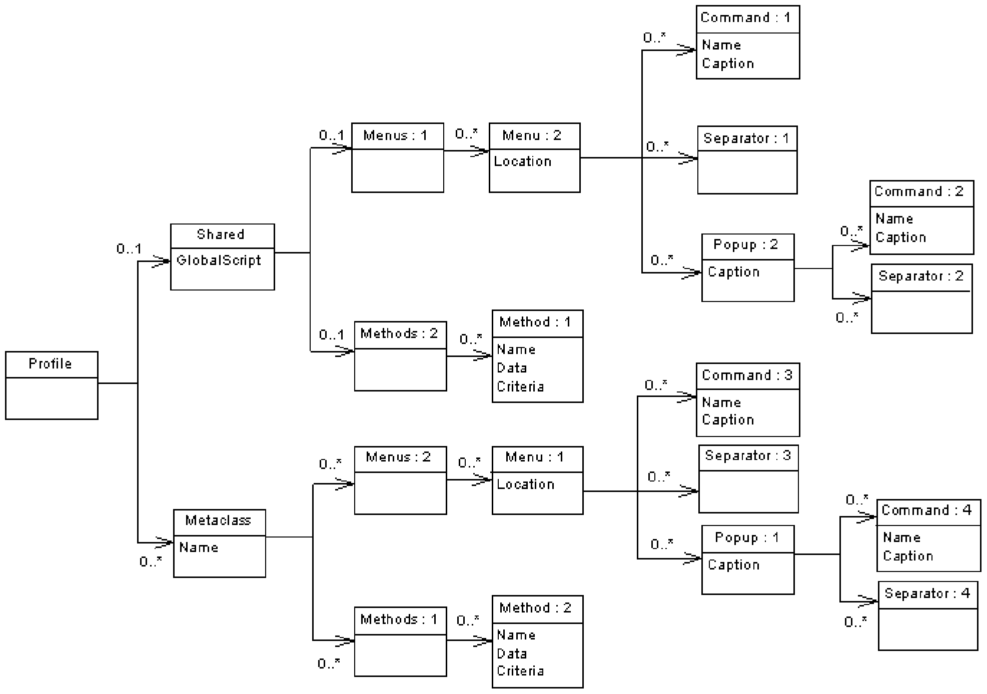
```
DoCommand ("Object", pModel, "CheckIn")
```

Note: To use your add-in, save it to the Add-ins directory beneath your PowerDesigner installation directory and enable it through the PowerDesigner General Options window (see *Core Features Guide > Modeling with PowerDesigner > Customizing Your Modeling Environment > General Options > Add-Ins*).

Creating an XML File Add-in

You can create XML add-ins to group multiple commands for calling executable programs or VB scripts and add them to PowerDesigner menus.

The following illustration helps you understand the XML file structure:



Note: The DTD is available at `PD_installdir\Add-ins\XMLAddins.dtd`.

The `Profile` is the root element of the XML file add-in descriptor and can contain:

- A `Shared` element - which defines the menus that are always available and their associated methods, along with a `GlobalScript` attribute, which can contain a global script for shared functions.
- One or more Metaclass elements - which define commands and menus for a specific metaclass, identified by its public name prefixed by its Type Library public name.

Both these elements can contain sub-elements as follows:

- `Menus` contains `Menu` elements that specify a location, which can be one of:
  - FileImport - shared only
  - FileExport - metaclass only
  - FileReverse - shared only
  - Tools
  - Help
  - Object - metaclasses only (default)

  Each `Menu` element can contain:
  - A `Command` element - whose `Name` must be equal to the name of a Method, and whose `Caption` defines the name of the command that appears in the menu.

  - A `Separator` element - which indicates that you want to insert a line in the menu.
  - A `Popup` element - which defines a sub-menu item that may in turn contain commands, separators, and popups.
- `Methods` contains `Method` elements, which define the methods used in the menus, and which are defined by a name and a VBScript. A method defined under a metaclass has the current object as a parameter. Inheritance is taken into account, so that a menu defined on the metaclass `PdCommon.NamedObject` will be available on `PdOOM.Class`.

The following example defines two menu items for the Perforce repository and the methods that are called by them:

```
<?xml version="1.0" encoding="UTF-8"?>
<Profile>
  <Metaclass Name="PdOOM.Model">
    <Menus>
      <Menu Location="Tools">
        <Popup Caption="Perforce">
          <Command Name="CheckIn" Caption="Check In"/>
          <Separator/>
          <Command Name="CheckOut" Caption="Check Out"/>
        </Popup>
      </Menu>
    </Menus>
    <Methods>
      <Method Name="CheckIn">
        Sub %Method%(obj)
        execute_command( p4, submit %Filename%, cmd_PipeOutput)
        End Sub
      </Method>
      <Method Name="CheckOut">
        Sub %Method%(obj)
        execute_command( p4, edit %Filename%, cmd_PipeOutput)
        End Sub
      </Method>
    </Methods>
  </Metaclass>
</Profile>
```

