



# Enterprise Architect

User Guide Series

# Software Models

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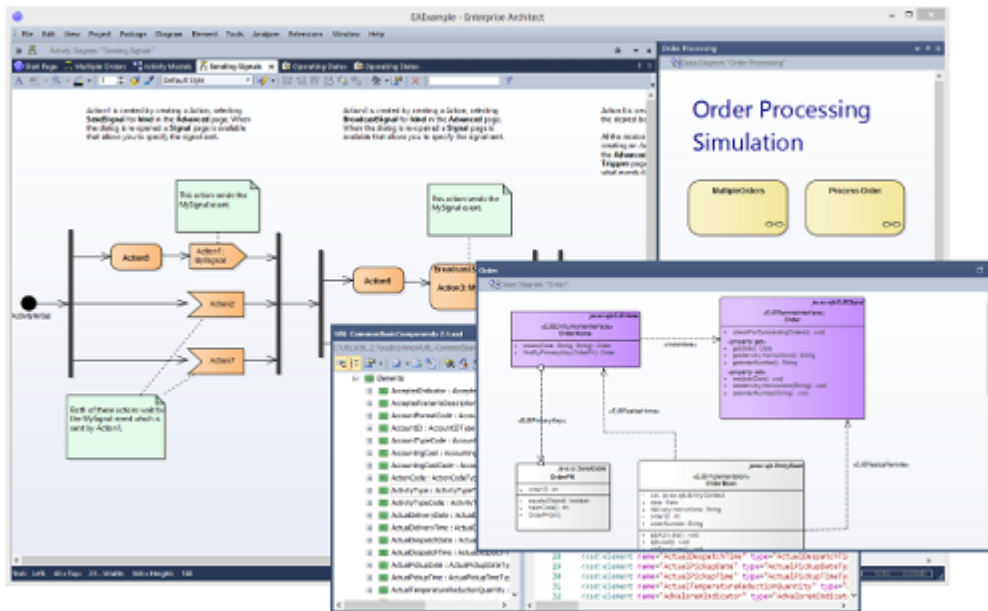
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# Software Models




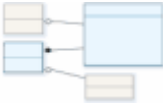
Software engineering is the discipline of designing, implementing and maintaining software. The process of software engineering starts with requirements and constraints as inputs and results in programming code and schemas that are deployed to a variety of platforms, creating running systems.

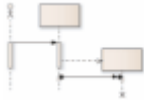


Enterprise Architect has a rich set of tools and features that assist Software Engineers to perform their work efficiently and to reduce the number of errors in implemented solutions. The features include design tools to create models of software, automated code generation, reverse engineering of source code, binaries and schemas, and tools to synchronize source code with the design models. The programming code can be viewed and edited directly in the integrated **Code Editors** within Enterprise Architect, which provide Intelli-sense and other features to aid in coding.

Another compelling aspect of the environment is the ability to trace the implementation Classes back to design elements and architecture, and then back to the requirements and constraints and other specifications, and ultimately back to stakeholders and their goals and visions.

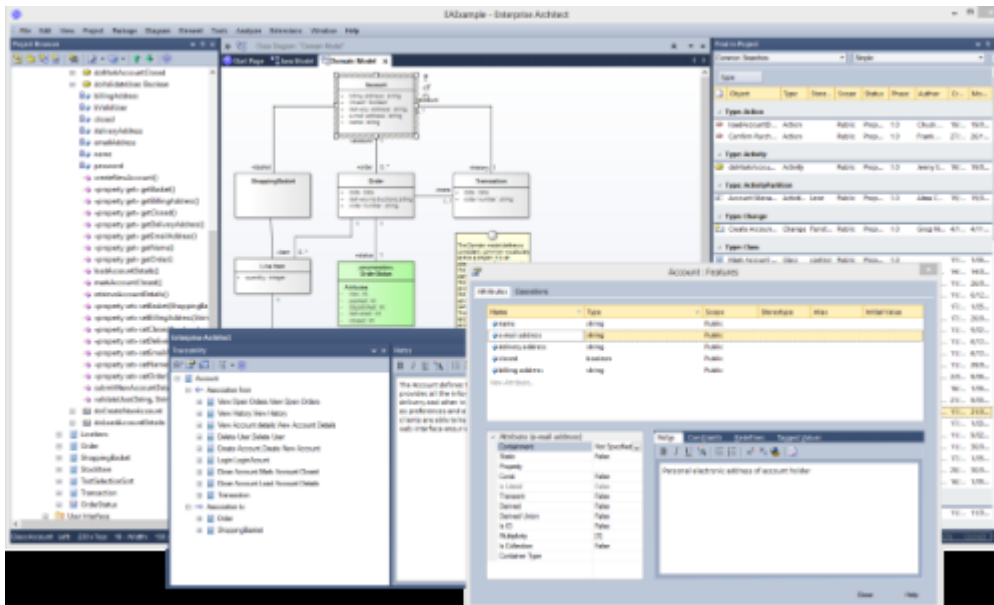
Enterprise Architect supports a wide range of programming languages and platforms and provides a lightweight and seamless integration with the two most prevalent Integrated Development Environments: Visual Studio and Eclipse. In addition there is a fully featured Execution Analyzer that allows the Software Engineer to design, build debug and test software modules right inside Enterprise Architect.

## Facilities

Facility	Description
<p>Development Tools</p> 	<p>Discover the tightly Integrated Development Environment with outstanding tools and functionality.</p>
<p>Code, Build and Debug</p> 	<p>Model, develop, debug, profile and manage an application from within the modeling environment.</p>

<p>Visual Analysis of Executing Code</p> 	<p>Understand your code base by visually analyzing running code. Use Test Points, profiling and automated diagram generation.</p>
<p>Generate Source Code</p> 	<p>Explore some of the ways to generate source code for a single Class, a selection of Classes, or a whole Package. Generate from structural or behavioral models.</p>
<p>Importing Source Code</p> 	<p>Examine existing systems by importing source code into Enterprise Architect. View and modify dialog definitions. Synchronize the model with the latest updates to source code.</p>

# Integrated Development



Enterprise Architect provides an unmatched set of tools and features for the Software Engineer, to assist in the process of creating robust and error free software systems. The engineer can start by defining the architecture and ensuring that it traces back to the requirements and specification. Technology neutral models can be transformed to target a comprehensive range of programming languages. The Model Driven Development Environment fits the bill for various technologies.

## Features

### Development Tools

- Model driven development with best in class UML tools
- Generate and reverse engineer code
- Customize code generation with templates
- Analyzer Scripts to manage your applications
- Code editors to author the code base
- Debuggers to investigate behavior
- Profilers to visualize behavior
- Analyzers to record behavior
- **Testpoints** for validation of programming contracts
- Integration with junit and NUnit
- Eclipse or Visual Studio Integration where required

### Traceability

At a glance traceability of Generalizations, Realizations, Associations, Dependencies and more. Customize relationship views. Easily navigate related elements in the model.

### Usage

Quickly browse element usage across all diagrams. Perform powerful element searches using sophisticated queries.

### Popular Languages

- C/ C++
- Java

- Microsoft .NET family
- ADA
- Python
- Perl
- PHP

**Toolboxes** Toolboxes are provided for a vast array of modeling technologies and programming languages.

**Application Patterns** Enterprise Architect provides complete starter projects, including model information, code and build scripts, for several basic application types.

## Learning Center topics

- **Alt+F1** | Enterprise Architect | Software Engineering

# Feature Overview

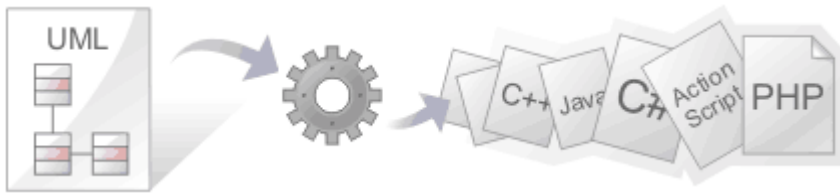
Code Engineering with Enterprise Architect broadly encompasses various processes for the design, generation and transformation of code from your UML model.

## Features

<b>Model Driven Code Engineering</b>	<ul style="list-style-type: none"> <li>• Source code generation and reverse engineering for many popular languages, including C++, C#, Java, Delphi, VB.Net, Visual Basic, ActionScript, Python and PHP</li> <li>• A built in 'syntax highlighting' source code editor</li> <li>• Code generation templates, which enable you to customize the generated source code to your company specifications</li> </ul>
<b>Transformations for Rapid Development</b>	<ul style="list-style-type: none"> <li>• Advanced Model Driven Architecture (MDA) transformations using transformation templates</li> <li>• Built-in transformations for DDL, C#, Java, EJB and <b>XSD</b></li> <li>• One Platform Independent Model can be used to generate and synchronize multiple Platform Specific Models, providing a significant productivity boost</li> <li>• XSL Transform diagram, toolbox, editor and debugger.</li> </ul>
<b>Visual Execution Analysis / Debugging, Verification and Visualization</b>	<ul style="list-style-type: none"> <li>• Execute build, test, debug, run and deploy scripts</li> <li>• Integrate UML development and modeling with source development and compilation</li> <li>• Generate NUnit and JUnit test Classes from source Classes using MDA Transformations</li> <li>• Integrate the test process directly into the Enterprise Architect IDE</li> <li>• Debug .NET, Java and Microsoft Native (C, C++ and Visual Basic) applications</li> <li>• Design and execute Test suites based on Programming by Contract principles</li> <li>• XSL Stylesheet debugging</li> </ul>
<b>Database Modeling</b>	<p>Enterprise Architect enables you to:</p> <ul style="list-style-type: none"> <li>• Reverse engineer from many popular DBMSs, including SQL Server, My SQL, Access, PostgreSQL and Oracle</li> <li>• Model database tables, columns, keys, foreign keys and complex relationships using UML and an inbuilt data modeling profile</li> <li>• Forward generate DDL scripts to create target database structures</li> </ul>
<b>XML Technology Engineering</b>	<p>Enterprise Architect enables you to rapidly model, forward engineer and reverse engineer two key W3C XML technologies:</p> <ul style="list-style-type: none"> <li>• XML Schema (<b>XSD</b>)</li> <li>• Web Service Definition Language (WSDL)</li> </ul> <p>XSD and WSDL support is critical for the development of a complete Service Oriented Architecture (SOA), and the coupling of UML 2.5 and XML provides the natural mechanism for implementing XML-based SOA artifacts within an organization.</p>



## Generate Source Code



Source code generation is the process of creating programming code from a UML model. There are great benefits in taking this approach as the source code Packages, Classes and Interfaces are automatically created and elaborated with variables and methods.

Enterprise Architect can also generate code from a number of behavioral models, including State Machine, Sequence and Activity diagrams. There is a highly flexible template mechanism that allows the engineer to completely tailor the way that source code is generated, including the comment headers in methods and the Collection Classes that are used.

From an engineering and quality perspective, the most compelling advantage of this approach is that the UML models and therefore the architecture and design are synchronized with the programming code. An unbroken traceable path can be created from the goals, business drivers and the stakeholder's requirements right through to methods in the programming code.

### Facilities

Facility	Description
Languages	<p>Enterprise Architect supports code generation in each of these languages:</p> <ul style="list-style-type: none"> <li>• Action Script</li> <li>• C</li> <li>• C# (for .NET 1.1, .NET 2.0 and .NET 4.0)</li> <li>• C++ (standard, plus .NET managed C++ extensions)</li> <li>• Delphi</li> <li>• Java (including Java 1.5, Aspects and Generics)</li> <li>• PHP</li> <li>• Python</li> <li>• Visual Basic</li> <li>• Visual Basic .NET</li> </ul>
Elements	<p>Code is generated from Class or Interface model elements, so you must create the required Class and Interface elements to generate from.</p> <p>Add attributes (which become variables) and operations (which become methods).</p>
Settings	<p>Before you generate code, you should ensure the default settings for code generation match your requirements; set up the defaults to match your required language and preferences.</p> <p>Preferences that you can define include default constructors and destructors, methods for interfaces and the Unicode options for created languages.</p> <p>Languages such as Java support 'namespaces' and can be configured to specify a namespace root.</p> <p>In addition to the default settings for generating code, Enterprise Architect facilitates setting specific generation options for each of the supported languages.</p>



Code Template Framework	The <b>Code Template Framework</b> (CTF) enables you to customize the way Enterprise Architect generates source code and also enables generation of languages that are not specifically supported by Enterprise Architect.
Local Paths	Local path names enable you to substitute tags for directory names.
Behavioral Code	You can also generate code from three UML behavioral modeling paradigms: <ul style="list-style-type: none"><li>• State Machine diagrams (SW &amp; HW)</li><li>• Interaction (Sequence) diagrams (SW)</li><li>• Activity diagrams (SW)</li></ul>
Live Code Generation	On the 'Code Engineering' submenu, you have the option to update your source code instantly as you make changes to your model.
Tasks	When you generate code, you perform one or more of these tasks: <ul style="list-style-type: none"><li>• Generate a Single Class</li><li>• Generate a Group of Classes</li><li>• Generate a Package</li><li>• Update Package Contents</li></ul>

## Notes

- The tools provided by Enterprise Architect for code engineering and debugging are available in the Professional, Corporate, Business and Software Engineering, System Engineering and Ultimate editions of Enterprise Architect
- When security is enabled there are permissions for Generate Source Code and DDL and **Reverse Engineer** from DDL and Source Code

## Learning Center topics


- **Alt+F1** | Enterprise Architect | Software Engineering | Generate Code

## Generate a Single Class

Before you generate code for a single Class, you:

- Complete the design of the model element (Class or Interface)
- Create Inheritance connectors to parents and Associations to other Classes that are used
- Create Inheritance connectors to Interfaces that your Class implements; the system provides an option to generate function stubs for all interface methods that a Class implements

### Generate code for a single Class

Step	Action
1	Open the diagram containing the Class or Interface for which to generate code.
2	Right-click on the required Class or Interface and select the 'Code Engineering   Generate Code' option, or press <b>F11</b> . The 'Generate Code' dialog displays, through which you can control how and where your source code is generated.
3	In the 'Path' field, click on the  button and select a path name for your source code to be generated to.
4	In the 'Target Language' field, click on the drop-down arrow and select the language to generate; this becomes the permanent option for that Class, so change it back if you are only doing one pass in another language.
5	Click on the <b>Advanced button</b> . The 'Object Options' dialog displays, providing subsets of the 'Source Code Engineering' and code language options pages on the 'Options' dialog.
6	Set any custom options (for this Class alone), then click on the <b>Close button</b> to return to the 'Generate Code' dialog.
7	If you are generating Java, C++, C# or C code, the 'Use the New Statemachine Template' option displays with the checkbox selected. If you want to use the Legacy Statemachine code generation templates, deselect the checkbox.
8	In the 'Import(s) / Header(s)' fields, type any import statements, #includes or other header information. Note that in the case of Visual Basic this information is ignored; in the case of Java the two import text boxes are merged; and in the case of C++ the first import text area is placed in the header file and the second in the body (.cpp) file.
9	Click on the <b>Generate button</b> to create the source code.
10	When complete, click on the <b>View button</b> to see what has been generated. Note that you should set up your default viewer/editor for each language type first; you can also set up the default editor on the 'Code Editors' page of the 'Options' dialog ('Tools   Options   Source Code Engineering   Code Editors').

## Learning Center topics

- **Alt+F1** | Enterprise Architect | Software Engineering | Generate Code | Generate a Single Class

## Generate a Group of Classes

In addition to being able to generate code for an individual Class, you can also select a group of Classes for batch code generation. When you do this, you accept all the default code generation options for each Class in the set.

### Generate Class Group

Step	Detail
1	Select a group of Classes and/or interfaces in a diagram.
2	Right-click on an element in the group to display the context menu.
3	Select the 'Code Generation   Generate Selected elements' menu option (or press <b>Shift+F11</b> ). If no code exists for the selected elements, the 'Save As' dialog displays on which you specify the file path and name for each code file; enter this information and click on the <b>Save button</b> .
4	The 'Batch Generation' dialog displays, showing the status of the process as it executes (the process might be too fast to see this dialog). If code already exists for the selected Class elements, and changes have been made to the Class name or structure, the 'Synchronize Element <package name>.<element name>' dialog might also display; this dialog helps synchronize the model and code.

### Notes

- If any of the elements selected are not Classes or interfaces the option to generate code is not available

### Learning Center topics

- **Alt+F1** | Enterprise Architect | Software Engineering | Generate Code | Generate Multiple Classes

## Generate a Package

In addition to generating source code from single Classes and groups of Classes, you can generate code from a Package. This feature provides options to recursively generate code from child Packages and automatically generate directory structures based on the Package hierarchy. This helps you to generate code for a whole branch of your project model in one step.

### Access

Ribbon	Code > Source Code > Generate All
Menu	Package   Code Engineering   Generate Source Code for Package
Context Menu	<b>Project Browser</b>   Right-click on Package   Code Engineering   Generate Source Code
Keyboard Shortcuts	<b>Ctrl + Alt + K</b>

### Generate code from a Package, on the Generate Package Source Code dialog

Step	Action
1	<p>In the 'Synchronize' field, click on the drop-down arrow and select the appropriate synchronize option:</p> <ul style="list-style-type: none"> <li>'Synchronize model and code': Code for Classes with existing files is forward synchronized with that file; code for Classes with no existing file is generated to the displayed target file</li> <li>'Overwrite code': All selected target files are overwritten (forward generated)</li> <li>'Do not generate': Generate code for only those selected Classes that do not have an existing file; all other Classes are ignored</li> </ul>
2	<p>Highlight the Classes for which to generate code; leave unselected any to not generate code for.</p> <p>If you want to display more of the information within the layout, you can resize the dialog and its columns.</p>
3	<p>To make Enterprise Architect automatically generate directories and filenames based on the Package hierarchy, select the 'Auto Generate Files' checkbox; this enables the 'Root Directory' field, in which you select a root directory under which the source directories are to be generated.</p> <p>By default, the 'Auto Generate Files' feature ignores any file paths that are already associated with a Class; you can change this behavior by also selecting the 'Retain Existing File Paths' checkbox.</p>
4	<p>To include code for all sub-Packages in the output, select the 'Include Child Packages' checkbox.</p>
5	<p>Click on the <b>Generate button</b> to start generating code.</p> <p>As code generation proceeds, Enterprise Architect displays progress messages. If a Class requires an output filename the system prompts you to enter one at the appropriate time (assuming Auto Generate Files is not selected). For example, if the selected Classes include partial Classes, a prompt displays to enter the filename into which to generate code for the second partial Class.</p>

## Further information on the dialog options

Option	Action
Root Package	Check the name of the Package for which code is to be generated.
Synchronize	Select options that specify how existing files should be regenerated.
Auto Generate Files	Specify whether Enterprise Architect should automatically generate file names and directories, based on the Package hierarchy.
Root Directory	If Auto Generate Files is selected, display the path under which the generated directory structures are created.
Retain Existing File Paths	<p>If Auto Generate Files is selected, specify whether to use existing file paths associated with Classes.</p> <p>If Auto Generate Files is unselected, Enterprise Architect generates Class code to automatically determined paths, regardless of whether source files are already associated with the Classes.</p>
Include all Child Packages	<p>Also generate code for all Classes in all sub-Packages of the target Package in the list.</p> <p>This option facilitates recursive generation of code for a given Package and its sub-Packages.</p>
Select Objects to Generate	<p>List all Classes that are available for code generation under the target Packages; only code for selected (highlighted) Classes is generated.</p> <p>Classes are listed with their target source file.</p>
Select All	Mark all Classes in the list as selected.
Select None	Mark all Classes in the list as unselected.
Generate	Start the generation of code for all selected Classes.
Cancel	Exit the 'Generate Package Source Code' dialog; no Class code is generated.

## Learning Center topics

- **Alt+F1** | Enterprise Architect | Software Engineering | Generate Code | Generate a Package

## Update Package Contents

In addition to generating and importing code, Enterprise Architect provides the option to synchronize the model and source code, creating a model that represents the latest changes in the source code and vice versa. You can use either the model as the source, or the code as the source.

The behavior and actions of synchronization depend on the settings you have selected on the 'Attributes and Operations' page of the 'Options' dialog. Working with these settings, you can either protect or automatically discard information in the model that is not present in the code, and prompt for a decision on code features that are not in the model. In these two examples, the appropriate checkboxes have been selected for maximum protection of data:

- You generated some source code, but made subsequent changes to the model. When you generate code again, Enterprise Architect adds any new attributes or methods to the existing source code, leaving intact what already exists. This means developers can work on the source code and then generate additional methods as required from the model, without having their code overwritten or destroyed.
- You might have made changes to a source code file, but the model has detailed notes and characteristics you do not want to lose. By synchronizing from the source code into the model, you import additional attributes and methods but do not change other model elements.

Using the synchronization methods, it is simple to keep source code and model elements up to date and synchronized.

### Access

Ribbon	Code > Source Code > Synch All
Menu	Package   Code Engineering   Synchronize Package
Context Menu	<b>Project Browser</b>   Right-click on Package   Code Engineering   Synchronize Package With Code
Keyboard Shortcuts	<b>Ctrl + Alt + M</b>

### Synchronize Package contents against source code

Field/Button	Action
Update Type	Select the radio button to either <b>Forward Engineer</b> or <b>Reverse Engineer</b> the Package Classes, as appropriate.
Include child packages in generation	Select the checkbox to include child Packages in the synchronization.
OK	<p>Click on the button to start synchronization.</p> <p>Enterprise Architect uses the directory names specified when the project source was first imported/generated and updates either the model or the source code depending on the option chosen. If:</p> <ul style="list-style-type: none"> <li>• Performing forward synchronization AND</li> <li>• There are differences between the model and code AND</li> <li>• The 'On forward synch, prompt to delete code features not in model' checkbox</li> </ul>

	<p>is selected in the 'Options - Attributes and Operations' dialog</p> <p>THEN the 'Synchronize Element &lt;package name&gt;.&lt;element name&gt;' dialog displays.</p> <p>Otherwise, no further action is required.</p>
--	--

## Notes

- Code synchronization does not change method bodies; behavioral code cannot be synchronized, and code generation only works when generating the entire file
- In the Corporate, Business and Software Engineering, System Engineering and Ultimate editions of Enterprise Architect, if security is enabled you must have Generate Source Code and DDL permission to synchronize source code with model elements

## Learning Center topics

- **Alt+F1** | Enterprise Architect | Software Engineering | Generate Code | Update Packages



## Synchronize Model and Code

You might either:

- Synchronize the code for a Package of Classes against the model in the **Project Browser**, or
- Regenerate code from a batch of Classes in the model

In such processes, there might be items in the code that are not present in the model.

If you want to trap those items and resolve them manually, select the 'On forward synch, prompt to delete code features not in model' checkbox in the 'Options - Attributes and Operations' dialog, so that the 'Synchronize Element <package name>.<element name>' dialog displays, providing options to respond to each item.