The following example defines a global script which is referenced by a method defined under a metaclass:

```
<?xml version="1.0" encoding="UTF-8"?>
<Profile>
  <Shared>
    <GlobalScript>
      Option Explicit
      Function Print (obj)
      Output obj.classname &amp; &quot; &quot; &amp; obj.name
      End Function
    </GlobalScript>
  </Shared>
  <Metaclass Name="PdOOM.Class">
    <Menus>
      <Menu>
        <Popup Caption="Transformation">
```

```
          <Command Name="ToInt" Caption="Convert to interface"/>
          <Separator/>
        </Popup>
      </Menu>
    </Menus>
    <Methods>
      <Method Name="ToInt">
        Sub %Method%(obj)
        Print obj
        ExecuteCommand(&quot;%MORPHEUS%\ToInt.vbs&quot;,
&quot;&quot;, cmd_InternalScript)
        End Sub
      </Method>
    </Methods>
  </Metaclass>
</Profile>
```

Note: To use your add-in, save it to the Add-ins directory beneath your PowerDesigner installation directory and enable it through the PowerDesigner General Options window (see *Core Features Guide > Modeling with PowerDesigner > Customizing Your Modeling Environment > General Options > Add-Ins*).

Launching Scripts and Add-Ins from Menus

You can extend PowerDesigner menus to add commands to call scripts defined in resource files or externally and to launch executables and ActiveX add-ins. XML add-ins can be used to group and organize multiple commands. You can extend the **File**, **Tools**, and **Help** menus, and the contextual menus available on objects in the Browser and diagrams.

You can modify PowerDesigner menus in the following ways:

- Custom commands - are defined directly in PowerDesigner and can call executable programs or VB scripts (see *Adding Commands to the Tools Menu* on page 341).
- Menu and method extensions – are specified in a DBMS or language definition or extension file and define commands for a specific target or model type (see *Menus (Profile)* on page 82).
- ActiveX Add-Ins – are written in languages such as VB, C#, C++ or any language supporting COM, and permit more complex interactions with PowerDesigner, such as enabling and disabling menu items based on object selection, and interaction with the windows display environment (see *Creating an ActiveX Add-in* on page 336).

Note: The XML syntax used to define menus in an ActiveX or XML add-in is the same as that used in the creation of a menu extension, and you can use the resource editor menu XML page (see*Menus (Profile)* on page 82) to help you construct the syntax for your add-ins.

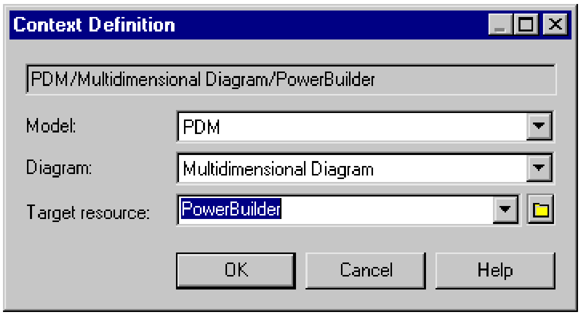
- XML Add-Ins – define multiple commands to call executable programs or VB scripts. Commands linked to the same applications (for example, ASE, IQ etc.) should be gathered into the same XML file (see *Creating an XML File Add-in* on page 337).

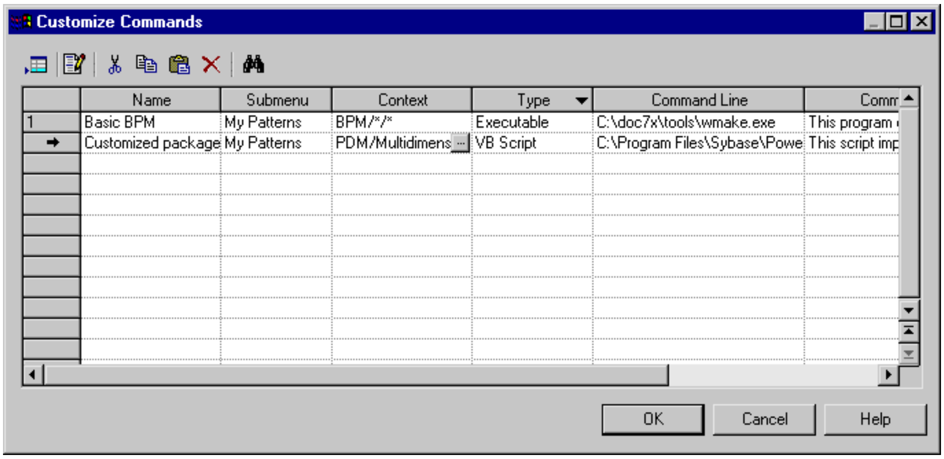
Adding Commands to the Tools Menu

You can create your own menu items in the PowerDesigner Tools menu to access PowerDesigner objects using your own scripts or executable programs. You can define up to 256 commands in the **Customize Commands** dialog, and control the contexts (model, diagram, and target type) in which they appear.

1. Select **Tools > Execute Commands > Customize Commands** and click the **Add a row** tool.
2. Enter the following properties:

Property	Description
Name	Specifies the name of the command that will appear in the menu. Names must be unique and can contain a pick letter (&Generate Java will appear as Generate Java)
Submenu	Specifies a submenu in which to place the command. You can enter your own or select one of: • <None> - directly under **Tools > Execute Commands** • Check Model • Export • Generation • Import - also appears under **File > Import** • Reverse - also appears under **File > Reverse-Engineer**

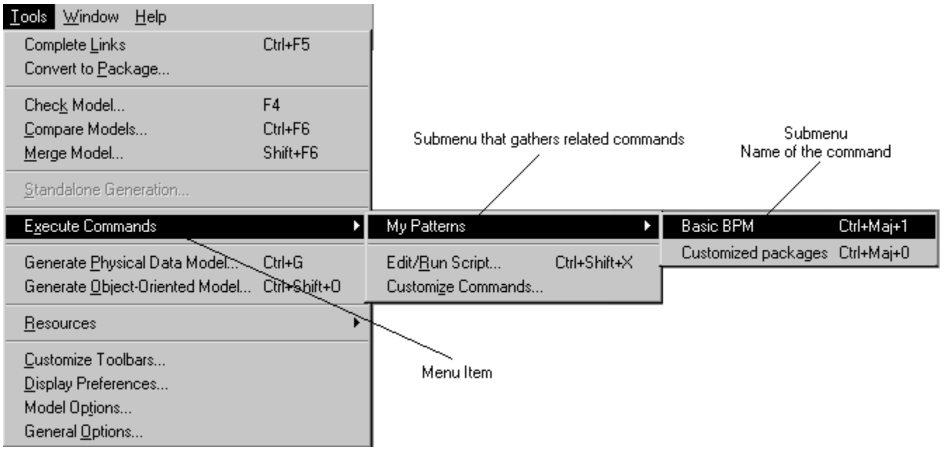
Property	Description
Context	Specifies when the command is available. By default the command is available at all times (`*/*/*`). Click the ellipsis button to restrict the display of the command to a specific: • Model type - for example `OOM/*/*` • Model and Diagram type - for example `OOM/Class diagram/*` • Model, Diagram, and Target type - for example `OOM/Class diagram/Java`. By default, the list contains extensions available for the chosen model type. Click the **Path** tool to navigate to another folder containing extensions or DBMS or language definition files.  Context Definition PDM/Multidimensional Diagram/PowerBuilder Model: PDM Diagram: Multidimensional Diagram Target resource: PowerBuilder OK Cancel Help
Type	Specifies whether the command will launch an executable or VBScript.
Command Line	Specifies the path to the executable or script file to run. Click the ellipsis button to navigate to a file. If your file is a VBScript, you can review or edit the script by clicking the **Edit With** tool in the toolbar.
Comment	Specifies text that is displayed in the status bar when you select the command.
[S]how in Menu	Specifies that the command should be displayed. Deselect this field to hide the command while retaining its definition.
Accelerator Key	Associates one of ten reserved keyboard shortcuts Ctrl-Shift-0 to Ctrl-Shift-9 with the command.



	Name	Submenu	Context	Type	Command Line	Comm
1	Basic BPM	My Patterns	BPM/*/*	Executable	C:\doc7x\tools\wmake.exe	This program
➜	Customized package	My Patterns	PDM/Multidimens	VB Script	C:\Program Files\Sybase\Powe	This script imp

3. Click **OK** to save your changes.

Your command is now available under **Tools** > **Execute Commands**.

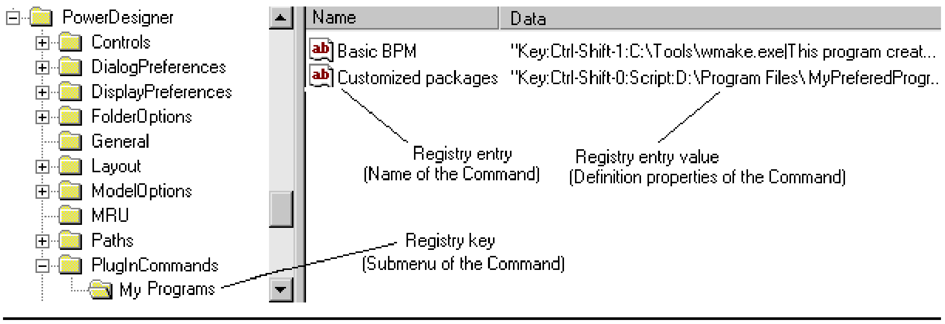


Note: Customized Commands are saved by default in the Registry at `HKEY_CURRENT_USER\Software\Sybase\PowerDesigner` **v** `\PlugInCommands\`**submenu** and are available only to the user defining them. To make them available to all users, create an entry at the same location under `HKEY_LOCAL_MACHINE`.

The name of the entry is the name of the command, and its value takes the following syntax, in which only the **commandline** parameter is mandatory and must be terminated by a `|` (pipe) character

```
[Hide:][Key:accelerator:][Script:]commandline[ |comment]
```

If you want to insert a pipe within a command, you must escape it with a second pipe.



Name	Data
Basic BPM	"Key:Ctrl-Shift-1:C:\Tools\wmake.exe|This program creat...
Customized packages	"Key:Ctrl-Shift-0:Script:D:\Program Files\ MyPreferedProgr..