### Synchronize Items

Button	Detail
Select All	Highlight and select all items in the Feature column.
Clear All	Deselect and remove highlighting from all items in the Feature column.
Delete	Mark the selected code features to be removed from the code (the value in the Action column changes to Delete).
Reassign	Mark the selected code features to be reassigned to elements in the model. This is only possible when an appropriate model element is present that is not already defined in the code. The Select the Corresponding Class Feature dialog displays, from which you select the Class to reassign the feature to. Click on the <b>OK button</b> to mark the feature for reassignment.
Ignore	Mark the selected code elements not present in the model to be ignored completely (the default; the value in the Action column remains as or changes to <none>).
Reset to Default	Reset the selected items to Ignore (the value in the Action column changes to <none>).
OK	Make the assigned changes to the items, and close the dialog.

# Namespaces

Languages such as Java support Package structures or namespaces. In Enterprise Architect you can specify a Package as a namespace root, which denotes where the namespace structure for your Class model starts; all subordinate Packages below a namespace root will form the namespace hierarchy for contained Classes and Interfaces.

To define a Package as a namespace root, right-click on the Package in the **Project Browser** and select 'Code Engineering | Set as Namespace Root'. The Package icon in the Project Browser changes to show a colored corner indicating this Package as a namespace root.



Generated Java source code, for example, will automatically add a Package declaration at the beginning of the generated file, indicating the location of this Class in the Package hierarchy below the namespace root.

To clear an existing namespace root, right-click on a namespace root Package in the Project Browser and select 'Code Engineering | Clear Namespace Root'.

To view a list of namespaces, select the 'Project | Settings | Namespace Roots' menu option; the 'Namespaces' dialog displays. If you double-click on a namespace in the list, the Package is highlighted in the Project Browser; alternatively, right-click on the namespace and select the 'Locate Package in Browser' option. You can also clear the selected namespace root by selecting the 'Clear Namespace Attribute' option.

To omit a Package from a namespace definition, select the 'Code Engineering | Suppress Namespace' context menu option; to include the Package in the namespace again, select the 'Code Engineering | Show Namespace' context menu option.

## Notes

- When performing code generation, any Package name that contains whitespace characters is automatically treated as a namespace root

## Learning Center topics

- **Alt+F1** | Enterprise Architect | Software Engineering | Generate Code | Namespaces

## Importing Source Code



The ability to view programming code and the models it is derived from at the same time brings clarity to the design of a system. One of Enterprise Architect's powerful code engineering features is the ability to **Reverse Engineer** source code into a UML model. A wide range of programming languages are supported and there are options that govern how the models are generated. Once the code is in the model it is possible to keep it synchronized with the model regardless of whether the changes were made directly in the code or the model itself. The code structures are mapped into their UML representations; for example, a Java class is mapped into a **UML Class** element, variables are defined as attributes, methods modeled as operations, and interactions between the Java classes represented by the appropriate connectors.

The representation of the programming code as model constructs helps you to gain a better understanding of the structure of the code and how it implements the design, architecture and the requirements, and ultimately how it delivers the business value.

It is important to note that if a system is not well designed, simply importing the source into Enterprise Architect does not turn it into an easily understandable UML model. When working with a poorly designed system it is useful to assess the code in manageable units by examining the individual model Packages or elements generated from the code; for example, dragging a specific Class of interest onto a diagram and then using the '**Insert Related Elements**' option at one level to determine the immediate relationships between that Class and other Classes. From this point it is possible to create Use Cases that identify the interaction between the source code Classes, providing an overview of the application's operation.

Several options guide how the code is reversed engineered, including whether comments are imported to notes and how they are formatted, how property methods are recognized and whether Dependency relationships are created for operation return and parameter types.

## Copyright Ownership

Situations that typically lend themselves to reverse engineering tend to operate on source code that:

- You have already developed
- Is part of a third-party library that you have obtained permission to use
- Is part of a framework that your organization uses
- Is being developed on a daily basis by your developers

If you are examining code that you or your organization do not own or do not have specific permission to copy and edit, you must ensure that you understand and comply with the copyright restrictions on that code before beginning the process of reverse engineering.

## Supported languages for Reverse Engineering

Language
Action Script
Ada 2012 (Systems Engineering and Ultimate editions)

C
C #
C ++
CORBA IDL (MDG Technology )
Delphi
Java
PHP
Python
SystemC(Systems Engineering and Ultimate editions)
Verilog (Systems Engineering and Ultimate editions)
VHDL(Systems Engineering and Ultimate editions)
Visual Basic
Visual Basic .NET

## Notes

- Reverse Engineering is supported in the Professional, Corporate, Business and Software Engineering, Systems Engineering and Ultimate editions of Enterprise Architect
- If security is enabled you must have '**Reverse Engineer** From DDL And Source Code' permission to reverse engineer source code and synchronize model elements against code
- Using Enterprise Architect, you can also import certain types of binary files, such as Java .jar files and .NET PE files
- Reverse Engineering of other languages is currently available through the use of MDG Technologies listed on the MDG Technology pages of the Sparx Systems website

## Learning Center topics

- **Alt+F1** | Enterprise Architect | Software Engineering | Import Code

# Import Source Code

## Import source code (reverse engineer)

As the import proceeds, Enterprise Architect provides progress information. When all files are imported, Enterprise Architect makes a second pass to resolve associations and inheritance relationships between the imported Classes.

Step	Action
1	In the <b>Project Browser</b> , select (or add) a diagram into which to import the Classes.
2	Right-click on the diagram background to open the context menu and either: <ul style="list-style-type: none"><li>• Select the language to import from the 'Import from source file(s)' submenu</li><li>• Click on the 'Import Language' drop-down arrow in the Code Generation toolbar and select the 'Import   Import xxx files' menu option, where xxx represents the language to import</li></ul>
3	From the file browser that appears, select one or more source code files to import.
4	Click on the <b>Open button</b> to start the import process.

## Learning Center topics

- **Alt+F1** | Enterprise Architect | Software Engineering | Import Source Code

## Notes on Source Code Import

You can import code into your Enterprise Architect project, in a range of programming languages. Enterprise Architect supports most constructs and keywords for each coding language. You select the appropriate type of source file for the language, as the source code to import.


If there is a particular feature you require support for that you feel is missing, please contact Sparx Systems.

### Notes

- When reverse engineering attributes with parameter substitutions (templated attributes):
  - If a Class with proper template parameter definitions is found, an Association connector is created and its parameter substitutions are configured
  - An Association connector is also created if a matching entry is defined as a Collection Class or in the 'Additional Collection Classes' option (for C#, C++ and Java); for an example, see *Example Use of Collection Classes*

### Programming Language notes

Language	Notes
ActionScript	Appropriate type of source file: .as code file.
C	<p>Appropriate type of source file: .h header files and/or .c files.</p> <p>When you select a header file, Enterprise Architect automatically searches for the corresponding .c implementation file to import, based on the options for extension and search path specified in the C options.</p> <p>Enterprise Architect does not expand macros that have been used, these must be added into the internal list of Language Macros.</p>
C++	<p>Appropriate type of source file: .h header file.</p> <p>Enterprise Architect automatically searches for the .cpp implementation file based on the extension and search path set in the C++ options; when it finds the implementation file, it can use it to resolve parameter names and method notes as necessary.</p> <p>When importing C++ source code, Enterprise Architect ignores function pointer declarations.</p> <p>To import them into your model you could create a typedef to define a function pointer type, then declare function pointers using that type; function pointers declared in this way are imported as attributes of the function pointer type.</p> <p>Enterprise Architect does not expand macros that have been used; these must be added into the internal list of Language Macros.</p>
C#	Appropriate type of source file: .cs.
Delphi	Appropriate type of source file: .pas.
Java	<p>Appropriate type of source file: .java.</p> <p>Enterprise Architect supports the AspectJ language extensions.</p>

	 <pre> classDiagram     class ThingObserving {         &lt;&lt;aspect&gt;&gt;         - observers: Vector = new Vector()         + addObserver(Thing, Thing) : void         + removeObserver(Thing, ThingObserver) : void         ~ updateObserver(Thing, ThingObserver) : void         &lt;&lt;advice&gt;&gt;         + after(Thing) : void         changes(t)         &lt;&lt;pointcut&gt;&gt;         ~ changes(Thing) : void         target(t) &amp;&amp; call(Void Thing.set*(int))     </pre> <p>Aspects are modeled using Classes with the stereotype aspect; these aspects can then contain attributes and methods as for a normal Class.</p> <p>If an intertype attribute or operation is required, you can add a tag 'className' with the value being the name of the Class it belongs to.</p> <p>Pointcuts are defined as operations with the stereotype &lt;&lt;pointcut&gt;&gt;, and can occur in any Java Class, Interface or aspect; the details of the pointcut are included in the 'behavior' field of the method.</p> <p>Advice is defined as an operation with the stereotype &lt;&lt;advice&gt;&gt;; the pointcut this advice operates on is in the 'behavior' field and acts as part of the method's unique signature.</p> <p>afterAdvice can also have one of the <b>Tagged Values</b> returning or throwing.</p>
PHP	<p>Appropriate type of source file: .php, .php4, or .inc.</p> <p>Nested if condition syntax is enabled.</p>
Python	<p>Appropriate type of source file: .py.</p>
Visual Basic	<p>Appropriate type of source file: .cls Class file.</p>
Visual Basic .NET	<p>Appropriate type of source file: .vb Class file.</p>


# Import Resource Script

Enterprise Architect supports the import and export of Microsoft Windows Resource Scripts (as .rc files), which contain the Win32® dialog definitions (those with the stereotype «win32Dialog») for an application's graphical user interface. Dialog resources are imported and exported for a specific language, defaulting to the locale of the current computer system.

## Access

Ribbon	Code > Source Code > Import Code > Windows .RC File
Menu	Package   Code Engineering   Import   Resource Script
Context Menu	Right-click on a Package   Code Engineering   Import Resource Script Right-click on a Screen element   Code Engineering   Synchronize with Code
Keyboard Shortcuts	<b>F7</b> (synchronize element with code)


## Import dialog resources from a .rc file

Field/Button/Option	Action
Resource File	Click on the  button and locate the .rc file to import the screen elements(s) from.
Resource ID	Either: <ul style="list-style-type: none"> <li>• Leave the default value 'All' to import all screen elements from the file, or</li> <li>• Click on the drop-down arrow and select the screen ID of a specific dialog to import</li> </ul>
Language	Click on the drop-down arrow and select the language version (such as English - United States) of the dialog(s) to import.
Import	Click on this button to import the screens from the resource file. The progress of the import is reported in the field underneath the 'Language' field.

## Export a dialog to a .rc file

Field/Button/Option	Action
Screen ID	Defaults from the Win32UI ID <b>Tagged Value</b> of the selected Screen element. (If the dialog does not have this ID, open the 'Win32UI' page of the element's



	'Properties' dialog and provide a value for the ID tag.)
Resource File	<p>Click on the  button and locate the .rc file into which to export the screen element(s).</p> <p>If the element was previously imported, this field defaults to the source file.</p>
Language	Click on the drop-down arrow and select the language version (such as English - United States) of the exported dialog.
Export	<p>Click on this button to export the screens from the resource file.</p> <p>The progress of the export is reported in the field underneath the 'Language' field.</p>

## Notes

- New dialogs are exported to an existing .rc file
- In an export to an existing .rc file, no dialogs are ever deleted from the file, even when they are deleted from the model
- In an import, no dialogs are deleted from the model even when omitted from the original .rc file

## Import a Directory Structure

You can import from all source files in a complete directory structure, which enables you to import or synchronize multiple files in a directory tree in one pass.

Enterprise Architect creates the necessary Packages and diagrams during the import process.

### Access

Ribbon	Code > Source Code > Import Code > Import Directory
Menu	Package > Code Engineering > Import > Source Directory
Context Menu	<b>Project Browser</b>   Right-click on Package   Code Engineering   Import Source Directory
Keyboard Shortcuts	<b>Ctrl + Shift + U</b>

### Import a directory structure, using the Import Source Directory dialog

Step	Action
1	<p>Select the options you require; you can configure:</p> <ul style="list-style-type: none"> <li>• The source directory</li> <li>• The source type</li> <li>• The file extensions to look at</li> <li>• Whether to recurse sub directories</li> <li>• Whether to create a diagram for each Package</li> <li>• Whether to import additional files as described in the 'Import Component Types' dialog</li> <li>• Whether to exclude private members from libraries being imported from the model</li> <li>• Whether to Synchronize or Overwrite existing Classes when found; if a model Class is found matching the one in code: <ul style="list-style-type: none"> <li>- 'Synchronize' updates the model Class to include the details from the one in code, which preserves information not represented in code, such as the location of Classes in diagrams</li> <li>- 'Overwrite' deletes the model Class and generates a new one from code, which deletes and does not replace the additional information</li> </ul> </li> <li>• Whether to create a Package for every directory, namespace or file; this might be restricted depending on the source type selected</li> <li>• How to handle Classes not found during the import (prompt for action enables you to review Classes individually)</li> <li>• What is shown on diagrams created by the import</li> </ul>
2	Click on the <b>OK button</b> to start.

## Learning Center topics

- **Alt+F1** | Enterprise Architect | Software Engineering | Import Code | Import Source Directory

# Import Binary Module

Enterprise Architect enables you to reverse-engineer certain types of binary modules.

## Access

Ribbon	Code > Source Code > Import Code > Binary File
Menu	Package   Code Engineering   Import   Binary Module
Context Menu	Right-click on Package   Code Engineering   Import Binary Module

## Use

Currently the permitted types are:

- Java Archive (.jar)
- .NET PE file (.exe, .dll) - Native Windows DLL and EXE files are not supported, only PE files containing .NET assembly data
- Intermediate Language file (.il)

Enterprise Architect creates the necessary Packages and diagrams during the import process; selecting the 'Do not import private members' checkbox excludes private members from libraries from being imported into the model.

When importing .NET files, you can import via reflection or via disassembly, or let the system select the best method - this might result in both types being used.

The reflection-based importer relies on a .NET program, and requires the .NET runtime environment to be installed.

The disassembler-based importer relies on a native Windows program called Ildasm.exe, which is a tool provided with the MS .NET SDK; the SDK can be downloaded from the Microsoft website.

A choice of import methods is available because some files are not compatible with reflection (such as mscorlib.dll) and can only be opened using the disassembler; however, the reflection-based importer is generally much faster.

You can also configure:

- Whether to Synchronize or Overwrite existing Classes when found; if a model Class is found matching the one in the file:
  - Synchronize updates the model Class to include the details from the one in the file, which preserves information not represented in the file, such as the location of Classes in diagrams
  - Overwrite deletes the model Class and generates a new one from the file, which deletes and does not replace the additional information
- Whether to create a diagram for each Package
- What is shown on diagrams created by the import

## Learning Center topics

- **Alt+F1** | Enterprise Architect | Software Engineering | Import Code | Import Compiled Java Libraries
- Alt+F1 | Enterprise Architect | Software Engineering | Import Code | Import from .Net Assemblies



## Classes Not Found During Import

When reverse engineering from your code, there might be times when Classes are deliberately removed from your source code.

The 'Import Source Directory' functionality keeps track of the Classes it expects to synchronize with and, on the 'Import Directory Structure' dialog, provides options for how to handle the Classes that weren't found.

You can select the appropriate option to make Enterprise Architect, at the end of the import, ignore the missing Classes, automatically delete them or prompt you to manage them.

On the 'Import Directory Structure' dialog, if you select the 'Prompt For Action' radio button to manually review missing Classes, a dialog displays on which you specify the handling for each Class that was missing in the imported code.

By default, all Classes are marked for deletion; to keep one or more Classes, select them and click on the **Ignore button**.

## Editing Source Code

Enterprise Architect contains a powerful source code editor that helps you to view, edit and maintain your source code directly inside the tool. Once source code has been generated for one or more Classes it can be viewed in this flexible editing environment. Seeing the code in the context of the UML models from which it is derived brings clarity to both the code and the models, and bridges the gap between design and implementation that has historically introduced errors into software systems.

The **Source Code Editor** is fully-featured, with a structure tree for easy navigation of attributes, properties and methods. Line numbers can be displayed and syntax highlight options can be configured. Many of the features that software engineers are familiar with in their favorite IDE, such as Intelli-sense and code completion are included in the editor. There are many additional features, such as macro recording that makes it easy to manage the source code inside Enterprise Architect. There are also many options for managing the code, available through the code editor context menu, toolbar and function keys.

For most programming languages a single file is created from a **UML Class**, but in the case of C++ both header and implementation classes are created and the source code editor displays these files in separate tabs.

A number of options change the way the source code editor works; they can be altered using the 'Options' dialog available from the editors toolbar or from the main menu:

'Tools | Options | Source Code Engineering | **Code Editors**'

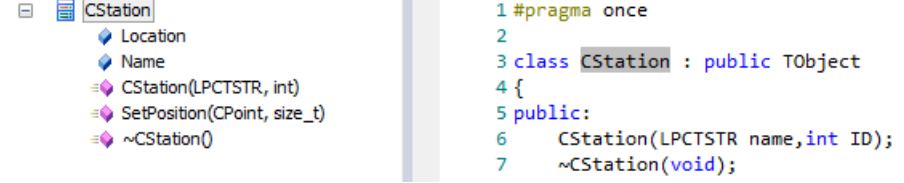
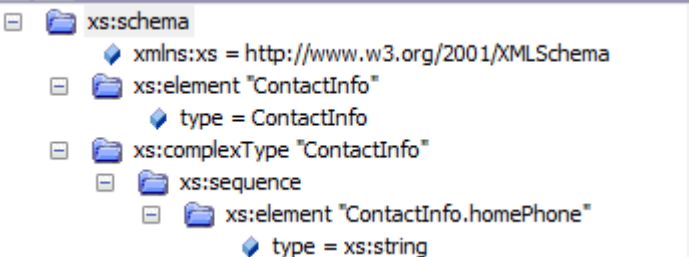
There are four variants of the Source Code Editor, with different access methods. The variants are discussed in the *Compare Editors* topic.

### Access

Ribbon	Code > Source Code > Edit Code > Open Source File or Code > Source Code > Edit Code > Edit Element Source or Code > Source Code > Edit Code > Edit New Source File
Menu	Edit   Open Source File
Context Menu	<b>Project Browser</b>   Right-click on element   Code Engineering   View Source Code On diagram   Right-click on element   Code Engineering   View Source Code
Keyboard Shortcuts	<b>Ctrl</b> + E (for code associated with elements) Ctrl + <b>Alt</b> + O (for external files)

### Facilities

Facility	Description
Source Code editor	By default the Source Code editor is set to: <ul style="list-style-type: none"> <li>Parse all opened files, and show a tree of the results</li> <li>Show line numbers</li> </ul>

	 <p>If you are editing an XML file, the structure tree is presented in a folder hierarchy rather than a Class structure hierarchy:</p> 
Structure Tree	<p>The structure tree is available for supported language files, such as C++, C#, Java, XML files such as <b>XSD</b>, <b>XSL</b></p>

## Notes

- There are no context menu options to display XML or DDL.sql files; select the appropriate object and use the keyboard keys **F12** or **Alt+7**
- When you select an element to view source code, if the element does not have a generation file (that is, code has not been or cannot be generated, such as for a Use Case), Enterprise Architect checks whether the element has a link to either an operation or an attribute of another element - if such a link exists, and that other element has source code, the code for that element displays
- You can also locate the directory containing a source file that has been created in or imported to Enterprise Architect, and edit it or its related files using an external editor such as Notepad or Visual Studio; right-click on the element in the **Project Browser** and select the 'Code Engineering | Open Source Directory' option (**Ctrl+Alt+Y**)

## Learning Center topics

- **Alt+F1** | Enterprise Architect | Software Engineering | Code Editor



## Languages Supported



The Source Code Editors can display code in a wide range of languages, as listed here. For each language, the editor highlights - in colored text - the standard code syntax.

- Ada (.ada, .ads, **.adb**)
- ActionScript (.as)
- BPEL Document (.bpel)
- C++ (.h, .hh, .hpp, .c, .cpp, .cxx)
- C# (.cs)
- DDL Structured Query Language (.sql)
- Delphi/Pascal (.pas)
- Diff/Patch Files (.diff, .patch)
- Document Type Definition (.dtd)
- DOS Batch Files (.bat)
- DOS Command Scripts (.cmd)
- HTML (.html)
- Interface Definition Language (.idl, .odl)
- Java (.java)
- Javascript (.javascript)
- JScript (.js)
- Modified Backus-Naur Form Grammar (.mbnf)
- PHP (.php, .php4, .inc)
- Python (.py)
- Standard Generalized Markup Language (.sgml)
- SystemC (.sc)
- Visual Basic 6 (.bas)
- VB.NET (.vb)
- VBScript (.vbs)
- Verilog (.v)
- VHSIC Hardware Description Language (.vhdl)
- Visual Studio Resource Configuration (.rc)
- XML (eXtensible Markup Language) (.xml)
- **XSD** (XML Schema Definition)
- XSL (XML Stylesheet Language)

# Configure File Associations

If you are a Windows® user, you can configure Enterprise Architect to be the default document handler for your language source files.

## Access

Ribbon	Start > Preferences > Preferences > Source Code Engineering > <b>Code Editors</b> : Configure Enterprise Architect File Associations 
Menu	Tools   Options   Source Code Engineering   <b>Code Editors</b> : Configure Enterprise Architect File Associations 

## Actions

For each file type that you would prefer to open in Enterprise Architect, click the checkbox to the left of the file type name. After selecting all of the document types you require, click on the **Save button**.

After this, clicking any corresponding file in Windows® Explorer will open it in Enterprise Architect.

## Notes

- You can change the default programs, or documents handled by them, directly through the 'Default Programs' option in Windows ® Control panel.

## Compare Editors

Enterprise Architect provides four principal code editor variants, available through a number of access paths. The most direct access options are identified in these descriptions.

The first three code editor variants listed have the same display format, option toolbar, context menu options and internal function keys. They differ in their method of access and display mechanism.