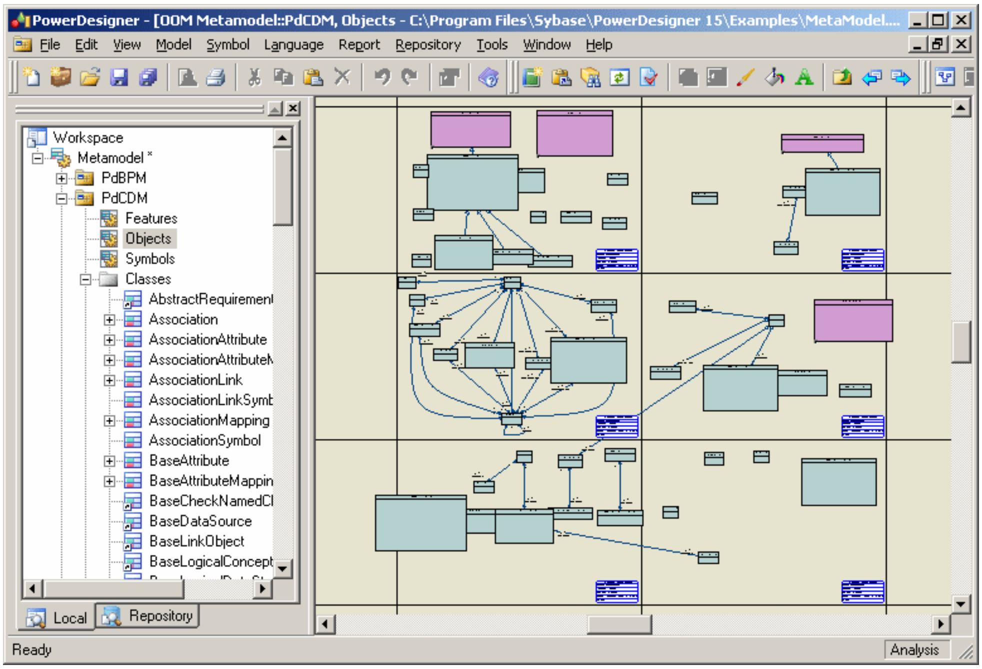
CHAPTER 8 The PowerDesigner Public Metamodel

The PowerDesigner public metamodel is an abstraction of the metadata for all the PowerDesigner models, describing the elements of a model, and the syntax and semantics of their manipulation.

You can review the public metamodel in PowerDesigner by opening `install dir\Examples\MetaModel.oom`, and find exhaustive documentation of all the metamodel objects, collections, and methods available via scripting, by selecting **Help** > **Metamodel Objects Help** (see *Using the Metamodel Objects Help File* on page 348).

This OOM and help file help you understand the structure of your models, especially when working with:

- Generation Template Language (GTL) templates (see *Chapter 5, Customizing Generation with GTL* on page 247).
- VB scripts (see *Chapter 7, Scripting PowerDesigner* on page 307).
- PowerDesigner XML model files (see *PowerDesigner Model File Format* on page 350).



The metamodel is divided into the following main packages:

- PdBPM - Business Process Model
- PdCDM - Conceptual Data Model
- PdCommon - contains all objects shared between two or more models, and the abstract classes of the model. For example, business rules, which are available in all models, and the BaseObject class, from which all model objects are derived, are defined in this package. Other model packages are linked to PdCommon by generalization links indicating that each model inherits common objects from the PdCommon package.
- PdEAM - Enterprise Architecture Model
- PdFRM - Free Model
- PdGLM - Glossary Model
- PdILM - Data Movement Model (the DMM was previously named Information Liquidity Model or ILM, and the PdILM library name has been retained for backwards compatibility)
- PdLDM - Logical Data Model
- PdMTM - Merise Model (available in French only)
- PdOOM - Object Oriented Model
- PdPDM - Physical Data Model
- PdPRJ - Project
- PdRMG - Repository
- PdRQM - Requirements Model
- PdXSM - XML Model
- PdWSP - Workspace

Each of these top-level packages contains the follow kinds of sub-objects, organized by diagram or, in the case of PdCommon, by sub-packages:

- Features - All the features implemented by classes in the model. For example, Report (available in all models) belongs to PdCommon, and AbstractDataType belongs to PdPDM.
- Objects - Design objects in the model
- Symbols - Graphical representation of design objects

Navigating in the Metamodel

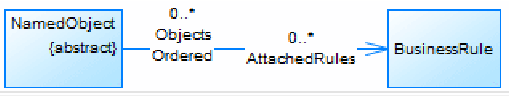
You can expand and collapse the packages in the Browser to explore their contents. Double-click a diagram to display it in the canvas.

Each metaclass has a name, contains zero or more attributes and assumes zero or more roles in associations with other classes, which allow you to identify collections. The PowerDesigner public metamodel uses standard UML concepts:

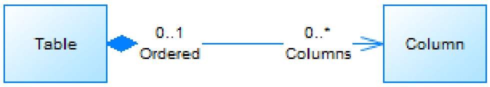
- *Public Names* - Each object in the metamodel has a name and a code corresponding to the public name of the object, which is the unique identifier of the object in a model library or package. Public names are referenced in PowerDesigner XML model files and when using

GTL and scripting. The public name often matches the object's name in the PowerDesigner interface, but where the two diverge, the public name must be used in scripts and GTL templates.

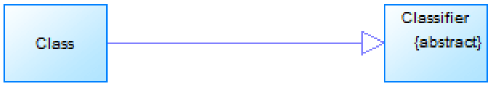
- *Classes* - are used to represent metadata in the following ways:
  - *Abstract classes* - are used only to share attributes and behaviors, and are not visible in the PowerDesigner interface.
  - *Instantiable/Concrete classes* - correspond to objects displayed in the interface. They have their own attributes and behaviors in addition to those they inherit from abstract classes through generalization links. For example, `NamedObject` is an abstract class, which contains standard attributes like `Name`, `Code`, `Comment`, `Annotation`, and `Description`, which are inherited by most PowerDesigner design objects.
- *Class attributes* - are object properties. Classes linked to other classes with generalization links usually contain derived attributes that are calculated from the attributes or collections of the parent class. Neither derived attributes, nor attributes migrated from navigable associations, are stored in the model file. Non-derived attributes are proper to the class, and are stored in the model and saved in the model file.
- *Associations* - express the semantic connections between classes. In the association property sheet, the roles carry information about the end object of the association. PowerDesigner objects are linked to other objects using collections, and the role at the other end of the association gives the name of the collection for an object. For example, `NamedOject` has a collection of business rules called `AttachedRules`, and `BusinessRule` has a collection of objects called `Objects`:

  When associations have two roles, only the collection with the *navigable* role will be saved in the XML file. In the case, only the `AttachedRules` collection is saved.
- *Compositions* – express an association where the children live and die with the parent and, when the parent is copied, the child is also copied. For example, `Table` has a composition association with the `Column` class:

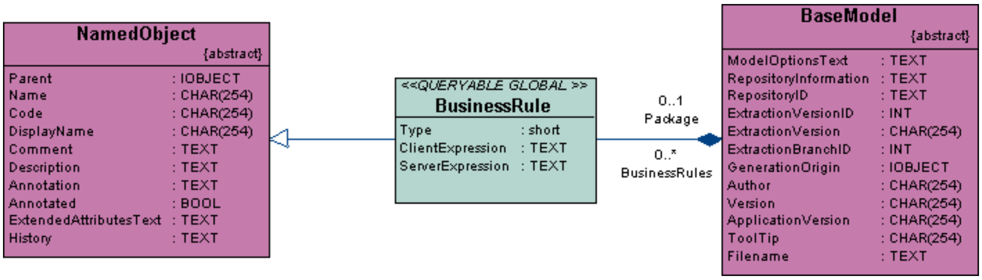
  

- *Generalizations* - show the *inheritance* links existing between a more general, usually abstract, class and a more specific, usually instantiable, class. The more specific class inherits from the attributes of the more generic class, these attributes are called derived attributes. For example, `Class` inherits from `Classifier`

Each diagram shows classes the connections between metaclasses via associations and generalizations. Classes in *green* are defined in the current diagram, while classes in *purple* are present only to provide context. To investigate a purple class, right-click it and select **Related Diagrams >** ***diagram*** to open the diagram where it is defined.

In the following example, `BusinessRule` is being defined, while `NamedObject` and `BaseModel` are present only to show inheritance and composition links:



Double-click any class to show its property sheet and review the following tabs:

- **General** - provides the public name in the **Name** and **Code** fields, a **Comment** providing a brief description of the class, and shows whether it is **Abstract**.

  Note: Objects, such as `RepositoryGroup` that do not support scripting bear the `<<notScriptable>>` stereotype.

- **Attributes** - lists the properties defined directly on the class, but not those that it inherits via any parent classes.
- **Associations** - lists the migrated associations for the class, which represent collections. The **Role B** column lists the collections for the class, while the **Role A** column lists the collections in which the class figures.
- **Operations** - lists the methods available for scripting.
- **Dependencies** - contains the following sub-tabs (among others):
  - **Associations**
  - **Generalizations** - lists the generalization links where the current class is the child and inherits attributes from a parent class.
  - **Specializations** - lists the generalization links where the current class is the parent and its children inherit attributes from it.
  - **Shortcuts** - lists the shortcuts created for the current object.
- **Notes** - may include further information on the **Description** or **Annotation** sub-tabs.

Using the Metamodel Objects Help File

PowerDesigner provides documentation of the metamodel available from **Help > Metamodel Objects Help**.

The file can be opened from the **Edit/Run Script** dialog (see *Running Scripts in PowerDesigner* on page 309) or from a metaclass in a resource file (see *Metaclasses (Profile)* on page 31) by clicking the **Find in MetaModel Help** button or pressing **Ctrl+F1**. It can also be opened from any object property sheet by pressing **Ctrl+F1** or clicking the **Property Sheet Menu** button and selecting **Find in MetaModel Help**.