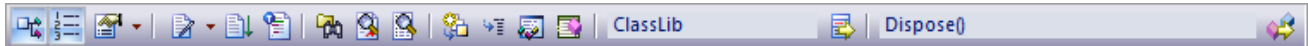
### Editor Variants

Variant	Function Key/ Menu Option
Source Code window (Dockable)	<p><b>Alt+7</b></p> <p>'Element   Show Source Viewer'</p> <p>Description: Displays the contents of the source file for a selected Class (except if the language is C++, when the window displays a tab for the Header file and a tab for the Implementation file).</p> <p>If you select a different Class, the window changes to show the code for the new Class (unless the first Class calls the second, in which case the window scrolls down to the second Class's code instead).</p>
Source Code View	<p><b>F12</b></p> <p><b>Ctrl+E</b></p> <p>Class context menu   'View Source Code'</p> <p>Description: Displays the code on a tab of the <b>Diagram View</b>; the tab label shows the file name and extension (such as .java); again, for C++, there are two tabs for the Header and Implementation files.</p> <p>You can display the source code for other Classes on additional tabs, by reselecting the menu option/keys on the next Class.</p>
Internal Editor, External Source Code	<p><b>Ctrl+Alt+O</b></p> <p>'Edit   Open Source File'</p> <p>Description: Use this option if you intend to edit external code, XML or DDL files (that is, code not imported to or generated in Enterprise Architect).</p> <p>Displays an external browser, then opens the specific selected code file as a tab of the <b>Diagram View</b> (for C++, not two code files); otherwise this is identical to the <b>F12</b> option.</p>
External Editor, Internal or External Source Code	<p><b>Ctrl+Alt+Y</b></p> <p>Class context menu   Open Source Directory</p> <p>Description: Displays an external file browser, open to the directory containing the selected Class's source files; you can open the files in Notepad, Visual Studio or other tools you might have on your system.</p>

# Code Editor Toolbar

When you are reviewing the code for a part of your model in the Source Code editor, you can access a wide range of display and editing functions from the editor toolbar.

## Code Editor Toolbar



## Toolbar Options

<b>Structure Tree</b>	Click on this icon to show or hide the element hierarchy panel (the left panel of the Source Code editor).
<b>Line Numbers</b>	Click on this icon to show or hide the line numbers against the lines of code.
<b>Source Code Engineering Properties</b>	<p>Click on the drop-down arrow to display a menu of options to select individual 'Source Code Engineering' pages of the 'Options' dialog, from which you can configure display and behavior options for source code engineering:</p> <ul style="list-style-type: none"> <li>• Syntax Highlighting Options</li> <li>• Code Editor Options</li> <li>• Code Engineering Options</li> <li>• Code Editor Key Bindings</li> </ul>
<b>Editor Functions</b>	<p>Click on the drop-down arrow to display a menu providing access to a range of code editing functions:</p> <ul style="list-style-type: none"> <li>• 'Open Corresponding File' (<b>Ctrl+Shift+O</b>) - opens the header or implementation file associated with the currently-open file</li> <li>• 'Go to Matching Brace' (<b>Ctrl+E</b>) - for a selected opening or closing brace, highlights the corresponding closing or opening brace in the pair</li> <li>• 'Go to Line' (<b>Ctrl+G</b>) - displays a dialog on which you select the number of the line to highlight; click on the <b>OK button</b> to move the cursor to that line</li> <li>• 'Cursor History Previous' (<b>Ctrl+-</b>) - the Source Code viewer keeps a history of the previous 50 cursor positions, creating a record when the cursor is moved either more than 10 lines away from its previous position, or in a find-and-replace operation; the menu option moves the cursor to the position in the immediately-previous cursor history record</li> <li>• 'Cursor History Next' (<b>Ctrl+Shift+-</b>) - if you have moved to an earlier cursor position, this option moves the cursor to the position in the immediately-following cursor history record</li> <li>• 'Find' (<b>Ctrl+F</b>) - displays a dialog in which you define a text string and search options to locate that text string in the code</li> <li>• 'Replace' (<b>Ctrl+R</b>) - displays a dialog in which you define a text string and search options to locate that text string in the code and replace it with another text string; the dialog has options to locate and replace each occurrence as you decide, or to replace all occurrences immediately</li> <li>• 'Record Macro' - records your next keystrokes to be saved as a macro</li> <li>• 'Stop Recording and Save Macro' - stops recording the keystrokes and displays</li> </ul>

the 'Save Macro' dialog on which you specify a name for the macro

- 'Play Macro' - displays the 'Open Macro' dialog from which you select and execute a saved macro, to repeat the saved keystrokes
- 'Toggle Line Comment' (**Ctrl+Shift+C**) - comments out ( // ) or re-establishes the code for each full line in which text is highlighted
- 'Toggle Stream Comment' (**Ctrl+Shift+X**) - inserts a stream comment ( /\* \*/) at the cursor position (comments out only the highlighted characters and lines), or re-establishes the commented text as code
- 'Toggle Whitespace Characters' (**Ctrl+Shift+W**) - shows or hides the spacing characters: --> (tab space) and . (character space)
- 'Toggle EOL Characters' (**Ctrl+Shift+L**) - shows or hides the end-of-line characters: CR (carriage return) and LF (line feed)
- 'Open Containing Folder' - opens the file browser at the folder containing the code file; you can open other files in your default external editor for comparison and parallel work

<b>Save Source and Resynchronize Class</b>	Click on this icon to save the source code and resynchronize the code and the Class in the model.
<b>Code Templates</b>	Click on this icon to access the Code Templates Editor, to edit or create code templates for code generation.
<b>Find in Project Browser</b>	For a selected line of code, click on this icon to highlight the corresponding structure in the <b>Project Browser</b> . If there is more than one possibility the 'Possible Matches' dialog displays, listing the occurrences of the structure from which you can select the required one.
<b>Search in Files</b>	Click on this icon to search for the selected object name in associated files, and display the results of the search in the <b>File Search window</b> . You can refine and refresh the search by specifying criteria on the <b>Find in Files window</b> toolbar.
<b>Search in Model</b>	Click on this icon to search for the selected text throughout the model, and display the results of the search in the <b>Model Search window</b> .
<b>Go to Declaration</b>	Click on this icon to locate the declaration of a symbol in the source code.
<b>Go to Definition</b>	Click on this icon to locate the definition of a symbol in the source code (applicable to languages such as C++ and Delphi, where symbols are declared and defined in separate files).
<b>Autocomplete List</b>	Click on this icon to display the autocompletion list of possible values; double-click on a value to select it.
<b>Parameter Information</b>	When the cursor is between the parentheses of an operation's parameter list, click on this icon to display the operation's signature, highlighting the current parameter.
<b>Find Current Class in Project Browser</b>	Click on this icon to display the name of the currently-selected Class in the code, and highlight that name in the <b>Project Browser</b> ; if there is more than one possibility the 'Possible Matches' dialog displays, listing the occurrences of the Class from which you can select the required one.
<b>Find Member</b>	Click on this icon to display the name of the currently-selected attribute or method in the code, and highlight that name in the <b>Project Browser</b> ; if there is more than one possibility the 'Possible Matches' dialog displays, listing the occurrences of the feature from which you can select the required one.

## Notes

- The 'Record Macro' option disables Intelli-sense while the macro is being recorded
- You can assign key strokes to execute the macro, instead of using the toolbar drop-down and 'Open Macro' dialog

## Code Editor Context Menu

When working on a file with a code editor, you can perform a number of code search and editing operations to review the contents of the file. These options are available through the editor context menu, and can vary depending on which code editor you are using.

### Access

Context Menu	Right-click on the code text string you are working on
--------------	--

### Options

**Go to Declaration**      Locate and highlight the declaration of a symbol in the source code.

**Go to Definition**      Locate and highlight the definition of a symbol in the source code (applicable to languages such as C++ and Delphi, where symbols are declared and defined in separate places).

**Search for '<string>'**      Display a submenu providing options to locate the selected text string in a range of locations.

- 'Find in Project Browser' - Highlight the object containing the selected text in the **Project Browser**
- 'Search in Open Files' - Search for the selected text string in associated open files and display the results of the search in the **Find in Files window**; you can refine and refresh the search by specifying criteria on the Find in Files window toolbar
- 'Search in Files' - Search for the selected text string in all associated files (closed or open), and display the results of the search in the Find in Files window; you can refine and refresh the search by specifying criteria on the Find in Files window toolbar (shortcut key: **F12**)
- 'Search in Model' - Perform an 'Element Name' search in the **Model Search** facility, and display the results on the Model Search tab
- 'Search in Scripts' - (Available while working in the **Script Editor**) Open the Find in Files window, set the 'Search Path' field to 'Search in Scripts' and the 'Search Text' field to the selected text, then search all scripts for the text string and display the results of the search; you can refine and refresh the search by specifying criteria on the Find in Files window toolbar
- 'EA User Guide' - Display the description of the code item in the *Enterprise Architect User Guide*
- 'Google' - Display the results of a Google search on the text
- 'MSDN' - Display the results of a search on the text in the Microsoft Developer Network (MSDN)
- 'Sun Java SE' - Display the results of a search on the text in the Sun Microsystems 'Sun Search' facility
- 'Wikipedia' - Display any entry on the object on the Wikipedia web site
- 'Koders' - Display the results of a search for the text string on Koders.com

<b>Search Intelli-sense   &lt;list of query names&gt;</b>	Perform a search on the specified string in any Intelli-sense libraries listed in the active Execution Analyzer script, and display the results in the <b>Find in Files window</b> , 'Intelli-sense Search' tab. Shortcut key: <b>Shift + F12</b>
<b>Set Debugger to Line</b>	(If the debugger is executing and has reached a breakpoint.) Move the execution point to the current line. Check that you do not skip over any code or declarations that affect the next section of code being debugged.
<b>Display Variable</b>	(If the debugger is executing.) Open the <b>Locals window</b> and highlight the local variable for the current point in the code.
<b>Show in String Viewer</b>	Display the full contents of a variable string in the String Viewer.
<b>Create Use Case for '&lt;string&gt;'</b>	Display the 'Create Use Case For Method' dialog, through which you create a Use Case for the method containing the text string.
<b>Breakpoint</b>	Display a submenu of options for creating a recording marker on the selected line of code. The recording markers you can add include: <ul style="list-style-type: none"> <li>• Breakpoint</li> <li>• Start Recording Marker</li> <li>• End Recording Marker</li> <li>• Stack Auto Capture Marker</li> <li>• Method Auto Record Marker</li> <li>• <b>Tracepoint</b></li> </ul>
<b>Testpoints</b>	Display options to add a new <b>Testpoint</b> , show the <b>Testpoints Manager</b> ( <b>Testpoints</b> window) or edit an existing Testpoint if one or more are already defined at the selected location. (The sub-options depend on the type of code file you are reviewing.)
<b>XML Validation</b>	Allows an xml document to be checked for compliance with it's own schema references or using a user specified schema; either a local schema file or URL.
<b>Open (Close) IME</b>	Open (or close) the Input Method Editor, so that you can enter text in a selected foreign language script, such as Japanese. You set the keyboard language using the Windows Control Panel - Regional and Language Options facility.
<b>Line Numbers</b>	( <b>Script Editor</b> only.) Show or hide the code line numbers on the left hand side of the editor screen.
<b>Undo Cut Copy Paste Delete Select All</b>	These six options provide simple functions for editing the code.

## Notes

- The options in the lower half of the 'Search for <string>' submenu (after 'Search in Scripts') are configurable; you



can add new search tools or remove existing ones by editing the searchProviders.xml file in the Sparx Systems > EA > Config folder - this file is in OpenSearch description document format

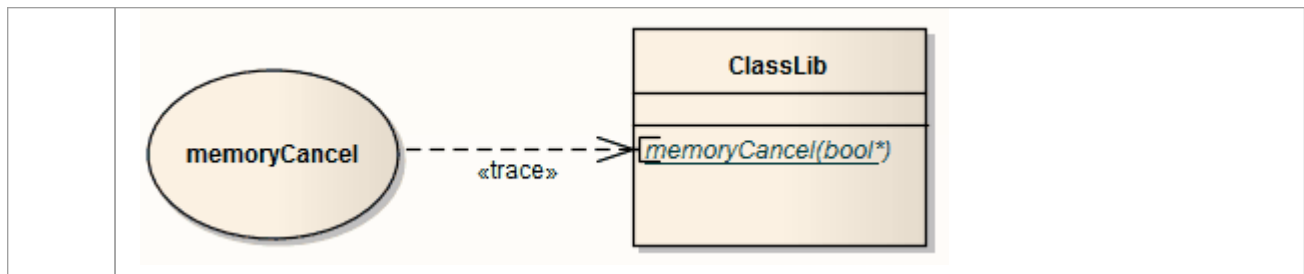
## Create Use Case for Method

Using the code editor context menu, you can create a Use Case element for a method that you select from the code. You can also:

- Link the Use Case directly to the method
- Add the parent Class to a diagram (if it is not already in the selected diagram) and/or add the Use Case element to the diagram
- Block from display any attributes or methods that are not also the targets of feature links

### Create a Use Case for a method, through the code editor

Step	Action
1	(If you want to depict the Use Case and its link to the method in a diagram) click on the diagram name in the <b>Project Browser</b> .
2	In the code editor, right-click on either the method name or any part of the method body, and select the 'Create Method for <methodname>' option. The 'Create Use Case for Method' dialog displays.
3	The basic function of this dialog is to create a Use Case for the selected method: <ul style="list-style-type: none"> <li>• If this is all that is required, click on the <b>OK button</b>; the Use Case element is created in the <b>Project Browser</b>, in the same Package as the parent Class for the method, and with the same name as the method</li> <li>• If you intend to make the relationship tangible, continue with the procedure</li> </ul>
4	To create a Trace connector linking the Use Case to the method, select the Link Use Case to Method check box.
5	To add the method's parent Class to the diagram, if it is not already there, select the Add Class to Diagram check box.
6	To add the newly-created Use Case to the diagram, select the Add Use Case to Diagram check box; this would now show the Use Case, Class and Trace connector on the diagram.
7	To only show the features (attributes and methods) of the parent Class that are the targets of 'link to feature' relationships, select the 'Display only linked features in Class' checkbox. The Class might contain any number of attributes and methods, but those without a 'link to feature' relationship are hidden.
8	Click on the <b>OK button</b> to create and depict the Use Case and relationship; if you selected all options, the diagram now contains linked elements resembling this illustration:



# Code Editor Functions

The common Code Editor provides a variety of functions to assist with the code editing process, including:

- Syntax Highlighting
- Bookmarks
- Cursor History
- Brace Matching
- Automatic Indentation
- Commenting Selections
- Scope Guides
- Zooming
- Line Selection
- Intelli-sense
- Find and Replace
- Find in Files

A range of these functions is available through keyboard key combinations and/or context menu options.

You can customize several of the Code Editor features by setting properties in the Code Editor configuration files; for example, by default the line containing the cursor is always highlighted, but you can turn the highlighting off.

## Learning Center topics

- **Alt+F1** | Enterprise Architect | Software Engineering | Code Editor | Locate in Source
- Alt+F1 | Enterprise Architect | Software Engineering | Code Editor | Using Intelli-sense

# Function Details

## Code Editor Functions

Topic	Detail
Syntax Highlighting	<p>The Code Editor highlights - in colored text - the standard code syntax of all language file formats supported by Enterprise Architect</p> <pre> 1 #pragma once 2 #include "afxwin.h" 3 #include "afxcmn.h" 4 5 6 // CToolBox dialog 7 8 class CToolBox : public CDialog 9 { 10     DECLARE_DYNAMIC(CToolBox) 11     CRect m_rect; 12     int m_offset; </pre> <p>You can define how the Code Editor implements syntax highlighting for each language, through the 'Code Editors' page of the 'Options' dialog.</p>
Bookmarks	<p>Bookmarks denote a line of interest in the document; you can toggle them on and off for a particular line by pressing <b>Ctrl+F2</b>.</p> <p>Additionally, you can press <b>F2</b> and <b>Shift+F2</b> to navigate to the next or previous bookmark in the document.</p> <p>To clear all bookmarks in the code file, press <b>Ctrl+Shift+F2</b>.</p>
Cursor History	<p>The Code Editor Control keeps a history of the previous 50 cursor positions; an entry in the history list is created when:</p> <ul style="list-style-type: none"> <li>• The cursor is moved more than 10 lines from its previous position</li> <li>• The cursor is moved in a find/replace operation</li> </ul> <p>You can navigate to an earlier point in the cursor history by pressing <b>Ctrl+-</b>, and to a later point by pressing <b>Ctrl+Shift+-</b>.</p>
Brace Matching	<p>When you place the cursor over a brace or bracket, the Code Editor highlights its corresponding partner; you can then navigate to the matching brace by pressing <b>Ctrl+E</b>.</p> <pre> 28           function ProtectedFunctionTest: boolean; 29           procedure ProtectedProcedureTest(a: WideString); </pre>
Automatic Indentation	<p>For each supported language, the Code Editor adjusts the indentation of a new line according to the presence of control statements or scope block tokens in the lines leading up to the cursor position.</p>

	<pre> 358 { 359     for(size_t t = 0; t &lt; Stations.size(); t++) 360     { 361         if(Stations[t]-&gt;Location == loc) 362             return Stations[t]; 363     } 364     return NULL; 365 } </pre> <p>The levels of indent are indicated by pale horizontal lines.</p> <p>You can also manually indent selected lines and blocks of code by pressing Tab; to un-indent the selected code, press <b>Shift+Tab</b>.</p>
Commenting Selections	<p>For languages that support comments, the Code Editor can comment entire selections of code.</p> <p>The Code Editor recognizes two types of commenting:</p> <ul style="list-style-type: none"> <li>Line Commenting - entire lines are commented from the start (for example: // This is a comment )</li> <li>Stream Commenting - sections of a line are commented from a specified start point to a specified end point (for example: /* This is a comment */)</li> </ul> <p>You can toggle comments on the current line or selection by pressing:</p> <ul style="list-style-type: none"> <li><b>Ctrl+Shift+C</b> for line comments, or</li> <li><b>Ctrl+Shift+X</b> for stream comments</li> </ul>
Scope Guides	<p>If the cursor is placed over an indentation marker, the Code Editor performs a 'look back' to find the line that started the scope at that indentation level; if the line is found and is currently on screen, it is highlighted in light blue.</p> <pre> 93 // If there were any answers, then return a packet, if not then just return null 94 // to indicate the server has no response 95 if ( answers.size() &gt; 0 ) 96 { 97     DNSPacket responsePacket = Helpers.createResponsePacket( answers, this.theS 98     responsePacket.queryID = receivedPacket.queryID; 99 100     return responsePacket; 101 } </pre> <p>Alternatively if the line is off screen, a calltip is displayed advising of the line number and contents:</p> <pre> 93 // If there were any answers, then return a packet, if not then just return null 94 // to indicate the server has no response 95 if ( answers.size() &gt; 0 ) 96 { 97     Line 73: private DNSPacket processQuery(DNSPacket receivedPacket) 98     DNSPacket responsePacket = Helpers.createResponsePacket( answers, this.theS 99     responsePacket.queryID = receivedPacket.queryID; 100 101     return responsePacket; 102 } </pre>
Zooming	<p>You can zoom into and out of the contents of the Code Editor using:</p> <ul style="list-style-type: none"> <li><b>Ctrl + keypad +</b> and</li> <li><b>Ctrl + keypad -</b></li> </ul> <p>Zoom can be restored to 100% using <b>Ctrl + keypad /</b>.</p>
	<p>If you want to move the cursor to a specific line of code, press <b>Ctrl+G</b> and, in</p>

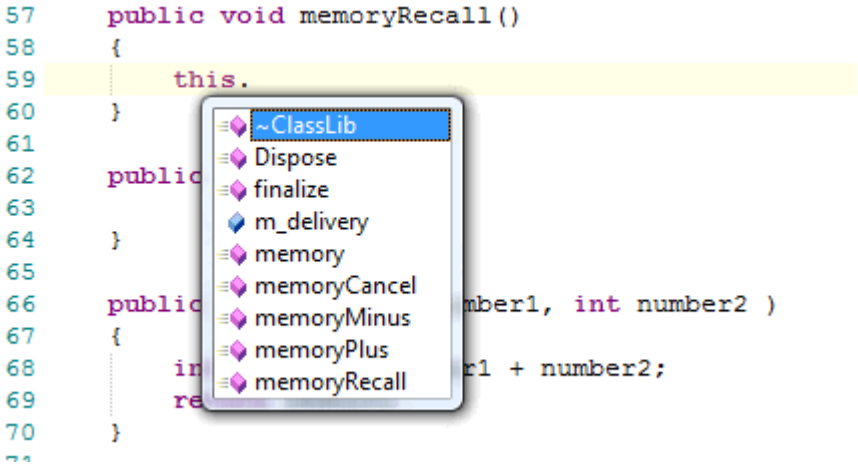
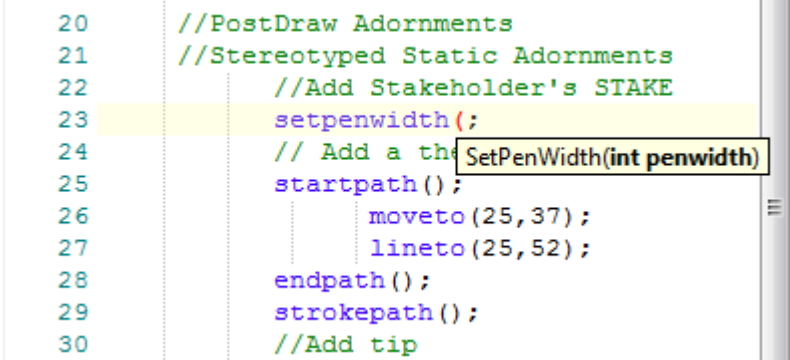
Line Selection	<p>response to the prompt, type in the line number.</p> <p>Press the <b>OK button</b>; the editor displays the specified line of code with the cursor at the left.</p>
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# Intelli-sense

Intelli-sense is a feature that provides choices of code items and values as you type. Not all code editors use Intelli-sense; for example, Intelli-sense is disabled while you record a macro in the **Source Code Viewer**.

Intelli-sense provides you with context-based assistance through autocompletion lists, calltips and mouseover information.

## Topics

Topic	Detail
Autocompletion List	<p>An autocompletion list provides a list of possible completions for the current text; the list is automatically invoked when you enter an accessor token (such as a period or pointer accessor) after an object or type that contains members.</p>  <pre> 57     public void memoryRecall() 58     { 59         this. 60     } 61 62     public 63 64     } 65 66     public 67     { 68         in 69         re 70     } 71 </pre> <p>You can also invoke the autocompletion list manually by pressing <b>Ctrl+Space</b>; the Code Editor then searches for matches for the word leading up to the invocation point.</p> <p>Select an item from the list and press the <b>Enter</b> key or <b>Tab</b> key to insert the item into the code; to dismiss the autocompletion list, press <b>Esc</b>.</p>
Calltips	<p>Calltips display the current method's signature when you type the parameter list token (for example, opening parenthesis); if the method is overloaded, the calltip displays arrows that you can use to navigate through the different method signatures</p>  <pre> 20     //PostDraw Adornments 21     //Stereotyped Static Adornments 22     //Add Stakeholder's STAKE 23     setpenwidth( 24     // Add a th 25     startpath(); 26     moveto(25,37); 27     lineto(25,52); 28     endpath(); 29     strokepath(); 30     //Add tip </pre>



Mouseover Information	<p>You can display supporting documentation for code elements (for example, attributes and methods) by hovering the cursor over the element in question.</p> <pre>11 dockable = "none"; 12 13 / Dock elements together. Tagged V 14 Valid Values: none, standard 15 //PreDraw Derived Attribute I</pre>
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# Find and Replace

Each of Enterprise Architect's code editors facilitates searching for and replacing terms in the editor, through the 'Find and Replace' dialog.

## Access

Highlight the required text string and press:

- **Ctrl+F** for the find controls only, or
- **Ctrl+R** for both find and replace controls

In each instance, the 'Find what' field is populated with the text currently selected in the editor. If no text is selected in the editor, the 'Find what' field is populated with the word at the current cursor position. If no word exists at the current cursor position, the last searched-for term is used.

## Basic Operations - Commands

Command	Action
Find Next	Locate and highlight the next instance (relative to the current cursor position) of the text specified in the 'Find what' field.
Replace	Replace the current instance of the text specified in the 'Find what' field with the text specified in the 'Replace with' field, and then locate and highlight the next instance (relative to the current cursor position) of the text specified in the 'Find what' field.
Replace All	Automatically replace all instances of the text specified in the 'Find what' field with the text specified in the 'Replace with' field.

## Basic Operations - Options

Option	Action
Match Case	Specify that the case of each character in the text string in the 'Find what' field is significant when searching for matches in the code.
Match whole word	Specify that the text string in the 'Find what' field is a complete word and should not be matched with instances of the text that form part of a longer string. For example, searches for ARE should not match those letters in instances of the words AREA or ARENA.
Search up	Perform the search from the current cursor position up to the start of the file, rather than in the default direction of current cursor position to end of file.
Use Regular Expressions	Evaluate specific character sequences in the 'Find what' and 'Replace with' fields as

## Regular Expressions.

## Concepts

### Regular Expressions

A Regular Expression is a formal definition of a search pattern, which can be used to match specific characters, words or patterns of characters.

For the sake of simplicity, the Code Editor's 'find and replace' mechanism supports only a subset of the standard Regular Expression grammar.

Text in the 'Find what' and 'Replace with' fields is only interpreted as a Regular Expression if the 'Use Regular Expressions' checkbox is selected in the 'Find and Replace' dialog.

### Metasequences

If the 'Use Regular Expressions' checkbox is selected, most characters in the 'Find what' field are treated as literals (that is, they match only themselves).

The exceptions are called **metasequences**; each metasequence recognized in the Code Editor 'Find and Replace' dialog is described in this table:

- \< - Indicates that the text is the start of a word; for example: \<cat is matched to *catastrophe* and *cataclysm*, but not *concatenate*
- \> - Indicates that the text is the end of a word; for example: hat\> is matched to *that* and *chat*, but not *hate*
- (...) - Indicates alternative single characters that can be matched - the characters can be specific (chr) or in an alphabetical or numerical range (a-m); for example: (hc) at is matched to *hat* and *cat* but not *bat*, and (a-m) Class is matched to any name in the range *aClass-mClass*
- (^...) - Indicates alternative single characters that should be excluded from a match - the characters can be specific (^chr) or in an alphabetical or numerical range (^a-m); for example: (^hc) at is matched to *rat* and *bat*, but *hat* and *cat* are excluded, and (^a-m) Class is matched to any name in the range *nClass* to *zClass*, but *aClass* to *mClass* are excluded
- ^ - Matches the start of a line
- \$ - Matches the end of a line
- \* - Matches the preceding character (or character set) 0 or more times; for example: ba\*t is matched to *bt*, *bat*, *baat*, *baaat* and so on, and b( ea ) \*t is matched to *bt*, *bet*, *bat*, *beat*, *beet*, *baat* and so on
- + - Matches the preceding character (or character set) 1 or more times; for example: ba+t is matched to *bat*, *baat* and *baaat* but not *bt*, and b( ea ) +t is matched to *bet*, *bat*, *beat*, *beet* and *baat* but not *bt*

If a single character metasequence is preceded by a backslash (\) it is treated as a literal character: c\( at\ ) matches c( at ) as the brackets are treated literally.

When the 'Use Regular Expressions' checkbox is selected, a metasequence helper menu is available to the right of both of the 'Find what' and 'Replace with' fields; selecting a metasequence from this menu inserts the metasequence into the field, replacing or wrapping the currently selected text as appropriate.

### Tagged Regions

When 'find and replacing' with Regular Expressions, up to nine sections of the original term can be substituted into the replacement term.

The **metasequences** \"(' and '\")' denote the start and the end of a tagged region; the section of the matched text that falls within the tagged region can be included in the replacement text with the metasequence \"n' (where *n* is the tagged region number

between 1 and 9).

For example:

Find: `\(( A-Za-z ) +\) 's things`

Replace with *items that belong to \1*

Original text: *These are all Michael's things.*

Replaced text: *These are all items that belong to Michael.*

## Search in Files

File Text Searches are provided by the **Search window** and from within the **Code Editors**, to search files for data names and structures. These files can be external code files, code files that you have already opened in Enterprise Architect, internal model scripts or the Help subsystem.

The Search window maintains a history of the file paths you have explored, helping you to quickly return to frequently-used folders in your file system. You can similarly select a previously-used search string, if you need to repeat a search several times. When you are searching code files, you can also confine the search to files of specific types, by selecting the file extensions, and to include just the selected folder or all of its subfolders as well. Another useful facility is being able to select to show the results of the search as either a list of every instance of the string, or a list of files containing the string with the instances grouped under the file in which they are found.

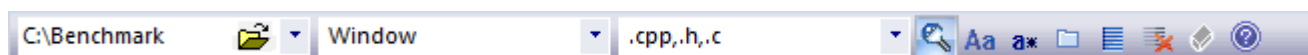
For all searches, you can qualify the search to be case-sensitive and/or to match the search string to complete words.

### Access

Ribbon	Start > Explore > Search > Search in Source Files
Menu	Edit   <b>Search in Files</b>
Context Menu	Right-click on selected text   Search for <selected text>   <b>Search in Files</b>
Keyboard Shortcuts	<b>Ctrl + Shift + Alt + F</b>

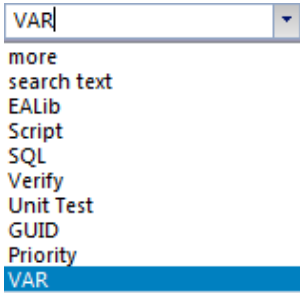
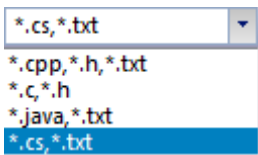







### Search Toolbar

You can use the toolbar options in the **Search window** to control the search operation. The state of each button persists over time to always reflect your previous search criteria.



### Options

Option	Action
	<p>The 'Search Path' field. Specify the folder to search, or the type of search.</p> <p>You can type the folder path to search directly into the text box, or click on the drop-down arrow and select 'Browse for folder' to search using the 'Browse for Folder' dialog.</p> <p>Any paths you enter are automatically saved in the drop-down list, up to a maximum of ten; paths added after that overwrite the oldest path in the list. You can select one of these saved paths if you prefer.</p> <p>Apart from 'Browse for folder', there are three other fixed options in the drop-down list:</p> <ul style="list-style-type: none"> <li>'Search in scripts', which searches the local and user-defined scripts in the 'Scripts' tab of the <b>Scripting window</b></li> </ul>

	<ul style="list-style-type: none"> <li>'Search in open files', which confines the search to the files that you have open in Enterprise Architect</li> <li>'Search in local help', which searches the local Help files that have been installed from the Sparx Systems web site; the results list the Help topics containing the search term, and the line number and line in which the text occurs</li> </ul> <p>These options disable the 'Search File Types' list box.</p>
	<p>The 'Search Text' field. Type the text string to search for.</p> <p>Any text you type in is automatically saved in the drop-down list, up to a maximum of ten strings; text added after that overwrites the oldest text string in the list. You can click on the drop-down arrow and select one of these saved text strings, if you prefer.</p>
	<p>The Search File Types field. Click on the drop-down arrow and select the file types (file extensions) to search.</p>
	<p>Click on this icon to begin the search.</p> <p>During the course of the search all other buttons in the toolbar are disabled. You can cancel the search at any time by clicking on the <b>Search button</b> again.</p> <p>If you switch any of these toggle buttons, you must run the search again to change the output.</p>
	<p>Click on this icon to toggle the case sensitivity of the search. The tooltip message identifies the current setting.</p>
	<p>Click on this icon to toggle between searching for any match and searching for only those matches that form an entire word. The tooltip message identifies the current setting.</p>
	<p>Click on this icon to toggle between limiting the search to a single path and including all subfolders under that path. The tooltip message identifies the current setting.</p>
	<p>Click on this icon to select the presentation format of the search results; you have two options:</p> <ul style="list-style-type: none"> <li>List View - each result line consists of the file path and line number, followed by the line text; multiple lines from one file are listed as separate entries</li> <li>Tree View - each result line consists of the file path that matches the search criteria, and the number of lines matching the search text within that file; you can expand the entry to show the line number and text of each line</li> </ul>
	<p>Click on this icon to clear the results.</p>
	<p>If necessary, click on this icon to remove all the entries in the Search Path, Search Text and Search File Types drop-down lists.</p>



Click on this icon to display this Help topic.

## Learning Center topics

- **Alt+F1** | Enterprise Architect | Software Engineering | Code Editor | Search for Options

## Search Intelli-sense

When editing a code file with the code editor, you can perform a search for a text string in any Intelli-sense libraries listed in the active Execution Analyzer script.

### Access

On the **Find in Files** window, click on the 'Intelli-sense Search' tab at the bottom of the window.

Ribbon	Start > Explore > Search > Search in Source Files
Menu	Edit   Find in Files
Keyboard Shortcuts	<b>Ctrl + Shift + Alt + F</b>

### Intelli-sense Libraries

Intelli-sense libraries are information databases that can be used to perform searches and queries on a code base. The databases are created from source code directories using a specific language such as C++, Java or C#, and are available using shortcut keys and context menus in Enterprise Architect code editors.

The libraries are created, updated, removed or added in the 'Analyzer **Script Editor**'. A typical scenario for using this feature would be create libraries for your source code and that of any libraries you are referencing. The libraries for your source can then be updated frequently with code changes, while the external libraries that remain mostly static will not get updated often. Libraries can be searched in a similar way to the 'File Search' tool, but with these differences:

- Multiple directories can be searched at once by having multiple libraries
- A query can be run in a fraction of the time required for a File Search
- All files are indexed based on equivalent UML constructs, allowing intelligent searches producing meaningful results in a modeling setting

### The Intelli-sense Search Control

The Intelli-sense Search Control is presented as the 'Intelli-sense Search' tab. From this control you view the results of Intelli-sense searches initiated from within the code editor. This control can be used to run, create and maintain queries. Each query is named and the names of all queries become available as sub-menu items in the 'Search Intelli-sense' context menu displayed in the code editors.

Using the 'Intelli-sense Search' tab toolbar you can run, create and maintain Intelli-sense queries. Queries are saved as either Personal or Model queries. Model queries are available to all users of the model; currently, a set of common Model queries are supplied by Sparx Systems and it is not expected that you will have to create others. All queries work on any Intelli-sense library created by users.

To view a query, select it from the list and use the gray arrow button at the far right of the toolbar to open the query editor.



# Code Editor Key Bindings

## Keys

Key	Description
Ctrl+G	Move cursor to a specified line
↓	Move cursor down one line
Shift+↓	Extend selection down one line
Ctrl+↓	Scroll down one line
Alt+Shift+↓	Extend rectangular selection down one line
↑	Move cursor up one line
Shift+↑	Extend selection up one line
Ctrl+↑	Scroll up one line
Alt+Shift+↑	Extend rectangular selection up one line
Ctrl+(	Move cursor up one paragraph
Ctrl+Shift+(	Extend selection up one paragraph
Ctrl+)	Move cursor down one paragraph
Ctrl+Shift+)	Extend selection down one paragraph
←	Move cursor left one character
Shift+←	Extend selection left one character
Ctrl+←	Move cursor left one word
Ctrl+Shift+←	Extend selection left one word
Alt+Shift+←	Extend rectangular selection left one character
→	Move cursor right one character.
Shift+→	Extend selection right one character
Ctrl+→	Move cursor right one word
Ctrl+Shift+→	Extend selection right one word

Alt+Shift+→	Extend rectangular selection right one character
Ctrl+/ 	Move cursor left one word part
Ctrl+Shift+/ 	Extend selection left one word part
Ctrl+\ 	Move cursor right one word part
Ctrl+Shift+\ 	Extend selection right one word part
Home	Move cursor to the start of the current line
Shift+Home	Extend selection to the start of the current line
Ctrl+Home	Move cursor to the start of the document
Ctrl+Shift+Home	Extend selection to the start of the document
Alt+Home	Move cursor to the absolute start of the line
Alt+Shift+Home	Extend rectangular selection to the start of the line
End	Move cursor to the end of the current line
Shift+End	Extend selection to the end of the current line
Ctrl+End	Move cursor to the end of the document
Ctrl+Shift+End	Extend selection to the end of the document
Alt+End	Move cursor to the absolute end of the line
Alt+Shift+End	Extend rectangular selection to the end of the line
Page Up	Move cursor up a page
Shift+Page Up	Extend selection up a page
Alt+Shift+Page Up	Extend rectangular selection up a page
Page Down	Move cursor down a page
Shift+Page Down	Extend selection down a page
Alt+Shift+Page Down	Extend rectangular selection down a page
Delete	Delete character to the right of the cursor
Shift+Delete	Cut selection

Ctrl+Delete	Delete word to the right of the cursor
Ctrl+Shift+Delete	Delete until the end of the line
Insert	Toggle overtype
Shift+Insert	Paste
Ctrl+Insert	Copy selection
Backspace	Delete character to the left of the cursor
Shift+Backspace	Delete character to the left of the cursor
Ctrl+Backspace	Delete word to the left of the cursor
Ctrl+Shift+Backspace	Delete from the start of the line to the cursor
Alt+Backspace	Undo delete
Tab	Indent cursor one tab
Ctrl+Shift+I	Indent cursor one tab
Shift+Tab	Unindent cursor one tab
Ctrl+keypad(+)	Zoom in
Ctrl+keypad(-)	Zoom out
Ctrl+keypad(/)	Restore Zoom
Ctrl+Z	Undo
Ctrl+Y	Redo
Ctrl+X	Cut selection
Ctrl+C	Copy selection
Ctrl+V	Paste
Ctrl+L	Cut line
Ctrl+T	Transpose line
Ctrl+Shift+T	Copy line
Ctrl+A	Select entire document
Ctrl+D	Duplicate selection

Ctrl+U	Convert selection to lowercase
Ctrl+Shift+U	Convert selection to uppercase
Ctrl+E	Move cursor to matching brace
Ctrl+Shift+E	Extend selection to matching brace
Ctrl+Shift+C	Toggle line comment on selection
Ctrl+Shift+X	Toggle stream comment on selection
Ctrl+F2	Toggle bookmark
F2	Go to next bookmark
Shift+F2	Go to previous bookmark
Ctrl+Shift+F2	Clear all bookmarks in current file
Ctrl+Shift+W	Toggle whitespace characters
Ctrl+Shift+L	Toggle EOL characters
Ctrl+Spacebar	Invoke autocomplete
Ctrl+-	Go backwards in cursor history
Ctrl+Shift+-	Go forwards in cursor history
F12	Start/Cancel search for keyword in file(s).
Ctrl+F	Find text
Ctrl+R	Replace text

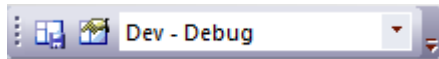
## Notes

- In addition to these keys, you can assign (Ctrl+Alt+<n>) key combinations to macros that you define within the **Source Code Editor**

# Workspace Layouts

Workspace layouts allow you to load or save a favorite arrangement of windows for different tasks. Enterprise Architect provides a number of layouts out of the box that you might find helpful. These can be customized or create your own. The position and size of the windows on view, and the placement of toolbars are saved. Any previous layout is restored when Enterprise Architect is started.

## Access



Ribbon	Start > Workspace > Preferences > Customize > Toolbars: select Workspace Layouts
Menu	View   Toolbars   Workspace Layouts

## Workspace Layouts

These layouts work well with the Execution Analyzer activities.

- Dev - Debug
- **VEA - Profile**
- VEA - Record
- VEA - Simulation
- **VEA - Testpoints**

## Application Patterns (Model + Code)

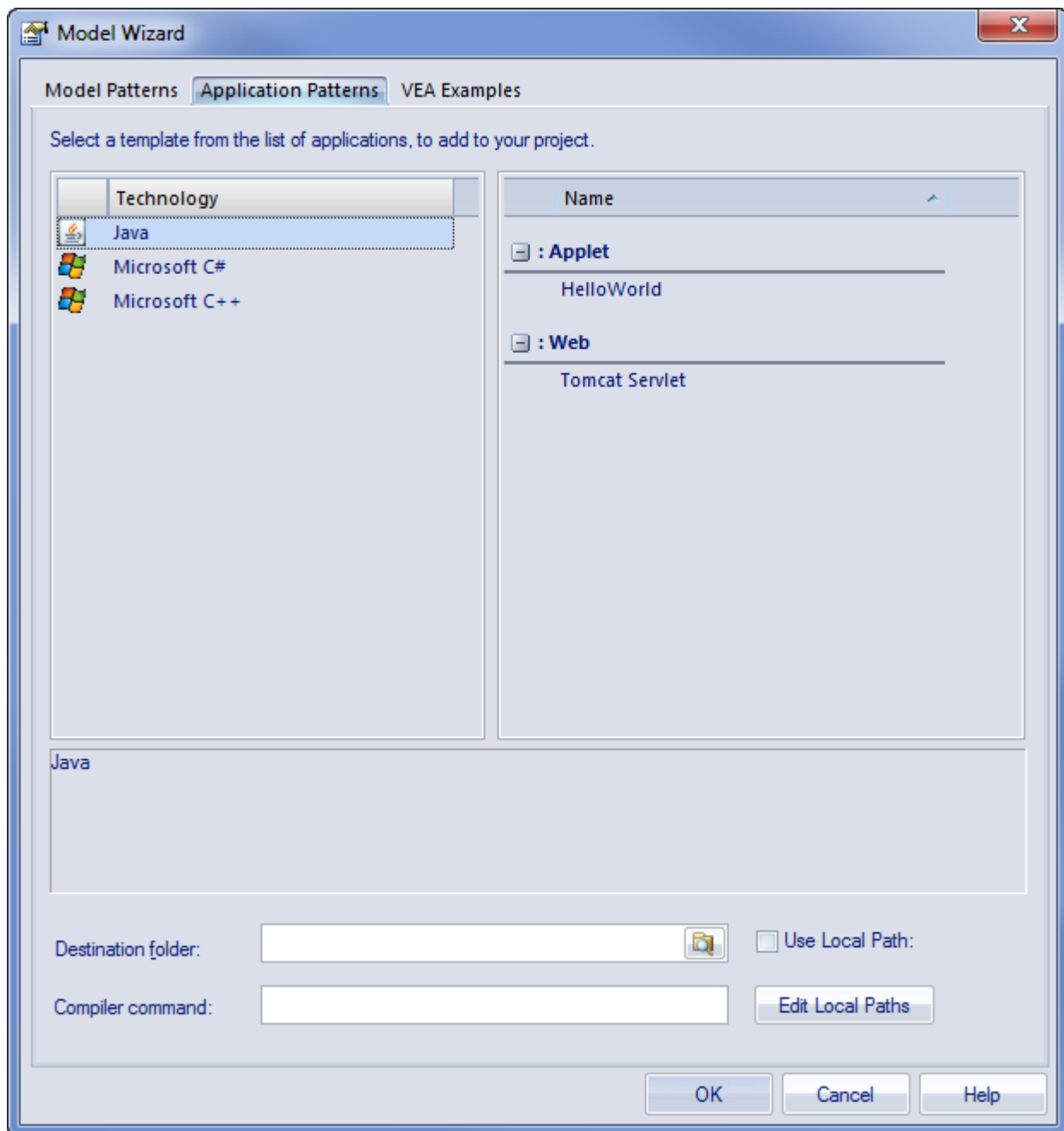
To get you going with a code based project as fast as possible, Enterprise Architect helps you to generate starter projects including model information, code and build scripts for one of several basic application types. Patterns include:

- MFC Windows applications
- Java programs
- ASP.NET web services

### Access

Ribbon	Design > Package > <b>Model Wizard</b> > Application Patterns
Menu	Package   New > Application Patterns
Context Menu	In <b>Project Browser</b>   Right-click on a Package   Add a Model using Wizard > Application Patterns
Keyboard Shortcuts	<b>Ctrl+Shift+M</b> > Application Patterns

### Generate Models



Field/Option/Button	Action
Technology	Select the appropriate technology.
Name	Displays the application patterns available for the selected technology; select the required pattern to import.
<description>	Displays a description of the selected pattern.
Destination folder	Browse for and select the directory in which to load the source code for the application.
Use Local Path	Enable the selection of an existing local path to place the source code under; changes the 'Destination folder' field to a drop-down selection.

Compiler command	<p>Displays the default compiler command path for the selected technology; you must either:</p> <ul style="list-style-type: none"><li>• Confirm that the compiler can be found at this path, or</li><li>• Edit the path to the compiler location</li></ul>
Edit Local Paths	<p>Many application patterns specify their compiler using a local path.</p> <p>The first time you use any pattern you must click on this button to ensure the local path points to the correct location.</p> <p>The 'Local Paths' dialog displays.</p>

## Notes

- If required, you can define custom application patterns by adding files to the *AppPatterns* directory where Enterprise Architect is installed; top level directories are listed as Technologies and can contain an icon file to customize the icon displayed for the technology  
Directories below this are defined as groups in the patterns list; the patterns are defined by the presence of four files with a matching name: a zip file (.zip), XMI file (.xml), config file (.cfg) and optional icon (.ico)
- The config file supports these fields:
  - [provider], [language], [platform], [url], [description], [version] - all displayed in the <description> field
  - [xmrootpaths] - the root path of the source code in the exported xmi; this is replaced with the selected destination folder when the user applies the application pattern



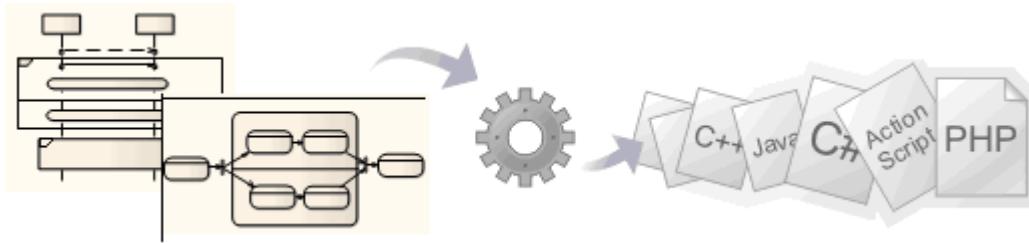
## MDG Integration and Code Engineering

MDG Integration for Eclipse and MDG Integration for Visual Studio are products that help you to create and maintain your UML models directly inside these two popular Integrated Development Environments, using the Enterprise Architect **Project Browser**. Models can be generated to source code using the powerful and flexible template engine that gives the engineer complete control over how the code is generated. Existing source code can also be reverse engineered and synchronized with the UML models. With the integration installed the IDE will become a feature rich modeling platform, saving time and effort and reducing the risk of error by linking requirements management, architecture and design to source code engineering.