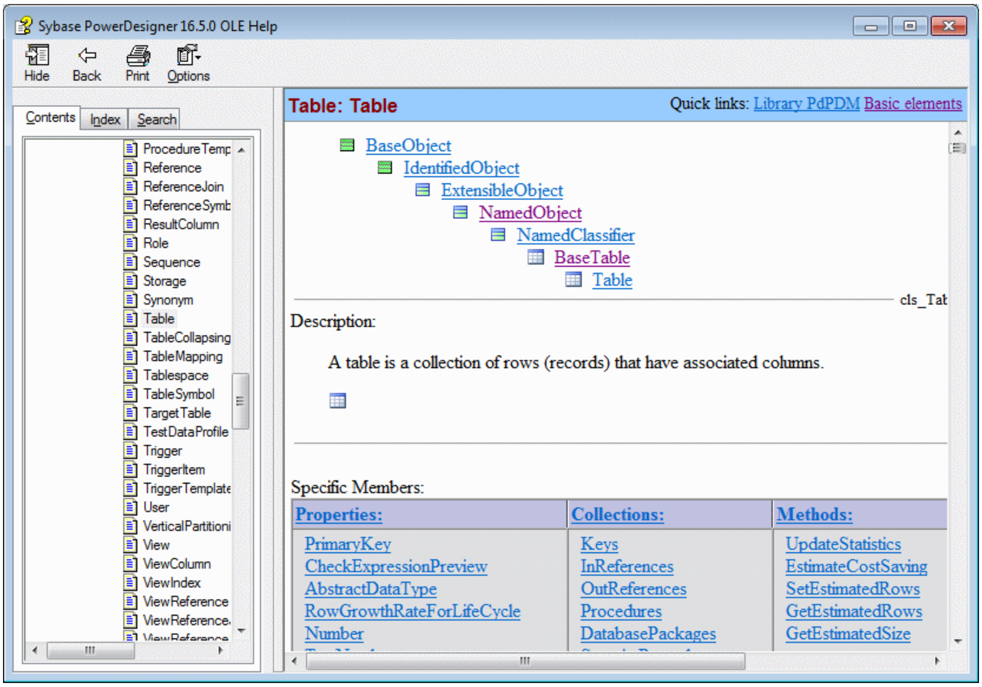


Table: Table

Description:

A table is a collection of rows (records) that have associated columns.

Specific Members:

The three top-level nodes contain the following documentation:

Nodes	What you can find...
Basic Elements	Provides general information on: • Collections of objects - provide the principal way of navigating the metamodel (see *Browsing and Modifying Collections (Scripting)* on page 316). • Structured Types - used for positioning symbols in diagrams (see *Displaying, Formatting, and Positioning Symbols (Scripting)* on page 322). • Global properties, constants, and functions - provide entry points for scripting (see *Manipulating Models, Collections, and Objects (Scripting)* on page 314).
Libraries	Provides exhaustive documentation of all scriptable properties, collections, and methods for metamodel objects, organized by module.
Appendix	Includes an expandable hierarchy showing all the metaclasses in the PowerDesigner metamodel, a VBScript code sample, and a list of the class ID constants used to identify objects in certain contexts (see *Accessing and Modifying Objects and Properties (Scripting)* on page 318).

To obtain information about the properties, collections and methods available for a particular metaclass, navigate to it under the Libraries category, or locate it in the index. All properties, collections, and methods are listed in the index.

Each metaclass shows the hierarchy of ancestors from which it is descended and inherits. After a brief description and symbol, it then lists:

- Specific Members - a table which lists the properties, collections, and methods defined directly on this metaclass
- Full definition - which lists, in separate tables, the properties, collections, and methods inherited from each of its ancestors. For example, the Table metaclass (located at `Libraries\PdPDM\Table`) inherits members from:
  - PdCommon.BaseObject
  - PdCommon.IdentifiedObject
  - PdCommon.ExtensibleObject
  - PdCommon.NamedObject
  - PdCommon.NamedClassifier
  - PdPDM.BaseTable
  - PdPDM.View

PowerDesigner Model File Format

PowerDesigner models are made up of objects, the properties and interactions of which are explained in the public metamodel. Models can be saved in either binary or XML file formats. Binary files are smaller and significantly quicker to open and save, but XML model files can be edited by hand or programatically (and DTDs are provided for each model type in the `DTD` folder in the installation directory).

Warning! You can modify an XML model file using a text or XML editor, but you should take care, as even a minor syntax error may render the file unusable. If you create an object in an XML file by copy and paste, make sure that you remove the duplicated OID. PowerDesigner will automatically assign an OID to the new object when next you open the model.

The following elements are used in PowerDesigner XML files:

- `<o:`*`object`*`>` - A PowerDesigner model object. The first time the object is mentioned in a collection, PowerDesigner assigns it an id using the `<o:`*`object`*` Id="`*`XYZ`*`">` syntax (where *XYZ* is a unique identifier automatically assigned to an object when it is found for the first time) or references it with the `<o:object Ref="`*`XYZ`*`"/>` syntax. Object definition is only used in composition collections, where the parent object owns the children in the association.
- `<c:`*`collection`*`>` - A collection of objects linked to another object. You can use the PowerDesigner metamodel to visualize the collections of an object. For example `<c:Children>`.

- `<a:`*`attribute`*`>` - An object is made up of a number of attributes each of which you can modify independently. For example `<a:ObjectID>`.

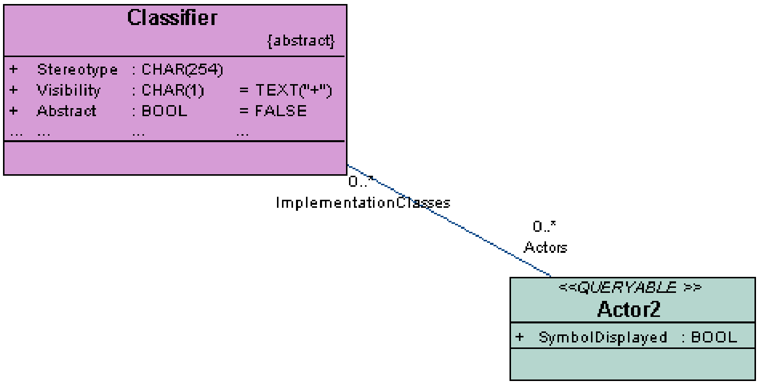
PowerDesigner XML model files have an `<o:model>` element at their root, which contains collections defined in the PowerDesigner metamodel. The model object and all the other object elements that it contains define their attributes and collections in sub-elements. The definition of an object implies the definition of its attributes and its collections. PowerDesigner checks each object and drills down the collections of this object to define each new object and collection in these collections, and so on, until the process finds terminal objects that do not need further analysis.

You can search for an object in the metamodel using its object name in the XML file in order to better understand its definition. Once you have found an object in the metamodel you can read the following information:

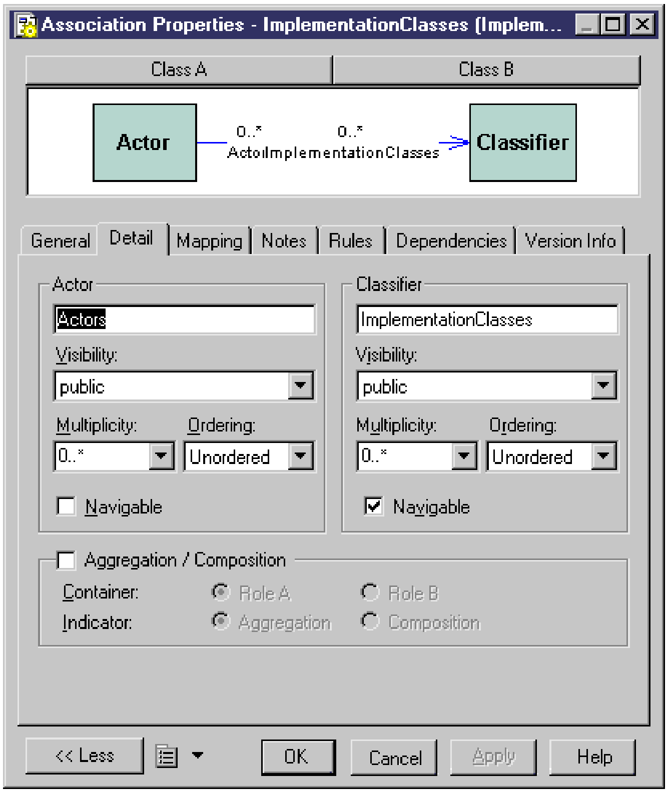
- Each PowerDesigner object can have several collections corresponding to other objects to interact with, these collections are represented by the associations existing between objects. The *roles* of the associations (aggregations and compositions included) correspond to the collections of an object. For example, each PowerDesigner model contains a collection of domains called Domains.

  Usually associations have only one role, the role is displayed at the opposite of the class for which it represents a collection. However, the metamodel also contains associations with two roles, in such case, both collections cannot be saved in the XML file. You can identify the collection that will be saved from the association property sheet: the role where the *Navigable* check box is selected is saved in the file.

  In the following example, association has two roles which means Classifier has a collection Actors, and Actor2 has a collection ImplementationClasses:



  If you display the association property sheet, you can see that the Navigable check box is selected for role ImplementationClass, which means that only collection ImplementationClass will be saved in file.


Association Properties - ImplementationClasses (Implem...

Class A: Actor — Class B: Classifier

Detail tab:

Actor: Actors
Visibility: public
Multiplicity: 0..* Ordering: Unordered
☐ Navigable

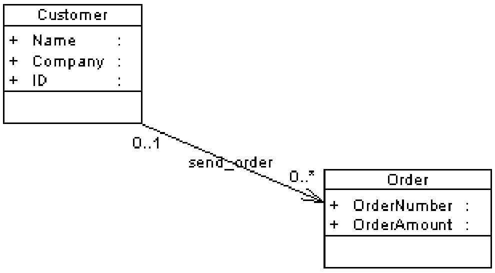
Classifier: ImplementationClasses
Visibility: public
Multiplicity: 0..* Ordering: Unordered
☑ Navigable

☐ Aggregation / Composition
Container: Role A / Role B
Indicator: Aggregation / Composition

- Attributes with the *IOBJECT* data type are attributes in the metamodel while they appear as collections containing a single object in the XML file. This is not true for Parent and Folder that do not contain any collection.