Rich and expressive documentation can be generated automatically into a wide range of formats including Docx, PDF and HTML. The documentation can include diagrams of requirements, design and architecture as well as source code descriptions, putting the source code into context.

You can purchase MDG Integration for Eclipse and MDG Integration for Visual Studio or download trial versions, from the Sparx Systems web site.

## Behavioral Models



Enterprise Architect's powerful system engineering capability can be used to generate code for software, system and hardware description languages directly from behavioral models, such as State Machine, Sequence and Activity diagrams. The supported languages include C(OO), C++, C#, Java, VB.Net, VHDL, Verilog and SystemC.

Software code can be generated from State Machine, Sequence and Activity diagrams, and hardware description languages from State Machine diagrams.

### Generate code from behavioral diagrams using the EAExample project

Step	Action
1	Open the EAExample.eap file by selecting the 'Help   Open Example Model' menu option.
2	<p>From the <b>Project Browser</b>, select any of these Packages:</p> <p>Software Language Examples:</p> <ul style="list-style-type: none"> <li>Project Models &gt; System Model &gt; Implementation Model (PSM) &gt; Java Model With Behaviors Generate the Account and Order classes</li> <li>Project Models &gt; Systems Engineering Model &gt; Implementation Model &gt; Software &gt; C#   Generate the DataProcessor Class</li> <li>Project Models &gt; Systems Engineering Model &gt; Implementation Model &gt; Software &gt; C++   Generate the IO Class</li> <li>Project Models &gt; Systems Engineering Model &gt; Implementation Model &gt; Software &gt; Java   Generate the IO Class</li> <li>Project Models &gt; Systems Engineering Model &gt; Implementation Model &gt; Software &gt; VBNet Generate the IO Class</li> </ul> <p>Hardware Language Examples:</p> <ul style="list-style-type: none"> <li>Project Models &gt; Systems Engineering Model &gt; Implementation Model &gt; Hardware &gt; SystemC Generate the PlayBack Class</li> <li>Project Models &gt; Systems Engineering Model &gt; Implementation Model &gt; Hardware &gt; VHDL Generate the PlayBack Class</li> <li>Project Models &gt; Systems Engineering Model &gt; Implementation Model &gt; Hardware &gt; Verilog Generate the PlayBack Class</li> </ul>
3	<p>When completed, press <b>Ctrl+E</b> to open the generated source code.</p> <p>You should see methods generated in the code.</p>

## Notes

- Software code generation from behavioral models is available in the Business and Software Engineering, Systems Engineering and Ultimate editions of Enterprise Architect
- Hardware code generation from State Machine models is available in the Systems Engineering and Ultimate editions of Enterprise Architect
- For C(OO), on the 'C Specifications' page of the 'Options' dialog set the 'Object Oriented Support' option to **True**
- To be able to generate code from behavioral models, all behavioral constructs should be contained within a Class
- Code synchronization is not supported for behavioral code

## Learning Center topics

- **Alt+F1** | Enterprise Architect | Software Engineering | Behavioral Code Generation

## Code Generation - State Machines

A State Machine illustrates how an object (represented by a Class) can change state, each change of state being a transition initiated by a trigger arising from an event, often under conditions or constraints defined as guards. As you model how the object changes state, you can generate and build (compile) code from it in the appropriate language and execute the code, visualizing the execution via the **Model Simulator**.

It is also possible, in Enterprise Architect, to combine the State Machines of separate but related objects to see how they interact (via Broadcast Events), and to quickly create and generate code from variants of the model. For example, you might model the behavior of:

- The rear off-side wheel of a vehicle in rear-wheel drive and front-wheel drive modes (one State Machine)
- The steering wheel and all four drive wheels of a vehicle in 4-wheel drive mode (five State Machines)
- The wheels of an off-road vehicle and of a sports car (two Artifacts, instances of a combination of State Machines)

Of critical importance in generating and testing code for all of these options is the Executable State Machine Artifact element. This acts as the container and code generation unit for your State Machine models.



### Prerequisites

- Select 'Tools | Options | Objects' and select the 'Port and Part type visible by default' checkbox
- Select 'Project | Settings | Project Options | Source Code Engineering' and, for the appropriate coding language (Java, C, C# or ANSI C++), set the 'Use the new Statemachine Template' option to **'True'**
- If working in C++, select 'Project | Settings | Project Options | Source Code Engineering' and set the 'C++ Version' option to 'ANSI'

This code generation method does not apply to the Legacy State Machine code generation templates developed prior to Enterprise Architect Release 11.0.

### Access

Drag an 'Executable State Machine Artifact' from the 'Artifacts' page of the diagram toolbox, onto your diagram. The 'Artifacts' page of the diagram toolbox can be accessed using any of the methods outlined in the following table.

Ribbon	Design > Diagram > Toolbox > Artifacts
Menu	Diagram > Toolbox > Artifacts
Keyboard Shortcuts	<b>Alt</b> + 5 > Artifacts
Other	You can display or hide the <b>Diagram Toolbox</b> by clicking on the  or  icons at the left-hand end of the Caption Bar at the top of the <b>Diagram View</b> .

### Prepare your State Machine diagram(s)

Step	Action
1	For each State Machine you want to model, create a Class diagram.

2	From the 'Class Elements' page of the <b>Diagram Toolbox</b> , drag the 'Class' icon onto your diagram and give the element an appropriate name.
3	Right-click on the Class element and select the 'New Child Diagram   State Machine' menu option. Give the State Machine diagram an appropriate name.
4	Create the State Machine model to reflect the appropriate transitions between States.

## Set up the Executable Statemachine Artifact

Step	Action
1	Create a new Class diagram to contain the modeled State Machine(s) from which you intend to generate code.
2	From the 'Artifacts' page of the <b>Diagram Toolbox</b> , drag the 'Executable StateMachine' icon onto the diagram to create the Artifact element. Name the element and drag its borders out to enlarge it.
3	From the <b>Project Browser</b> , drag the (first) Class element containing a State Machine diagram onto the Artifact element on the diagram. The '<element name>: Paste As' dialog displays, with the 'Paste as' field defaulted to 'Property'. (If the dialog does not display, press <b>Ctrl</b> as you drag the Class element from the Project Browser.)
4	Click on the <b>OK button</b> . The Class element is pasted inside the Artifact as a Part.
5	Repeat steps 3 and 4 for any other Classes with State Machines that you want to combine and generate code for. These might be: <ul style="list-style-type: none"> <li>Repeat 'drops' of the same Class and State Machine, modeling parallel objects</li> <li>Different Classes and State Machines, modeling separate interacting objects</li> </ul>
6	Right-click on the Artifact element and select the 'Properties' option, and in the 'Language' field click on the drop-down arrow and set the code language to the same language as is defined for the Class elements. You can now drag this Executable Statemachine Artifact element from the <b>Project Browser</b> onto the diagram any number of times, and modify the Parts to model variations of the system or process, or the same system or process with different programming languages.

## Generate Code From Artifact

Step	Action
1	Right-click on the Executable Statemachine Artifact element and select the 'Code Engineering   Executable Statemachine   Generate' menu option. The 'Executable Statemachine Code Generation' dialog displays.
	In the 'Project output directory' field, type or browse for the directory pathname under which to create the

2	<p>output files.</p> <p>During code generation, all existing files in this directory are deleted.</p>
3	<p>In the 'Location of &lt;compiler&gt; installation directory' field, type or browse for the path of the compiler installation directory, to be automatically mapped to the local path (displayed to the left of the field). For each programming language, the paths might resemble these examples:</p> <ul style="list-style-type: none"> <li>• Java JAVA_HOME C:\Program Files (x86)\Java\jdk1.7.0_17</li> <li>• C/C++ VC_HOME C:\Program Files (x86)\Microsoft Visual Studio 9.0</li> <li>• C# CS_HOME C:\Windows\Microsoft.NET\Framework\V3.5</li> </ul>
4	<p>Click on the <b>Generate button</b>. The code files are created appropriate to the programming language. The <b>System Output</b> window displays with an 'Executable State Machine Output' tab, showing the progress and status of the generation.</p> <p>During code generation, an automatic validation function is executed to check for diagram or model errors against the UML constraints. Any errors are identified by error messages on the 'Executable State Machine Output' tab.</p> <p>Double-click on an error message to display the modeling structure in which the error occurs, and correct the mistake before re-generating the code.</p>
5	<p>When the code generates without error, right-click on the Artifact element and select the 'Code Engineering   Executable Statemachine   Build' option to compile the code.</p> <p>The <b>System Output</b> window displays with a 'Build' tab, showing the progress and status of the compilation. Notice that the compilation includes configuration of the simulation operation.</p>

## Code Generation Macros

You can also use two macros in the code generation for State Machines.

Macro Name	Description
SEND_EVENT	Send an event to a receiver (the Part). For example: %SEND_EVENT("event1", "Part1")%
BROADCAST_EVENT	Broadcast an event to all receivers. For example: %BROADCAST_EVENT("event2")%

## Execute/Simulate Code From Artifact

Step	Action
1	<p>Select the two menu options:</p> <ul style="list-style-type: none"> <li>• 'Analyzer   Simulator' to display the <b>Simulation window</b></li> <li>• 'Analyzer   Simulation Events' to display the <b>Simulation Events window</b></li> </ul>

	Dock the two windows in a convenient area of the screen.
2	<p>On the diagram or <b>Project Browser</b>, right-click on the Artifact element and select the 'Code Engineering   Executable Statemachine   Run' menu option.</p> <p>The first State Machine diagram in the series displays with the simulation of the process already started. In the <b>Simulation window</b>, the processing steps are indicated in this format:</p> <pre>[03516677]  Part1[Class1].Initial_367_TO_State4_142 Effect [03516683]  Part1[Class1].StateMachine_State4 ENTRY [03516684]  Part1[Class1].StateMachine_State4 DO [03518375]  Blocked</pre>
3	<p>Click on the appropriate <b>Simulation window</b> toolbar buttons to step through the simulation as you prefer. When the simulation finishes at the Exit or Terminate element, click on the <b>Stop button</b> in the Simulation window toolbar.</p>
4	<p>Where the trace shows Blocked, the simulation has reached a point where a Trigger event has to occur before processing can continue. On the 'Simulation Events' window, in the 'Waiting Triggers' column, double-click on the appropriate Trigger.</p> <p>When the Trigger is fired, the simulation continues to the next pause point, Trigger or exit.</p>

## Notes

- If you are making small changes to an existing State Machine model, you can combine the code generation, build and run operations by selecting the 'Code Engineering | Executable Statemachine | Generate, build and run' option
- You can also generate code in JavaScript

## Legacy State Machine Templates

Code generation operates using a set of generation templates. From Release 11.0 of Enterprise Architect, a different set of templates are available as the default for software code generation from a State Machine diagram into Java, C, ANSI C++ or C# code. You can still use the original templates, as described here, for models developed in earlier releases of Enterprise Architect, if you do not want to upgrade them for the new template facilities.

### Switch Between Legacy and Release 11 templates

#### Access

Display the 'Manage Project Options' dialog, then show the 'Language Specifications' page for your chosen language, using one of the methods outlined in the table below. If necessary, expand the 'Statemachine Engineering (for current model)' grouping and set the 'Use the new Statemachine Template' option to **True** (to use the later templates) or **False** (to use the Legacy templates).

Ribbon	Configure > Reference Data > Settings > Project Options > Source Code Engineering > [language name]
Menu	Project   Settings   Project Options   Source Code Engineering   <language name>

### Legacy Template Transformations

A State Machine in a Class internally generates a number of constructs in software languages to provide effective execution of the States' behaviors (do, entry and exit) and also to code the appropriate transition's effect when necessary.

Model Objects	Code Objects
Enumerations	<ul style="list-style-type: none"> <li>StateType - comprises an enumeration for each of the States contained within the State Machine</li> <li>TransitionType – comprises an enumeration for each transition that has a valid effect associated with it; for example: ProcessOrder_Delivered_to_ProcessOrder_Closed</li> <li>CommandType – comprises an enumeration for each of the behavior types that a State can contain (Do, Entry, Exit)</li> </ul>
Attributes	<ul style="list-style-type: none"> <li>currState:StateType - a variable to hold the current State's information</li> <li>nextState:StateType - a variable to hold the next State's information, set by each State's transitions accordingly</li> <li>currTransition:TransitionType - a variable to hold the current transition information; this is set if the transition has a valid effect associated with it</li> <li>transcend:Boolean - a flag used to advise if a transition is involved in transcending between different State Machines (or Submachine states)</li> <li>xx_history:StateType - a history variable for each State Machine/Submachine State, to hold information about the last State from which the transition took place</li> </ul>



Operations	<ul style="list-style-type: none"><li>• StatesProc - a States procedure, containing a map between a State's enumeration and its operation; it de-references the current State's information to invoke the respective State's function</li><li>• TransitionsProc - a Transitions procedure, containing a map between the Transition's enumeration and its effect; it invokes the Transition's effect</li><li>• &lt;&lt;State&gt;&gt; - an operation for each of the States contained within the State Machine; this renders a State's behaviors based on the input CommandType, and also executes its transitions</li><li>• initializeStateMachine - a function that initializes all the framework-related attributes</li><li>• runStateMachine - a function that iterates through each State, and executes their behaviors and transitions accordingly</li></ul>
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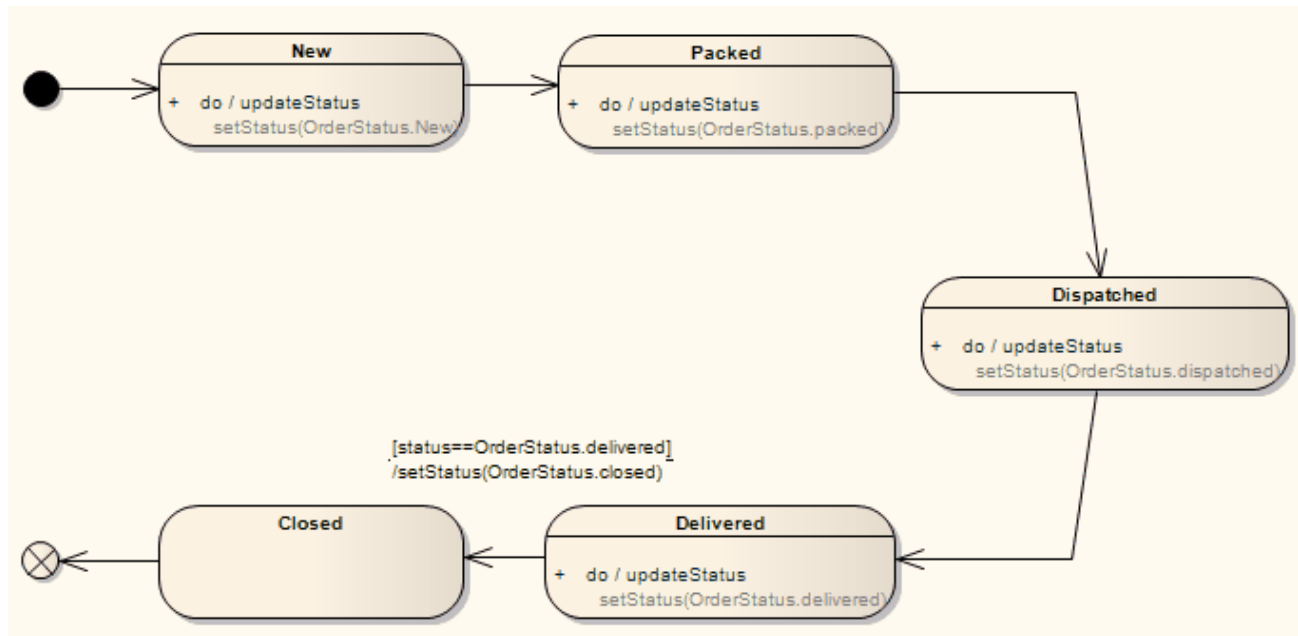
## Notes

- To be able to generate code from behavioral models, all behavioral constructs should be contained within a Class

## Learning Center topics

- **Alt+F1** | Enterprise Architect | Software Engineering | Behavioral Code Generation | State Machines

## Java Code Generated From Legacy State Machine Template



```

private enum StateType: int
{
    ProcessOrder_Delivered,
    ProcessOrder_Packed,
    ProcessOrder_Closed,
    ProcessOrder_Dispatched,
    ProcessOrder_New,
    ST_NOSTATE
}

private enum TransitionType: int
{
    ProcessOrder_Delivered_to_ProcessOrder_Closed,
    TT_NOTTRANSITION
}

private enum CommandType
{
    Do,
    Entry,
    Exit
}

private StateType currState;
private StateType nextState;
private TransitionType currTransition;
  
```

```
private boolean transcend;
private StateType ProcessOrder_history;
private void processOrder_Delivered(CommandType command)
{
    switch(command)
    {
        case Do:
        {
            // Do Behaviors..
            setStatus(Delivered);
            // State's Transitions
            if((status==Delivered))
            {
                nextState = StateType.ProcessOrder_Closed;
                currTransition = TransitionType.ProcessOrder_Delivered_to_ProcessOrder_Closed;
            }
            break;
        }
        default:
        {
            break;
        }
    }
}

private void processOrder_Packed(CommandType command)
{
    switch(command)
    {
        case Do:
        {
            // Do Behaviors..
            setStatus(Packed);
            // State's Transitions
            nextState = StateType.ProcessOrder_Dispatched;
            break;
        }
        default:
        {
            break;
        }
    }
}
```

```
private void processOrder_Closed(CommandType command)
{
    switch(command)
    {
        case Do:
        {
            // Do Behaviors..
            // State's Transitions
            break;
        }
        default:
        {
            break;
        }
    }
}

private void processOrder_Dispatched(CommandType command)
{
    switch(command)
    {
        case Do:
        {
            // Do Behaviors..
            setStatus(Dispatched);
            // State's Transitions
            nextState = StateType.ProcessOrder_Delivered;
            break;
        }
        default:
        {
            break;
        }
    }
}

private void processOrder_New(CommandType command)
{
    switch(command)
    {
        case Do:
        {
            // Do Behaviors..
            setStatus(new);
        }
    }
}
```

```
// State's Transitions
nextState = StateType.ProcessOrder_Packed;
break;
}
default:
{
break;
}
}
}
private void StatesProc(StateType currState, CommandType command)
{
switch(currState)
{
case ProcessOrder_Delivered:
{
processOrder_Delivered(command);
break;
}
case ProcessOrder_Packed:
{
processOrder_Packed(command);
break;
}
case ProcessOrder_Closed:
{
processOrder_Closed(command);
break;
}
case ProcessOrder_Dispatched:
{
processOrder_Dispatched(command);
break;
}
case ProcessOrder_New:
{
processOrder_New(command);
break;
}
default:
break;
}
```

```
}  
private void TransitionsProc(TransitionType transition)  
{  
    switch(transition)  
    {  
        case ProcessOrder_Delivered_to_ProcessOrder_Closed:  
        {  
            setStatus(closed);  
            break;  
        }  
        default:  
            break;  
    }  
}  
private void initalizeStateMachine()  
{  
    currState = StateType.ProcessOrder_New;  
    nextState = StateType.ST_NOSTATE;  
    currTransition = TransitionType.TT_NOTRANSITION;  
}  
private void runStateMachine()  
{  
    while (true)  
    {  
        if (currState == StateType.ST_NOSTATE)  
        {  
            break;  
        }  
        currTransition = TransitionType.TT_NOTRANSITION;  
        StatesProc(currState, CommandType.Do);  
        // then check if there is any valid transition assigned after the do behavior  
        if ( nextState == StateType.ST_NOSTATE)  
        {  
            break;  
        }  
        if ( currTransition != TransitionType.TT_NOTRANSITION )  
        {  
            TransitionsProc(currTransition);  
        }  
        if (currState != nextState)  
        {  
            StatesProc(currState, CommandType.Exit);  
        }  
    }  
}
```

```
StatesProc(nextState, CommandType.Entry);  
currState = nextState;  
}  
}  
}
```

# State Machine Modeling For HDLs

For efficient code generation from State Machine models into Hardware Description Languages (HDL) such as VHDL, Verilog and SystemC, apply these design practices.

In an HDL State Machine model, you might expect to:

- Designate Driving Triggers
- Establish Port-Trigger Mapping
- Add to Active State Logic

## Aspect

Topic	Detail
Designate Driving Triggers	<ul style="list-style-type: none"> <li>• A 'change' trigger is deemed to be an asynchronous trigger if these two conditions are satisfied: <ul style="list-style-type: none"> <li>- There is a transition from the actual submachine state (which encapsulates the actual logic) triggered by it</li> <li>- The target state of that transition has a self transition triggered by the same trigger</li> </ul> </li> <li>• Asynchronous triggers should be modeled according to this pattern: <ul style="list-style-type: none"> <li>- The trigger should be of type Change (specification: <b>True / False</b>)</li> <li>- The active state (Submachine State) should have a transition trigger by it</li> <li>- The target state of the triggered transition should have a self transition with the same trigger</li> </ul> </li> <li>• A trigger of type 'time', which triggers the transitions to the active state (Submachine State) is deemed as the Clock; the specification of this trigger should be specific to the target language: <ul style="list-style-type: none"> <li>- VHDL - rising_edge - falling_edge</li> <li>- Verilog - posedge - negedge</li> <li>- SystemC - positive - negative</li> </ul> </li> </ul>
Establish Port-Trigger Mapping	<p>After successfully modeling the different operating modes of the component, and the Triggers associated with them, you must associate the Triggers with the component's Ports.</p> <p>A Dependency relationship from the Port to the associated Trigger is used to signify their association</p>
Active State Logic	<p>The first two aspects, above, put in place the preliminaries required for efficient interpretation of the hardware components.</p>



	The actual State Machine logic is now modeled within the Active (Submachine) state.
--	---

## Notes

- To be able to generate code from behavioral models, all behavioral constructs should be contained within a Class
- The current code generation engine supports only one clock trigger for a component

## Code Generation - Interaction Diagrams

During code generation from Interaction (Sequence) diagrams in a Class, Enterprise Architect applies its system engineering graph optimizer to transform the Class constructs into programmatic paradigms. Messages and Fragments are identified as one of the several action types based on their functionality, and Enterprise Architect uses the code generation templates to render their behavior accordingly.

### Topics

Topic	Detail
Action Call	A Message that invokes an operation.
Action Create	A Message with Lifecycle = New.
Action Destroy	A Message with Lifecycle = Delete.
Action Loop	A Combined Fragment with Type = <b>Alt</b> .
Action If	A Combined Fragment with Type = loop.
Assign To	A Call Message with a valid target attribute set using the 'Assign To' field is rendered in the code as the target attribute of a Call Action.

### Notes

- To be able to generate code from behavioral models, all behavioral constructs should be contained within a Class
- For an Interaction (Sequence) diagram, the behavioral code generation engine expects the Sequence diagram and all its associated messages and interaction fragments to be encapsulated within an interaction element

### Learning Center topics

- **Alt+F1** | Enterprise Architect | Software Engineering | Behavioral Code Generation | Interaction Diagrams

## Code Generation - Activity Diagrams

Code generation from Activity diagrams in a Class requires a validation phase, during which Enterprise Architect uses the system engineering graph optimizer to analyze the diagram and render it into various constructs from which code can be generated. Enterprise Architect also transforms the constructs into one of the various action types (if appropriate), similar to the Interaction diagram constructs.

### Topics

Topic	Detail
Call Actions (Invocation Actions)	<p>Used to invoke operations or behaviors in an Activity diagram; the two main variants of Call Actions supported in behavioral code generation are:</p> <ul style="list-style-type: none"> <li>• <b>CallOperation Action</b> - used to invoke operations, which can be within the same Class or in other Classes within the same Package; if referencing operations from other Classes within the same Package, you must have a target to which the request is passed</li> <li>• <b>CallBehavior Action</b> - used to invoke another Activity in an activity flow; the referenced Activity is expected to be within the same Class</li> </ul> <p>Arguments</p> <p>Call Actions can specify argument values corresponding to the parameters in the associated behavior or behavioral feature.</p> <p>You can add the arguments manually or create them automatically using the <b>Synchronize button</b> of the 'Arguments' dialog.</p>
CreateObjectAction	<p>Used to denote an object creation in the activity flow; you can set the result Pin of the CreateObjectAction as the object to be created, using the 'Assign Action Pins' dialog.</p> <p>The Classifier of the CreateObjectAction signifies the Classifier for which an instance is to be created.</p>
DestroyObjectAction	<p>Used to denote an object deletion in the activity flow; you can set the target Pin of the DestroyObjectAction as the object to be destroyed, using the 'Assign Action Pins' dialog.</p>
Loops	<p>Enterprise Architect's system engineering graph optimizer is also capable of analyzing and identifying loops; an identified loop is internally rendered as an Action Loop, which is translated by the EASL code generation macros to generate the required code.</p> <p>You can have a single loop, nested loops, and multiple levels of nested loops.</p>
Conditional Statements	<p>To model a conditional statement, you use Decision/Merge nodes.</p> <p>Alternatively, you can imply Decisions/Merges internally; the graph optimizer expects an associated Merge node for each Decision node, to facilitate efficient tracking of various branches and analysis of the code constructs within them.</p>

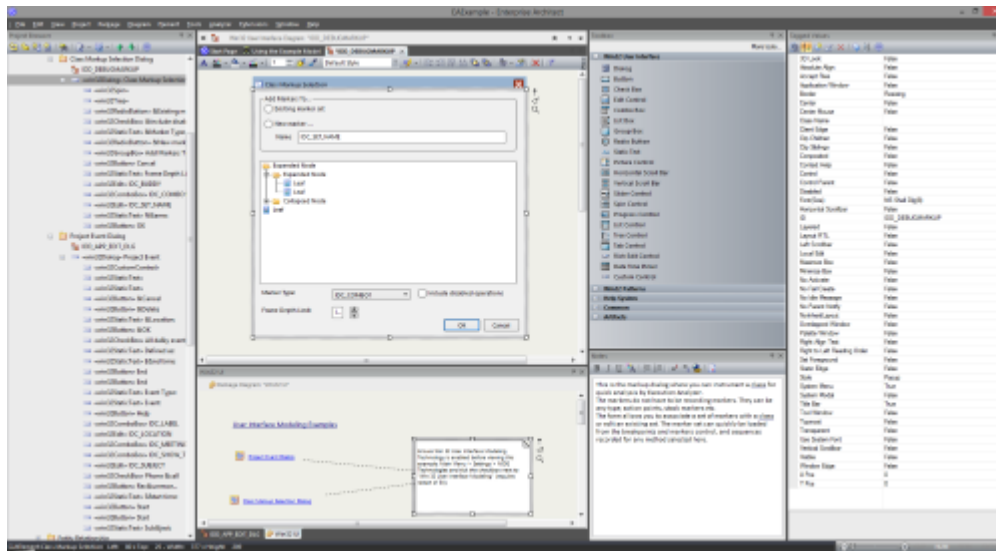
### Notes

- To be able to generate code from behavioral models, all behavioral constructs should be contained within a Class

## Learning Center topics

- **Alt+F1** | Enterprise Architect | Software Engineering | Behavioral Code Generation | Activity Diagrams

# Win32 UI Technology



Using the MDG Win32 UI Technology, you can design user interface screens that render as Win32® controls. The user interface produced can be used in any resource definition script. Resource definition scripts, or RC files, are a Microsoft technology that - as for other code - can be compiled and the assets used by native desktop applications. User interface screens or dialogs can be created from scratch or reverse engineered. User interface models can also be forward engineered using the synchronize code function **F7**. Interface modeling takes place on diagrams in the exact same fashion as you would work with any technology in Enterprise Architect. An interesting aspect of User Interface design in Enterprise Architect is that components can take an active role in the simulation of State Machines and Activities, enabling a simulation to interact with users much like a real program!

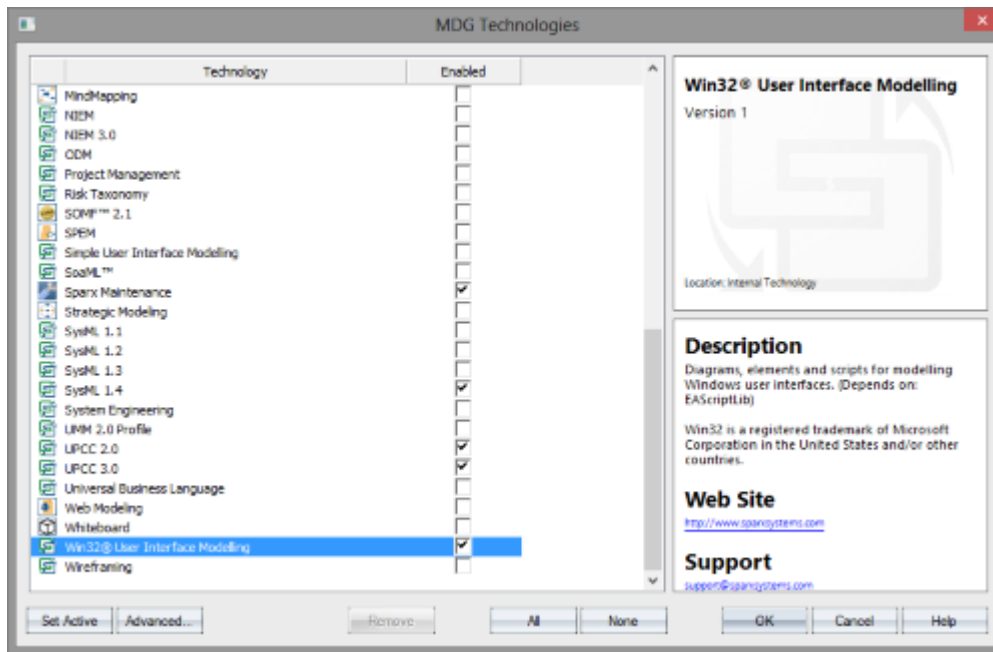
## Access

Ribbon	Design > Diagram > New > Type > User Interface Win32
Menu	Diagram   New > Type   User Interface Win32
Context Menu	Right-click on Package   Add Diagram > Type   User Interface Win32
Other	<b>Project Browser</b> caption bar menu   New Diagram   User Interface Win32

## Support

The MDG Win32® User Interface Technology is available in the Enterprise Architect Professional, Corporate and Suite editions

## Enabling Win32 User Interface Technology



The Win32® UI Technology in Enterprise Architect is enabled or disabled using the 'MDG Technologies' dialog ('Extensions | MDG Technologies').

## Default technology

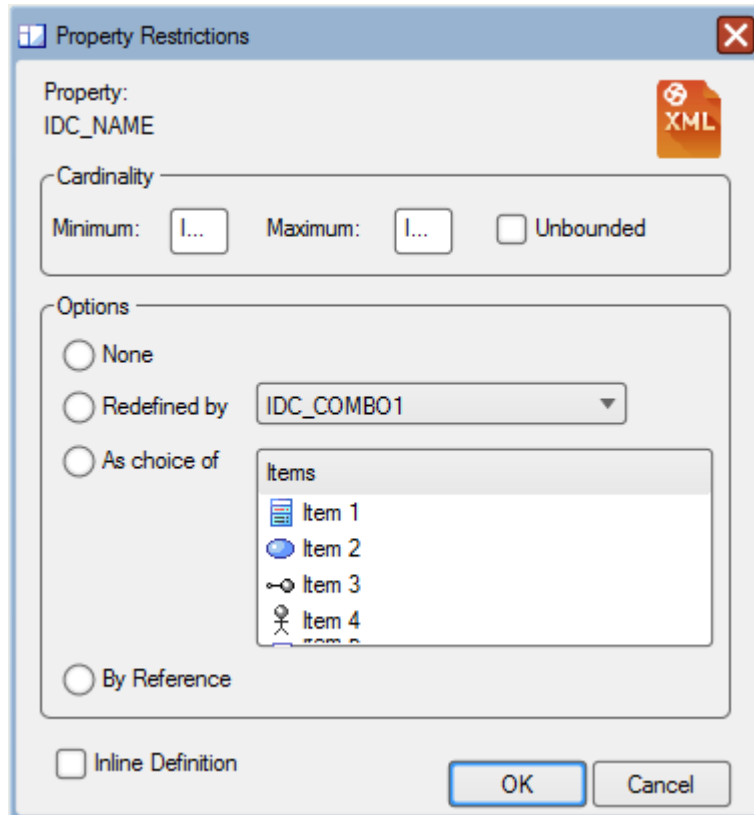
You can set the MDG Win32® UI Technology as the active default technology to access the Toolbox pages directly.

## Learning Center topics

- **Alt+F1** | Enterprise Architect | Modeling Languages | Standard Profiles | Win32 User Interface
- **Alt+F1** | Enterprise Architect | Software Engineering | User Interface | Win32 Dialog Modeling

## Modeling UI Dialogs

The Win32 User Interface MDG Technology provides the tools to help you design a user interface that closely emulates the visual style and available options for Windows dialogs.



## Win32 Dialog

These user interface components are supported, each matching the equivalent-named RC resource.

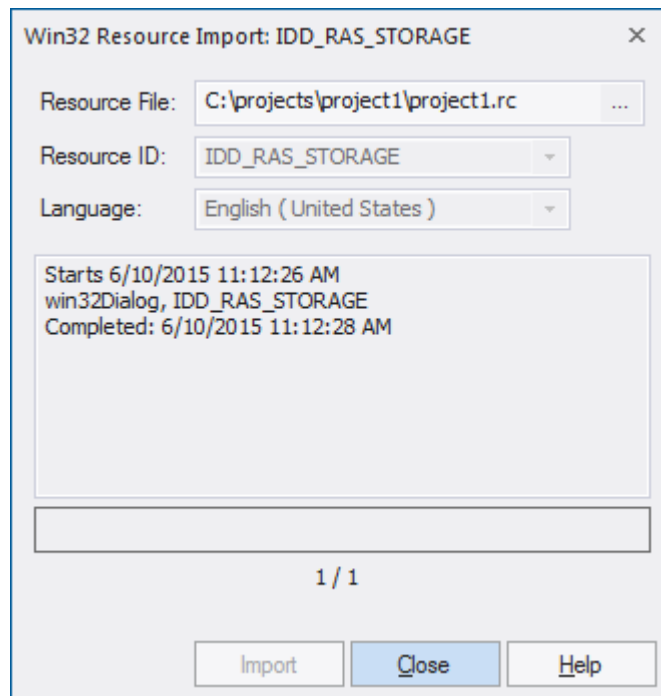
Component	Details
win32Dialog	The equivalent of the RC format DIALOG and DIALOGEX resources.
win32StaticText	The equivalent of the RC format LTEXT, RTEXT, CTEXT resources.
win32Edit	The equivalent of the RC format EDITTEXT resource.
win32Button	The equivalent of the RC format BUTTON, DEFPUSHBUTTON and other resources.
win32CheckBox	The equivalent of the RC format CHECKBOX resource.
win32ScrollBarH	The equivalent of the RC format SCROLLBAR resource with SBS_HORZ style
win32ScrollBarV	The equivalent of the RC format SCROLLBAR resource with SBS_VERT style.
win32GroupBox	The equivalent of the RC format GROUPBOX resource.

win32ComboBox	<p>The equivalent of the RC format COMBOBOX resource.</p> <p>Note: When you initially drag the 'Combo Box' icon - of type 'Drop Down' or 'Drop Down List' - onto a diagram, the middle 'tracking handle' on each side of the element is white, indicating that you can only adjust the width of the element. To adjust the height of the element as well as the width, click on the drop-down arrow part of the image; the middle 'tracking handle' on the bottom edge is now white, indicating that you can drag the base down to set the virtual height (the height of the element when it is expanded to show all possible values in the drop-down list).</p>
win32ListBox	<p>The equivalent of the RC format LISTBOX resource.</p>
win32RadioButton	<p>The equivalent of the RC format RADIOBUTTON resource.</p>
win32TabPage	<p>The equivalent of the RC format TABPANE resource.</p>
win32Picture	<p>The equivalent of the RC format STATIC resource with SS_BITMAP style.</p> <p>The control can render an image when applied from your model. An image can be applied by selecting it first and pressing <b>Ctrl+Shift+W</b> to display the <b>Image Manager</b>. Afterwards, you might need to change the value of the resource ID in the appropriate <b>Tagged Value</b>.</p>
win32CustomControl	<p>The equivalent of the RC format CONTROL resource.</p>



## Import Single Dialog from RC File

You can quickly import a single dialog by name.

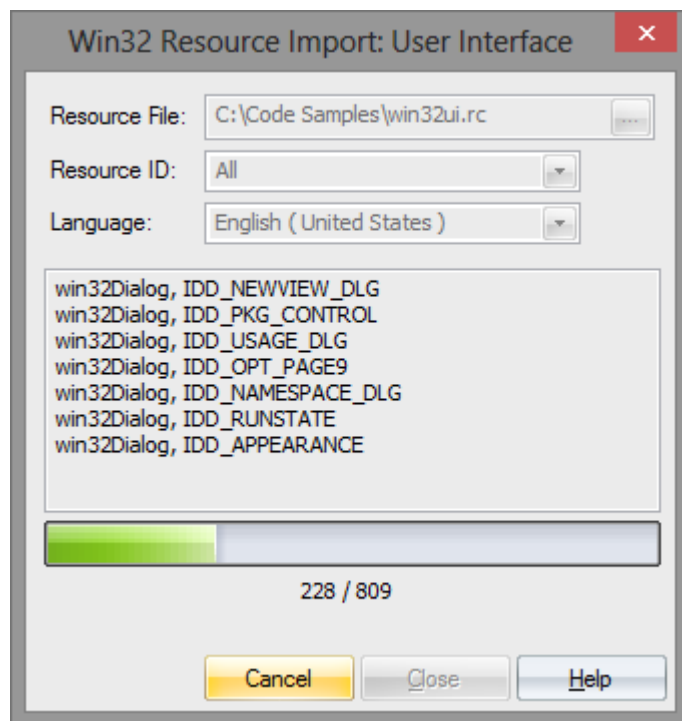


### Access

Context Menu	Right-click on Package   Code Engineering   Import Resource Script
--------------	--

## Import All Dialogs from RC File

All dialogs in a single RC file can be imported into your model. This image was captured one minute into the import, at which time over 200 large dialog definitions had been imported.

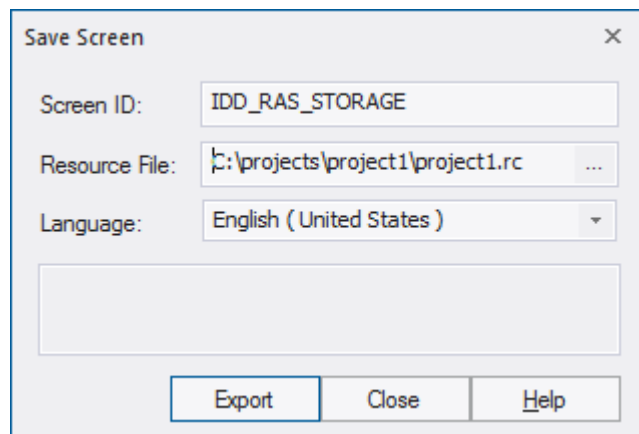


### Access

Ribbon	Code > Source Code > Import Code > Windows .RC File
Menu	Package > Code Engineering > Import > Resource Script
Context Menu	Right-click on Package   Code Engineering   Import Resource Script

## Export Dialog to RC File

Once a screen design is modified or a new one created, you probably want to get it back to the RC file you use to build your application, so you can see what it looks like with real data. Begin by selecting the Win32Dialog element in the **Project Browser**, then use the context menu to perform the synchronization.



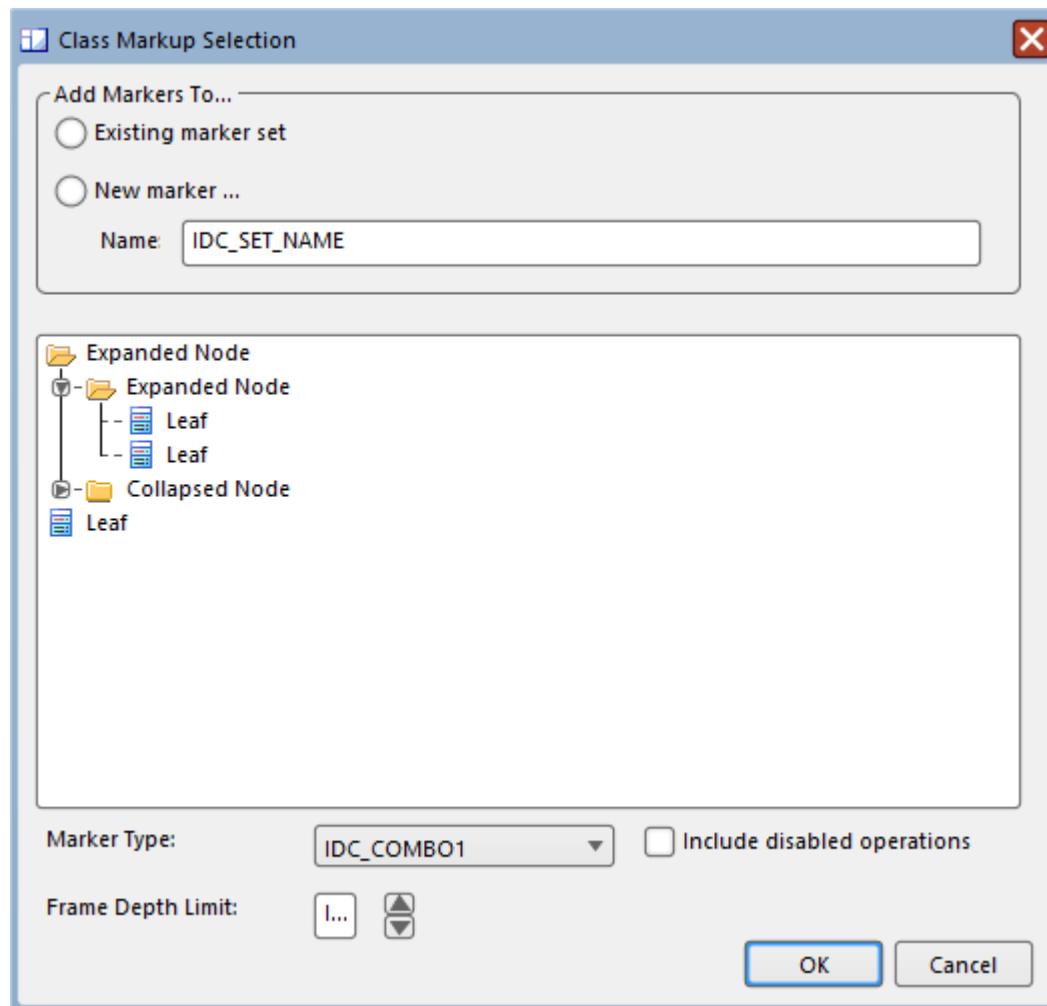
### Access

Context Menu	<b>Project Browser</b>   Right-click on win32Dialog element  Code Engineering   Synchronize with Code
Keyboard Shortcuts	<b>F7</b>

## Design a New Dialog

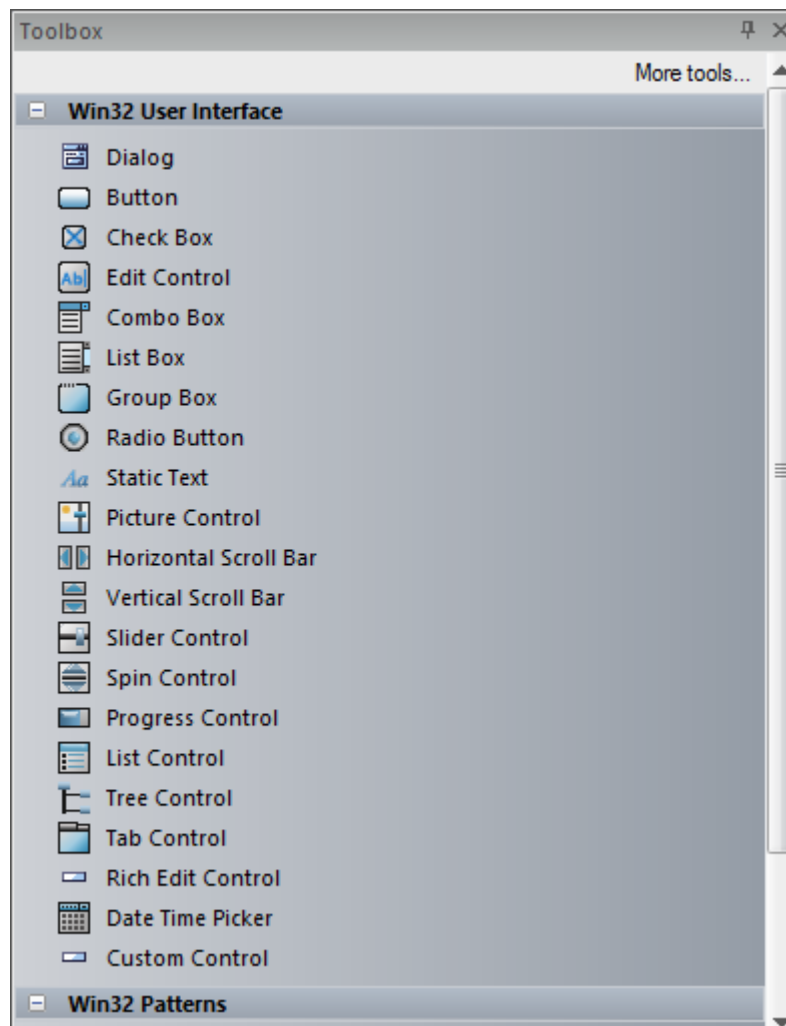
Creating a new win32 dialog is easy and mostly visual. You will probably need a workspace that shows:

1. The new diagram ('Diagram | New | User Interface win32')
2. The Win32 User Interface Toolbox ('Diagram | Toolbox')
3. The Tagged Values window (**Ctrl+Shift+6**)



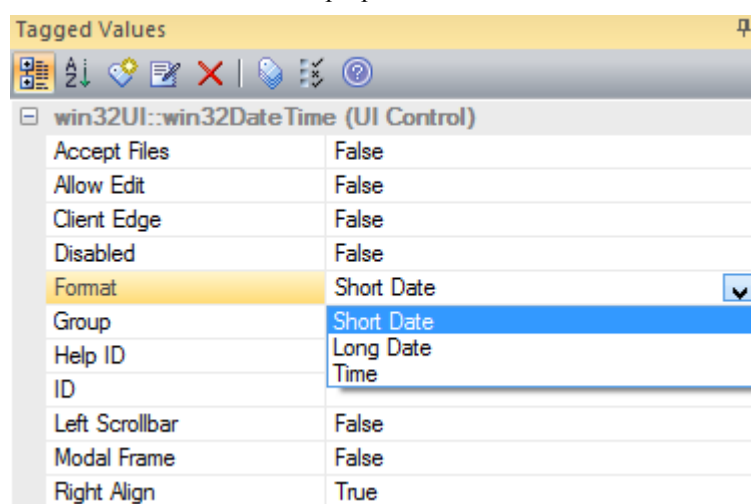
## The UI Toolbox

All of the common RC elements can be found on the UI toolbox



## The Tagged Values Window

This window is where all the properties of a control can be viewed and edited.