Example: Simple OOM XML File

In this example, we will explore the structure of a simple OOM model file containing two classes and one association.



The file starts with several lines stating XML and model related details.

The first object to appear is the root of the model <o:RootObject Id="01">. RootObject is a model container that is defined by default whenever you create and save a model. RootObject contains a collection called Children that is made up of models.

In our example, Children contains only one model object that is defined as follows:

```
<o:Model Id="o2">
 <a:ObjectID>3CEC45F3-A77D-11D5-BB88-0008C7EA916D</a:ObjectID>
 <a:Name>ObjectOrientedModel_1</a:Name>
 <a:Code>OBJECTORIENTEDMODEL_1</a:Code>
 <a:CreationDate>1000309357</a:CreationDate>
 <a:Creator>arthur</a:Creator>
 <a:ModificationDate>1000312265</a:ModificationDate>
 <a:Modifier>arthur</a:Modifier>
 <a:ModelOptionsText>
[ModelOptions]
...
```

Below the definition of the model object, you can see the series of ModelOptions attributes. Note that ModelOptions is not restricted to the options defined in the Model Options dialog box of a model, it gathers all properties saved in a model such as intermodel generation options.

After ModelOptions, you can identify collection <c:ObjectLanguage>. This is the object language linked to the model. The second collection of the model is <c:ClassDiagrams>. This is the collection of diagrams linked to the model, in our example, there is only one diagram defined in the following paragraph:

```
<o:ClassDiagram Id="o4">
   <a:ObjectID>3CEC45F6-A77D-11D5-BB88-0008C7EA916D</a:ObjectID>
   <a:Name>ClassDiagram_1</a:Name>
   <a:Code>CLASSDIAGRAM_1</a:Code>
   <a:CreationDate>1000309357</a:CreationDate>
   <a:Creator>arthur</a:Creator>
   <a:ModificationDate>1000312265</a:ModificationDate>
   <a:Modifier>arthur</a:Modifier>
   <a:DisplayPreferences>
...
```

Like for model options, ClassDiagram definition is followed by a series of display preference attributes.

Within the ClassDiagram collection, a new collection called <c:Symbols> is found. This collection gathers all the symbols in the model diagram. The first object to be defined in collection Symbols is AssociationSymbol:

```
<o:AssociationSymbol Id="o5">
   <a:CenterTextOffset>(1, 1)</a:CenterTextOffset>
   <a:SourceTextOffset>(-1615, 244)</a:SourceTextOffset>
   <a:DestinationTextOffset>(974, -2)</a:DestinationTextOffset>
   <a:Rect>((-6637,-4350), (7988,1950))</a:Rect>
   <a:ListOfPoints>((-6637,1950),(7988,-4350))</a:ListOfPoints>
   <a:ArrowStyle>8</a:ArrowStyle>
   <a:ShadowColor>13158600</a:ShadowColor>
   <a:FontList>DISPNAME 0 Arial,8,N
```

AssociationSymbol contains collections <c:SourceSymbol> and <c:DestinationSymbol>. In both collections, symbols are referred to but not defined: this is because ClassSymbol does not belong to the SourceSymbol or DestinationSymbol collections.

```
<c:SourceSymbol>
    <o:ClassSymbol Ref="o6"/>
   </c:SourceSymbol>
   <c:DestinationSymbol>
    <o:ClassSymbol Ref="o7"/>
   </c:DestinationSymbol>
```

The association symbols collection is followed by the<c:Symbols> collection. This collection contains the definition of both class symbols.

```
<o:ClassSymbol Id="o6">
   <a:CreationDate>1012204025</a:CreationDate>
   <a:ModificationDate>1012204025</a:ModificationDate>
   <a:Rect>((-18621,6601), (-11229,12675))</a:Rect>
   <a:FillColor>16777215</a:FillColor>
   <a:ShadowColor>12632256</a:ShadowColor>
   <a:FontList>ClassStereotype 0 Arial,8,N
```

Collection <c:Classes> follows collection <c:Symbols>. In this collection, both classes are defined with their collections of attributes.

```
<o:Class Id="o10">
   <a:ObjectID>10929C96-8204-4CEE-911#-E6F7190D823C</a:ObjectID>
   <a:Name>Order</a:Name>
   <a:Code>Order</a:Code>
   <a:CreationDate>1012204026</a:CreationDate>
   <a:Creator>arthur</a:Creator>
   <a:ModificationDate>1012204064</a:ModificationDate>
   <a:Modifier>arthur</a:Modifier>
   <c:Attributes>
  <o:Attribute Id="o14">
```

Attribute is a terminal object: there is not further ramification required to define this object.

Each collection belonging to an analyzed object is expanded, and analyzed and the same occurs for collections within collections.

Once all objects and collections are browsed, the following markups appear:

```
</o:RootObject>
</Model>
```

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