## Using the Picture Control

Images from your model (see *Image Manager*) can be applied by selecting the control on the dialog and pressing **Ctrl+Shift+W**. You might have to enter the value of the resource ID in the appropriate **Tagged Value**.

## Note

- You can copy and paste dialog Packages

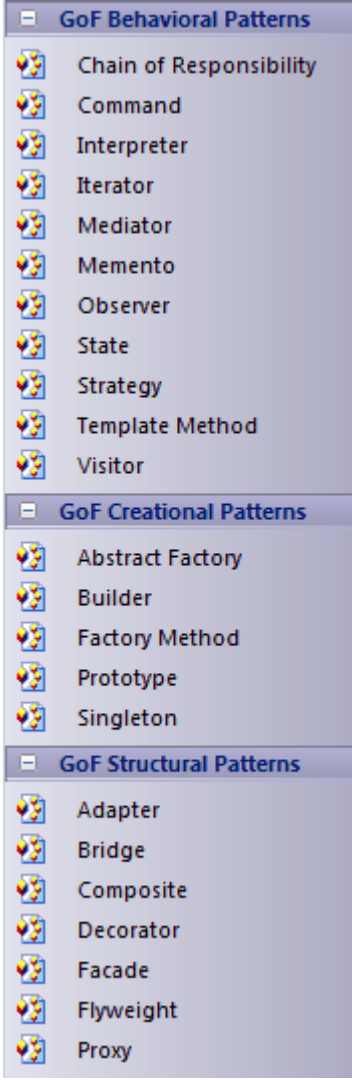
## GoF Patterns

A Design Pattern is a template for solving commonly recurring design problems; it consists of a series of elements and connectors that can be reused in a new context. The advantage of using patterns is that they have been tested and refined in a number of contexts and so are typically robust solutions to common problems. Enterprise Architect provides the Gang of Four patterns as an MDG Technology that can be loaded into the current repository.

The Gang of Four (Gof) patterns are a group of twenty three design patterns originally published in a seminal book entitled 'Design Patterns: Elements of Reusable Object-Oriented Software'; the term 'Gang of Four' refers to the four authors. Enterprise Architect displays these patterns in its powerful pattern engine, helping you to visualize the elements of the pattern and adjust the pattern to the context of your software design problem.

### GoF Patterns in Enterprise Architect

Topic	Detail
GoF Pattern Facilities	<p>The GoF Patterns are provided in the form of:</p> <ul style="list-style-type: none"><li>• GoF Behavioral Patterns, GoF Creational Patterns and GoF Structural Patterns pages in the Toolbox</li><li>• Gang of Four Pattern entries in the Toolbox Shortcut Menu</li></ul> <p><b>GoF Pattern Toolbox Pages</b></p> <p>You can access the 'GoF Pattern' pages of the Toolbox through the 'More tools   GoF Patterns' menu option; these icons are available:</p>

	 <p>When you drag one of the pattern elements onto a new diagram, the 'Add Pattern GoF &lt;pattern group&gt;&lt;pattern type&gt;' dialog displays; if necessary, modify the action and/or default for the component elements, then click on the <b>OK button</b> to create a diagram based on the pattern.</p>
Disable GoF Patterns	<p>If you prefer not to use the GoF Patterns technology in Enterprise Architect, you can disable it (and subsequently re-enable it) using the 'MDG Technologies' dialog ('Extensions   MDG Technologies').</p>



## Configuration Settings



You can set the default code options such as the editors for each of the programming languages available for Enterprise Architect and special options for how source code is generated or reverse engineered. These options are defined according to whether they apply to:

- All users of the current model, set on the 'Manage Project Options' dialog, or
- All models that you access (other users can define their own settings that apply to the same models), set on the 'Options' dialog

You can also:

- For each programming language used in the model, for all users working on the model, define Collection Classes for generating code from Association connectors where the target role has a multiplicity setting greater than 1
- Define a local path for yourself, using the 'Local Path' dialog; these settings apply to all Enterprise Architect models that you access
- Define language macros within the model, which are useful in reverse engineering and can be exported from and imported to the model

# Source Code Engineering Options

The 'Source Code Engineering' options apply to the languages in which you generate code from Enterprise Architect.

## Model-Specific Options

These options are defined on the 'Manage Project Options' dialog.

### Access

Ribbon	Configure > Reference Data > Settings > Project Options > Source Code Engineering
Menu	Project   Settings   Project Options > Source Code Engineering

## Types of Option

Option Type	Detail
Source Code Generation Options	You can define a number of settings for generating code in the model, such as the default language to generate code in and the Unicode character set for code generation.
Options - Object Lifetimes	You can configure various options concerning Object Lifetimes.
Code Language Options	For each of the code languages that Enterprise Architect supports, you can define the model-specific options and set any Collection Classes required.

## User-Specific Options

These options are defined on the 'Preferences' dialog.

### Access

On the 'Preferences' dialog, click on 'Source Code Engineering' in the left-hand list.

Ribbon	Start > Workspace > Preferences > (Preferences)
Menu	Tools   Preferences

Keyboard Shortcuts	<b>Ctrl+F9</b>
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## Types of option

Option Type	Detail
Source Code Generation Options	You can define a number of settings for generating code in any model that you access under the same user ID.
Code Editors	These are options for accessing and configuring the source code editor.
Attributes/Operations	Use these options for configuring attributes and operations.
Code Language Options	For each of the code languages that Enterprise Architect supports, you can define the user-specific options that apply to any model that you access under your user ID.

## Code Generation Options


When you generate code for your model, you can set certain options. These include:

- The default language
- Whether to generate methods for implemented interfaces
- The Unicode options for code generation

### Access

Ribbon	Configure > Reference Data > Settings > Project Options > Source Code Engineering
Menu	Project   Settings   Project Options   Source Code Engineering

### Configure code generation options

Field/Option	Action
Always synchronize with existing file (recommended)	Select the radio button to synchronize imported code with an existing file.
Replace (overwrite) existing source file	Select the radio button to overwrite the existing source file with imported code.
Component Types	Click on this button to open the 'Import component types' dialog, to set up the importation of component types.
Default Language for Code Generation	Click on the drop-down arrow and select the default language for code generation.
DDL Name Templates	Click on the  button to define the template names for Primary Key, Unique Constraint, Foreign Key and Foreign Key Index Name templates.
Default name for associated attrib	Type in a default name to be generated from imported attributes.
Generate methods for implemented interfaces	Select the checkbox to indicate that methods are generated for implemented interfaces.
Code page for source editing	Click on the drop-down arrow and select the appropriate Unicode character embedding format to apply.

## Notes

- It is worthwhile to configure these settings, as they serve as the defaults for all Classes in the model; you can override most of these on a per-Class basis using the custom settings (from the 'Code Generation' dialog)

## Import Component Types

Using the 'Import Component Types' dialog you can configure what elements you would like to be created for files of any extension found while importing a source code directory.

### Access

Ribbon	Configure > Reference Data > Settings > Project Options > Source Code Engineering: Component Types
Menu	Project   Settings   Project Options   Source Code Engineering: Component Types

### Define Import Component Types

Field/Option	Action
Extension	Type in the extension name for a component type.
Type	Click on the drop-down arrow and select the component type.
Stereotype	Type in any stereotype name that further identifies a component of this type.
Component List	Lists the currently-defined component types.
Save	Click on this button to saves the component definition and add it to the component list.
New	Click on this button to clear the dialog fields so that you can define a new component type.
Delete	Click on this button to delete the selected component type from the component list.

### Notes

- You can transport these import component types between models, using the 'Export Reference Data' and 'Import Reference Data' facilities

## Source Code Options

You can set a wide range of options for generating code in the models you work with. These include:

- How to format the generated code
- How to respond to certain events during code generation
- Whether to generate a diagram from the code

### Access

On the 'Preferences' dialog, select the 'Source Code Engineering' option

Ribbon	Start > Workspace > Preferences ( > Preferences)
Menu	Tools   Preferences
Keyboard Shortcuts	<b>Ctrl+F9</b>

### Configure code generation options

Field	Action
Wrap long comment lines at	Type in the number of characters to allow in a comment line before wrapping the text to the next line.
Auto Layout Diagram on Import	Click on the drop-down arrow and select if and when a diagram is automatically generated on code import.
Output files use both CR & LF	Select the checkbox to include carriage returns and line feeds; set this option according to what operating system is currently in use, as code might not render correctly.
Prompt when synchronizing (reversing)	Select the checkbox to display a prompt when synchronization occurs.
Remove hard breaks from comments on import	Select the checkbox to remove hard breaks from commented sections on importation.
Auto generate role names when creating code	Select the checkbox to generate role names when creating code.
Do not generate members where association direction is 'Unspecified'	Select the checkbox to prevent generation of members if the Association direction is unspecified.
Create dependencies for operation returns and parameter types	Select the checkbox to generate dependencies for operation returns and parameter types.

Comments: Generate	Select the checkbox to generate comments.
Comments: Reverse	Select the checkbox to generate reverse comments.
Remove prefixes when generating Get/Set properties	Type in the prefixes, separated by semi-colons, used in your variable naming conventions, to be removed in the variables' corresponding get/set functions.
Treat as suffixes	Select the checkbox to use the prefixes defined in the 'Remove prefixes when generating Get/Set properties' field as suffixes.
Capitalized Attribute Name for Properties	Select the checkbox to capitalize attribute names for properties.
Use 'Is' for Boolean property Get()	Select the checkbox to use the Is keyword for the Boolean property Get().

## Notes

- It is worthwhile to configure these settings, as they serve as the defaults for all Classes in the model; you can override most of these on a per-Class basis using the custom settings (from the 'Code Generation' dialog)



## Options - Code Editors



You access the source code editor options via the 'DDL' page of the 'Preferences' dialog. On this page you can configure options for Enterprise Architect's internal editor, as well as the default editor for DDL scripts. You can configure external editors for code languages on each language options page.


### Access

On the 'Preferences' dialog, select the 'Source Code Engineering > **Code Editors**' option.

Ribbon	Start > Workspace > Preferences (> Preferences)
Menu	Tools   Preferences
Keyboard Shortcuts	<b>Ctrl+F9</b>

### Options


Field/Option	Action
DDL Editor	<p>Defaults to blank, indicating that the Enterprise Architect code editor is the DDL editor in use.</p> <p>You can select a different default editor if necessary; click on the  button to browse for and select the required DDL editor. The editor name then displays in the 'DDL Editor' field.</p>
Default Database	Click on the drop-down arrow and select the default database to be used.
MySQL Storage	Click on the drop-down arrow and select the MySQL storage engine to be used.
Use inbuilt editor if no external editor set	Select the checkbox to use the inbuilt editor for code in any language if no external editor is defined for that language in the user-specific options.
Show Line Numbers	Select the checkbox to display line numbers in the editor.
Show Structure Tree	Select the checkbox to show a tree with the results of parsing the open file (if the file is parsed successfully).
Automatically Reverse Engineer on File Save	If you select this check box, pressing <b>Ctrl+S</b> to save in the source code editor automatically reverse engineers the code in the same way as the <b>Save Source and Re-Synchronize Class</b> button does.
Don't parse files larger than	Click on the drop-down arrow and select the upper limit on file size for parsing. Setting this option prevents performance decrease due to parsing very large files.
Syntax Highlighting Options	Click on the  button to display the 'Editor Language Properties' dialog, in




	which you can set both global and language-specific editor language properties.
Configure Enterprise Architect File Associations	Click on the  button to display the 'Set Associations for a Program' dialog, and select the file extensions for files that you want to open through the Enterprise Architect Document Handler.

## Editor Language Properties

Using the 'Editor Language Properties' dialog, you can specify syntax highlighting properties for any of the programming languages that Enterprise Architect supports at installation.


### Access

In the 'Preferences' dialog, select the 'Source Code Engineering | **Code Editors**' option and click on the  button next to 'Syntax Highlighting Options'.

Ribbon	Start > Workspace > Preferences > Preferences > select 'Source Code Engineering   <b>Code Editors</b> ' option > click on the  button next to 'Syntax Highlighting Options'
Menu	Tools   Preferences > select 'Source Code Engineering   <b>Code Editors</b> ' option   click on the  button next to 'Syntax Highlighting Options'
Other	In the 'Code Editor' window, click on the toolbar icon    Syntax Highlighting Options

### Options

Panel	Description
Language Panel	<p>The panel on the left of the dialog lists the languages for which you can set properties.</p> <p>At the top of the list are three non-language options:</p> <ul style="list-style-type: none"> <li>(Dark Theme) - assigns a dark background to the property fields and to the code panel in the code editor screen (you can apply a different color to specific properties)</li> <li>(Light Theme) - assigns a pale background to the property fields and to the code panel in the code editor screen (you can apply a different color to specific properties)</li> </ul> <p>You can also set the background themes on the 'Application Look' dialog</p> <ul style="list-style-type: none"> <li>(Global) provides properties that you can set for all programming languages; however, you can reset a global property to a different value for a particular language, in the properties specifically for that language</li> </ul> <p>Resetting a global property for one language does not affect that property's value for the other languages</p> <p>Click on the required language in the list, to display the properties for that language:</p> <ul style="list-style-type: none"> <li>Properties shown in bold indicate that this is the highest level at which this property can be defined (for most language options other than 'Global', this is effectively the only point at which the property is defined)</li> <li>Properties shown in normal font are generally the global properties that you can reset just for the current language</li> </ul>

Properties Panel	<p>Scroll through the property categories and individual properties for the language. You can collapse and expand categories as necessary, using the expansion box next to the category name (☐).</p> <p>When you click on a property name, an explanation of that property displays in the panel at the bottom right of the dialog.</p> <p>To define a property, click on the value field following the property name; depending on the type of property, either the field is enabled for direct editing or a drop-down arrow or  button displays (as described for the <b>Tagged Values</b> window) so that you can select the values to define the property.</p> <p>Select or type in the required values.</p> <p>Use the Toolbar icons to:</p> <ul style="list-style-type: none"> <li>• Save your changes to the properties</li> <li>• Reset all properties fields to the default settings shipped with Enterprise Architect</li> <li>• Reset the current style field to the default setting (not enabled for non-style fields)</li> </ul>
Assign Keys to Macros	<p>In the 'Macros' category of the properties, you can assign (Ctrl+Alt+&lt;n&gt;) keystroke combinations to coding macros that you have created yourself in the '<b>Source Code Viewer</b>'.</p> <p>When you click on the <b>Browse button</b> in a selected 'Macro' field, the 'Open Macro' dialog displays; this dialog lists the existing macros and, if a key combination has been assigned to a macro, what that key combination is.</p> <p>Click on the name of the macro and on the <b>Open button</b> to assign the selected keys to the macro.</p>

## Notes

- You cannot currently set properties for any additional languages you include through an MDG Technology
- You can resize this dialog, if required

## Options - Object Lifetimes

You can use these options to configure various Object Lifetime settings such as:

- Defining constructor details when generating code
- Specifying whether to create a copy constructor
- Defining Destructor details

### Access

Ribbon	Configure > Reference Data > Settings > Project Options > Source Code Engineering > Object Lifetimes
Menu	Project   Settings   Project Options   Source Code Engineering   Object Lifetimes

### Options

Field/Option	Action
Constructor	If necessary, select the checkboxes to specify that a constructor is generated and (for C++) that the constructor is in-line. Click on the drop-down arrow and select the appropriate visibility of the default constructor - Private, Protected or Public.
Copy Constructor	If necessary, select the checkboxes to specify that a copy constructor is generated and (for C++) that the copy constructor is in-line. Click on the drop-down arrow and select the appropriate visibility of the default copy constructor - Private, Protected or Public.
Destructor	If necessary, select the checkboxes to specify that a destructor is generated and (for C++) that the destructor is in-line and/or virtual. Click on the drop-down arrow and select the appropriate visibility of the default destructor - Private, Protected or Public.

## Options - Attribute/Operations

Your use of attributes and operations can be configured in a number of ways. You can set options to:

- Delete model attributes not included in the code during reverse synchronization
- Delete model methods not included in the code during reverse synchronization
- Delete code from features contained in the model during forward synchronization
- Delete model associations and aggregations that correspond to attributes not included in the code during reverse synchronization
- Define whether or not the bodies of methods are included and saved in the model when reverse engineering
- Create features in quick succession, clearing the 'Features' dialog when you click on 'Save' so that you can enter another feature name

You configure these options on the 'Attribute/Operations' page of the 'Preferences' dialog.

### Access

On the 'Preferences' dialog, select the 'Source Code Engineering > Attribute/Operations' option.

Ribbon	Start > Workspace > Preferences (> Preferences)
Menu	Tools   Preferences
Keyboard Shortcuts	<b>Ctrl+F9</b>

### Options

Field	Action
On reverse synch, delete model attributes not in code	Select the checkbox to indicate that on reverse synchronization, attributes in the model that are not included within code are automatically removed from the model.
On reverse synch, delete model associations not in code	Select the checkbox to indicate that on reverse synchronization, associations in the model that are not included within code are automatically removed from the model.
On reverse synch, delete model methods not in code	Select the checkbox to indicate that on reverse synchronization, methods in the model that are not included within code are automatically removed from the model.
Include method bodies in model when reverse engineering	Select the checkbox to indicate that on reverse engineering code, method bodies in the code are included within your model.
After Save, re-select edited item	Select the checkbox to indicate that after saving an attribute or operation, the properties definition continues to display the details of the selected feature. If deselected, indicates that the fields of the properties definition will clear so that you can enter another attribute or operation name and details immediately.

<p>On forward synch, prompt to delete code features not in model</p>	<p>Select the checkbox to indicate that, during forward synchronization, the 'Synchronize Element &lt;package name&gt;.&lt;element name&gt;' dialog displays, so that you can either ignore, reassign or delete features in the code that are not in the model.</p>
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# Modeling Conventions



The synchronization between UML models and programming code is achieved using a set of modeling conventions (mappings) between UML constructs and programming code syntax. The Software Engineer is advised to become familiar with these conventions in order to work with the code generation process for the programming languages they intend to target. There are a range of constructs used, including elements, features, connectors, connector ends, stereotypes and **Tagged Values**. The newcomer will require a little time to become familiar with these conventions but after a short time they will be translating between programming code and UML constructs without effort.

## Supported Languages

Language
Action Script
Ada 2012 (Systems Engineering and Ultimate editions)
C
C#
C++
Delphi
Java
PHP
Python
SystemC (Systems Engineering and Ultimate editions)
Verilog (Systems Engineering and Ultimate editions)
VHDL (Systems Engineering and Ultimate editions)
Visual Basic
Visual Basic .NET



## Notes

Enterprise Architect incorporates a number of visibility indicators or scope values for its supported languages; these include, for:

- All languages - Public (+), Protected (#) and Private (-)
- Java - Package (~)
- Delphi - Published (^)
- C# - Internal (~), Protected Internal (^)
- ActionScript - Internal (~)
- VB.NET - Friend (~), Protected Friend (^)
- PHP - Package (~)
- Python - Package (~)
- C - Package (~)
- C++ - Package (~)

# ActionScript Conventions

Enterprise Architect supports round trip engineering of ActionScript 2 and 3, where these conventions are used.

## Stereotypes

Stereotype	Applies To
literal	Operation Corresponds To: A literal method referred to by a variable.
property get	Operation Corresponds To: A 'read' property.
property set	Operation Corresponds To: A 'write' property.

## Tagged Values

Tag	Applies To
attribute_name	Operation with stereotype property get or property set Corresponds To: The name of the variable behind this property.
dynamic	Class or Interface Corresponds To: The 'dynamic' keyword.
final	ActionScript 3: Operation Corresponds To: The 'final' keyword.
intrinsic	ActionScript 2: Class Corresponds To: The 'intrinsic' keyword.
namespace	ActionScript 3: Class, Interface, Attribute, Operation Corresponds To: The namespace of the current element.
override	ActionScript 3: Operation Corresponds To: The 'override' keyword.
prototype	ActionScript 3: Attribute Corresponds To: The 'prototype' keyword.
rest	ActionScript 3: Parameter Corresponds To: The rest parameter (...)

## Common Conventions

- Package qualifiers (ActionScript 2) and Packages (ActionScript 3) are generated when the current Package is not a namespace root
- An unspecified type is modeled as 'var' or an empty 'Type' field

## ActionScript 3 Conventions

- The Is Leaf property of a Class corresponds to the sealed keyword
- If a namespace tag is specified it overrides the Scope that is specified

# Ada 2012 Conventions

Enterprise Architect supports round trip engineering of Ada 2012, where these conventions are used.

## Stereotypes

Stereotype	Applies To
adaPackage	Class Corresponds To: A Package specification in Ada 2012 without a tagged record.
adaProcedure	Class Corresponds To: A procedure specification in Ada 2012.
delegate	Operation Corresponds To: Access to a subprogram.
enumeration	Inner Class Corresponds To: An enumerated type.
struct	Inner Class Corresponds To: A record definition.
typedef	Inner Class Corresponds To: A type definition, subtype definition, access type definition, renaming.

## Tagged Values

Tag	Applies To
Aspect	Inner Class with stereotype typedef Operation Corresponds to: Aspect specification (Precondition and Postcondition of Subprogram type 'invariant', subtype 'predicate').
InstantiatedUnitType	Inner Class with stereotype typedef Corresponds To: The instantiated unit's type (Package / Procedure / Function).
IsAccess	Parameter Corresponds To: Determination of whether the parameter is an access variable.
IsAliased	Function parameter Corresponds to: Aliased function parameter.

Discriminant	Inner Class with stereotype typedef Corresponds To: The type's discriminant.
PartType	Inner Class with stereotype typedef Corresponds To: The part type ('renames' or 'new').
Type	Inner Class with stereotype typedef Corresponds To: If 'Value' = 'SubType', set 'subtype' If 'Value' = 'Access', set 'access type'.

## Other Conventions

- Appropriate type of source files: Ada specification file, .ads
- Ada 2012 imports Packages defined as either <<adaPackage>> Class or Class, based on the settings in the Ada 2012 options
- A Package in the Ada specification file is imported as a Class if it contains a Tagged Record, the name of which is governed by the options 'Use Class Name for Tagged Record' and 'Alternate Tagged Record Name'; all attributes defined in that Tagged Record are absorbed as the Class's attributes
- A procedure / function in an Ada specification file is considered as the Class's member function if its first parameter satisfies the conditions specified in the options 'Ref Param Style', 'Ignore Reference parameter name' and 'Ref parameter name'
- The option 'Define Reference for Tagged Record', if enabled, creates a reference type for the Class, the name of which is determined by the option 'Reference Type Name'; for example:

HelloWorld.ads

package HelloWorld is

  type HelloWorld is tagged record

    Att1: Natural;

    Att3: Integer;

  end record;

  -- Public Functions

  function MyPublicFunction (P: HelloWorld) return String;

  procedure MyPublicFunction (P1: in out HelloWorld; AFlag: Boolean);

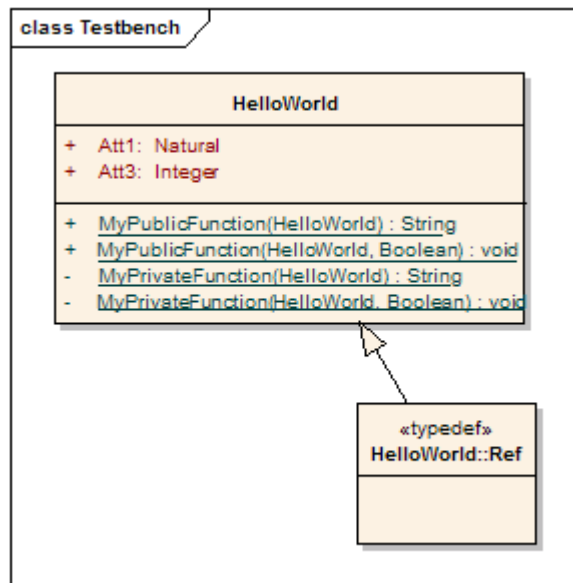
private

  -- Private Functions

  function MyPrivateFunction (P: HelloWorld) return String;

  procedure MyPrivateFunction (P1: in out HelloWorld; AFlag: Boolean);

end HelloWorld;



## Notes

- Ada 2012 support is available in the System Engineering and Ultimate editions of Enterprise Architect

## C Conventions

Enterprise Architect supports round trip engineering of C, where these conventions are used:

### Stereotype

Stereotype	Applies To
enumeration	Inner Class Corresponds To: An enumerated type.
struct	Inner Class Corresponds To: A 'struct' type.
Attribute	A keyword struct in variable definition.
typedef	Inner Class Corresponds To: A 'typedef' statement, where the parent is the original type name.
union	Inner Class Corresponds To: A union type.
Attribute	A keyword union in variable definition.

### Tagged Values

Tag	Applies To
anonymous	Class also containing the <b>Tagged Value</b> typedef Corresponds To: The name of this Class being defined only by the typedef statement.
bitfield	Attribute Corresponds To: The size, in bits, allowed for storage of this attribute.
bodyLocation	Operation Corresponds To: The location the method body is generated to; expected values are header, classDec or classBody.
typedef	Class with stereotype other than 'typedef' Corresponds To: This Class being defined in a 'typedef' statement.
typeSynonyms	Class Corresponds To: The 'typedef' name and/or fields of this type.

## C Code Generation for UML Model

UML	C Code
A Class	A pair of C files (.h + .c) Notes: File name is the same as Class name
Operation (public & protected)	Function declaration in .h file and definition in .c file Notes:
Operation (private)	Function definition in .c file only Notes:
Operation (static)	Function definition in .c file only Notes: Static functions will only appear in the .c file regardless of their scope.
Attribute (public & protected)	Variable definition in .h file Notes:
Attribute (private)	Variable definition in .c file Notes:
Inner Class (without stereotype)	(N/A) Notes: This inner Class would be ignored

## Capture #define value to be generated in C code

For example, #define PI 3.14.

Step	Process
1	Add an attribute to the Class, with Name = PI and Initial Value = 3.14.
2	In the properties panel of the 'Attributes' page, update the 'Static' and 'Const' fields.
3	On the 'Tagged Values' tab of the 'Attributes' page, add a tag called 'define' with the value <b>True</b> .

## Notes

- Separate conventions apply to Object Oriented programming in C



# Object Oriented Programming In C

In Enterprise Architect, you apply a number of conventions for Object-Oriented programming in C.

To configure the system to support Object-Oriented programming using C, you must set the 'Object Oriented Support' option to **True** on the 'C Specifications' page of the 'Options' dialog.

## Stereotypes

Stereotype	Applies To
enumeration	Class Corresponds To: An enumerated type.
struct	Class Corresponds To: A 'struct' type.
Attribute	A keyword struct in variable definition.
typedef	Class Corresponds To: A 'typedef' statement, where the parent is the original type name.
union	Class Corresponds To: A union type.
Attribute	A keyword union in variable definition.

## Tagged Values

Tag	Applies To
anonymous	Class with stereotype of 'enumeration', 'struct' or 'union' Corresponds To: The name of this Class being defined only by the typedef statement.
bodyLocation	Operation Corresponds To: The location the method body is generated to; expected values are 'header', 'classDec' or 'classBody'.
define	Attribute Corresponds To: '#define' statement.
typedef	Class with stereotype of 'enumeration', 'struct' or 'union' Corresponds To: This Class being defined in a 'typedef' statement.

## Object-Oriented C Code Generation for UML Model

The basic idea of implementing a **UML Class** in C code is to group the data variable (UML attributes) into a structure type; this structure is defined in a .h file so that it can be shared by other Classes and by the client that referred to it.

An operation in a UML Class is implemented in C code as a function; the name of the function must be a fully qualified name that consists of the operation name, as well as the Class name to indicate that the operation is for that Class.

A delimiter (specified in the 'Namespace Delimiter' option on the 'C Specifications' page) is used to join the Class name and function (operation) name.

The function in C code must also have a reference parameter to the Class object - you can modify the 'Reference as Operation Parameter', 'Reference Parameter Style' and 'Reference Parameter Name' options on the 'C Specifications' page to support this reference parameter.

## Limitations of Object-Oriented Programming in C

- No scope mapping for an attribute: an attribute in a **UML Class** is mapped to a structure variable in C code, and its scope (private, protected or public) is ignored
- Currently an inner Class is ignored: if a UML Class is the inner Class of another UML Class, it is ignored when generating C code
- Initial value is ignored: the initial value of an attribute in a UML Class is ignored in generated C code

# C# Conventions

Enterprise Architect supports the round trip engineering of C#, where these conventions are used.

## Stereotypes

Stereotype	Applies To
enumeration	Class Corresponds To: An enumerated type.
event	Operation Corresponds To: An event.
extension	Operation Corresponds To: A Class extension method, represented in code by a 'this' parameter in the signature.
indexer	Operation Corresponds To: A property acting as an index for this Class.
partial	Operation Corresponds To: The 'partial' keyword on an operation.
property	Operation Corresponds To: A property possibly containing both read and write code.
struct	Class Corresponds To: A 'struct' type.

## Tagged Values

Tag	Applies To
argumentName	Operation with stereotype extension Corresponds To: The name given to this parameter.
attribute_name	Operation with stereotype property or event Corresponds To: The name of the variable behind this property or event.
className	Operation with stereotype extension Corresponds To: The Class that this method is being added to.
const	Attribute

	Corresponds To: The const keyword.
definition	Operation with stereotype partial Corresponds To: Whether this is the declaration of the method, or the definition.
delegate	Operation Corresponds To: The 'delegate' keyword.
enumType	Operation with stereotype property Corresponds To: The datatype that the property is represented as.
expressionBody	Operation, Operation with stereotype property or indexer Corresponds To: <b>True</b> if the 'Initial Code' is from an expression body function member.
extern	Operation Corresponds To: The 'extern' keyword.
fixed	Attribute Corresponds To: The 'fixed' keyword.
generic	Operation Corresponds To: The generic parameters for this operation.
genericConstraints	Templated Class or Interface, Operation with tag 'generic' Corresponds To: The constraints on the generic parameters of this type or operation.
Implements	Operation Corresponds To: The name of the method this implements, including the interface name.
ImplementsExplicit	Operation Corresponds To: The presence of the source interface name in this method declaration.
initializer	Operation Corresponds To: A constructor initialization list.
new	Class, Interface, Operation Corresponds To: The 'new' keyword.
override	Operation Corresponds To: The 'override' keyword.
params	Parameter Corresponds To: A parameter list using the 'params' keyword.
partial	Class, Interface Corresponds To: The 'partial' keyword.

propertyInitializer	Operation with stereotype property Corresponds To: A property initializer.
readonly	Operation with stereotype property Corresponds To: This property only defining 'read' code.
sealed	Operation Corresponds To: The 'sealed' keyword.
static	Class Corresponds To: The 'static' keyword.
unsafe	Class, Interface, Operation Corresponds To: The 'unsafe' keyword.
virtual	Operation Corresponds To: The 'virtual' keyword.
writeonly	Operation with stereotype property Corresponds To: This property only defining 'write' code.

## Other Conventions

- Namespaces are generated for each Package below a namespace root
- The Const property of an attribute corresponds to the readonly keyword, while the tag const corresponds to the const keyword
- The value of inout for the Kind property of a parameter corresponds to the ref keyword
- The value of out for the Kind property of a parameter corresponds to the out keyword
- Partial Classes can be modeled as two separate Classes with the partial tag
- The Is Leaf property of a Class corresponds to the sealed keyword

## C++ Conventions

Enterprise Architect supports round trip engineering of C++, including the Managed C++ and C++/CLI extensions, where these conventions are used.

### Stereotypes

Stereotype	Applies To
enumeration	Class Corresponds To: An enumerated type.
friend	Operation Corresponds To: The 'friend' keyword.
property get	Operation Corresponds To: A 'read' property.
property set	Operation Corresponds To: A 'write' property.
struct	Class Corresponds To: A 'struct' type.
typedef	Class Corresponds To: A 'typedef' statement, where the parent is the original type name.
alias	Class Corresponds to an 'Alias' declaration, where the parent is the original type name.
union	Class Corresponds To: A union type.

### Tagged Values

Tag	Applies To
afx_msg	Operation Corresponds To: The afx_msg keyword.
anonymous	Class also containing the <b>Tagged Value</b> typedef Corresponds To: The name of this Class being only defined by the typedef statement.

attribute_name	Operation with stereotype property get or property set Corresponds To: The name of the variable behind this property.
bitfield	Attribute Corresponds To: The size, in bits, allowed for storage of this attribute.
bodyLocation	Operation Corresponds To: The location the method body is generated to; expected values are header, classDec or classBody.
callback	Operation Corresponds To: A reference to the CALLBACK macro.
explicit	Operation Corresponds To: The 'explicit' keyword.
initializer	Operation Corresponds To: A constructor initialization list.
inline	Operation Corresponds To: The inline keyword and inline generation of the method body.
mutable	Attribute Corresponds To: The 'mutable' keyword.
scoped	Class with stereotype enumeration Corresponds To: Either the 'class' or 'struct' keyword.
throws	Operation Corresponds To: The exceptions that are thrown by this method.
typedef	Class with stereotype other than 'typedef' Corresponds To: This Class being defined in a 'typedef' statement.
typeSynonyms	Class Corresponds To: The 'typedef' name and/or fields of this type.
volatile	Operation Corresponds To: The 'volatile' keyword.

## Other Conventions

- Namespaces are generated for each Package below a namespace root
- By Reference attributes correspond to a pointer to the type specified
- The Transient property of an attribute corresponds to the volatile keyword
- The Abstract property of an attribute corresponds to the virtual keyword

- The Const property of an operation corresponds to the const keyword, specifying a constant return type
- The Is Query property of an operation corresponds to the const keyword, specifying the method doesn't modify any fields
- The Pure property of an operation corresponds to a pure virtual method using the "= 0" syntax
- The Fixed property of a parameter corresponds to the const keyword



## Managed C++ Conventions

These conventions are used for managed extensions to C++ prior to C++/CLI. In order to set the system to generate managed C++ you must modify the C++ version in the C++ Options.

### Stereotypes

Stereotype	Applies To
property	Operation Corresponds To: The '__property' keyword.
property get	Operation Corresponds To: The '__property' keyword and a read property.
property set	Operation Corresponds To: The '__property' keyword and a 'write' property.
reference	Class Corresponds To: The '__gc' keyword.
value	Class Corresponds To: The '__value' keyword.

### Tagged Values

Tag	Applies To
managedType	Class with stereotype reference, value or enumeration; Interface Corresponds To: The keyword used in declaration of this type; expected values are 'class' or 'struct'.

### Other Conventions

- The typedef and anonymous tags from native C++ are not supported
- The Pure property of an operation corresponds to the keyword \_\_abstract

## C++/CLI Conventions

These conventions are used for modeling C++/CLI extensions to C++. In order to set the system to generate managed C++/CLI you must modify the C++ version in the C++ Options.

### Stereotypes

Stereotype	Applies To
event	Operation Description: Defines an event to provide access to the event handler for this Class.
property	Operation, Attribute Description: This is a property possibly containing both read and write code.
reference	Class Description: Corresponds to the 'ref class' or 'ref struct' keyword.
value	Class Description: Corresponds to the 'value class' or 'value struct' keyword.

### Tagged Values

Tag	Applies To
attribute_name	Operation with stereotype property or event Description: The name of the variable behind this property or event.
generic	Operation Description: Defines the generic parameters for this Operation.
genericConstraints	Templated Class or Interface, Operation with tag generic Description: Defines the constraints on the generic parameters for this Operation.
initonly	Attribute Description: Corresponds to the 'initonly' keyword.
literal	Attribute Description: Corresponds to the literal keyword.
managedType	Class with stereotype reference, value or enumeration; Interface Description: Corresponds to either the 'class' or 'struct' keyword.

## Other Conventions

- The typedef and anonymous tags are not used
- The property get/property set stereotypes are not used
- The Pure property of an operation corresponds to the keyword abstract

# Delphi Conventions

Enterprise Architect supports round trip engineering of Delphi, where these conventions are used:

## Stereotypes

Stereotype	Applies To
constructor	Operation Corresponds To: A constructor.
destructor	Operation Corresponds To: A destructor.
dispinterface	Class, Interface Corresponds To: A dispatch interface.
enumeration	Class Corresponds To: An enumerated type.
metaclass	Class Corresponds To: A metaclass type.
object	Class Corresponds To: An object type.
operator	Operation Corresponds To: An operator.
property get	Operation Corresponds To: A 'read' property.
property set	Operation Corresponds To: A 'write' property.
struct	Class Corresponds To: A record type.

## Tagged Values

Tag	Applies To
attribute_name	Operation with stereotype property get or property set Corresponds To: The name of the variable behind this property.

overload	Operation Corresponds To: The 'overload' keyword.
override	Operation Corresponds To: The 'override' keyword.
packed	Class Corresponds To: The 'packed' keyword.
property	Class Corresponds To: A property; see <i>Delphi Properties</i> for more information.
reintroduce	Operation Corresponds To: The 'reintroduce' keyword.

## Other Conventions

- The Static property of an attribute or operation corresponds to the class keyword
- The Fixed property of a parameter corresponds to the const keyword
- The value of inout for the Kind property of a parameter corresponds to the Var keyword
- The value of out for the Kind property of a parameter corresponds to the Out keyword

# Java Conventions

Enterprise Architect supports round trip engineering of Java - including AspectJ extensions - where these conventions are used.

## Stereotypes

Stereotype	Applies To
annotation	Interface Corresponds To: An annotation type.
default	Operation Corresponds To: The 'default' keyword.
enum	Attributes within a Class stereotyped enumeration Corresponds To: An enumerated option, distinguished from other attributes that have no stereotype.
enumeration	Class Corresponds To: An enumerated type.
operator	Operation Corresponds To: An operator.
property get	Operation Corresponds To: A 'read' property.
property set	Operation Corresponds To: A 'write' property.
static	Class or Interface Corresponds To: The 'static' keyword.

## Tagged Values

Tag	Applies To
annotations	Anything Corresponds To: The annotations on the current code feature.
arguments	Attribute with stereotype enum Corresponds To: The arguments that apply to this enumerated value.

attribute_name	Operation with stereotype property get or property set Corresponds To: The name of the variable behind this property.
dynamic	Class or Interface Corresponds To: The 'dynamic' keyword.
generic	Operation Corresponds To: The generic parameters to this operation.
parameterList	Parameter Corresponds To: A parameter list with the ... syntax.
throws	Operation Corresponds To: The exceptions that are thrown by this method.
transient	Attribute Corresponds To: The 'transient' keyword.

## Other Conventions

- Package statements are generated when the current Package is not a namespace root
- The Const property of an attribute or operation corresponds to the final keyword
- The Transient property of an attribute corresponds to the volatile keyword
- The Fixed property of a parameter corresponds to the final keyword

# AspectJ Conventions

These are the conventions used for supporting AspectJ extensions to Java.

## Stereotypes

Stereotype	Applies To
advice	Operation Corresponds To: A piece of advice in an AspectJ aspect.
aspect	Class Corresponds To: An AspectJ aspect.
pointcut	Operation Corresponds To: A 'pointcut' in an AspectJ aspect.

## Tagged Values

Tag	Applies To
className	Attribute or operation within a Class stereotyped aspect Corresponds To: The Classes this AspectJ intertype member belongs to.

## Other Conventions

- The specifications of a pointcut are included in the 'Behavior' field of the method



# PHP Conventions

Enterprise Architect supports the round trip engineering of PHP 4 and 5, where these conventions are used.

## Stereotypes

Stereotype	Applies To
trait	Class Corresponds To: A 'trait'.
property get	Operation Corresponds To: A 'read' property.
property set	Operation Corresponds To: A 'write' property.

## Tagged Values

Tag	Applies To
attribute_name	Operation with stereotype property get or property set Corresponds To: The name of the variable behind this property.
final	Operations in PHP 5 Corresponds To: The 'final' keyword.

## Common Conventions

- An unspecified type is modeled as var
- Methods returning a reference are generated by setting the Return Type to var\*
- Reference parameters are generated from parameters with the parameter Kind set to inout or out

## PHP 5 Conventions

- The final Class modifier corresponds to the Is Leaf property
- The abstract Class modifier corresponds to the Abstract property
- Parameter type hinting is supported by setting the Type of a parameter
- The value of inout or out for the Kind property of a parameter corresponds to a reference parameter



# Python Conventions

Enterprise Architect supports the round trip engineering of Python, where these conventions are used.

## Tagged Values

Tag	Applies To
Decorators	Class, Operation Corresponds To: The decorators applied to this element in the source.

## Other Conventions

- Model members with Private Scope correspond to code members with two leading underscores
- Attributes are only generated when the Initial value is not empty
- All types are reverse engineered as var

# SystemC Conventions

Enterprise Architect supports round-trip engineering of SystemC, where these conventions are used.

## Stereotypes

Stereotype	Applies To
delegate	Method Corresponds To: A delegate.
enumeration	Inner Class Corresponds To: An enum type.
friend	Method Corresponds To: A friend method.
property	Method Corresponds To: A property definition.
sc_ctor	Method Corresponds To: A SystemC constructor.
sc_module	Class Corresponds To: A SystemC module.
sc_port	Attribute Corresponds To: A port.
sc_signal	Attribute Corresponds To: A signal.
struct	Inner Class Corresponds To: A struct or union.

## Tagged Values

Tag	Applies To
kind	Attribute (Port) Corresponds To: Port kind (clocked, fifo, master, slave, resolved, vector).
mode	Attribute (Port) Corresponds To: Port mode (in, out, inout).

overrides	Method Corresponds To: The Inheritance list of a method declaration.
throw	Method Corresponds To: The exception specification of a method.

## Other Conventions



- SystemC also inherits most of the stereotypes and **Tagged Values** of C++

## SystemC Toolbox Pages

To model a SystemC design, drag these icons onto a diagram from the 'SystemC Constructs' page of the **Diagram Toolbox**.

Page	Icon
SystemC	Module Action: Defines a SystemC Module. An <code>sc_module</code> -stereotyped Class element.
SystemC Features	Port Action: Defines a SystemC Port. An <code>sc_port</code> - stereotyped attribute.

## Access

Ribbon	Design > Diagram > Toolbox : More tools > HDL > SystemC Constructs
Menu	Diagram > Toolbox : More tools   HDL   SystemC Constructs
Keyboard Shortcuts	<b>Alt</b> + 5 : More tools   HDL   SystemC Constructs
Other	You can display or hide the <b>Diagram Toolbox</b> by clicking on the  or  icons at the left-hand end of the Caption Bar at the top of the <b>Diagram View</b> .

## VB.NET Conventions

Enterprise Architect supports round-trip engineering of Visual Basic.NET, where these conventions are used. Earlier versions of Visual Basic are supported as a different language.

### Stereotypes

Stereotype	Applies To
event	Operation Corresponds To: An event declaration.
import	Operation Corresponds To: An operation to be imported from another library.
module	Class Corresponds To: A module.
operator	Operation Corresponds To: An operator overload definition.
partial	Operation Corresponds To: The 'partial' keyword on an operation.
property	Operation Corresponds To: A property possibly containing both read and write code.

### Tagged Values

Tag	Applies To
Alias	Operation with stereotype import Corresponds To: The alias for this imported operation.
attribute_name	Operation with stereotype property Corresponds To: The name of the variable behind this property.
Charset	Operation with stereotype import Corresponds To: The character set clause for this import - one of the values 'Ansi', 'Unicode' or 'Auto'.
delegate	Operation Corresponds To: The 'delegate' keyword.

enumTag	Operation with stereotype property Corresponds To: The datatype that this property is represented as.
Handles	Operation Corresponds To: The 'handles' clause on this operation.
Implements	Operation Corresponds To: The 'implements' clause on this operation.
Lib	Operation with stereotype import Corresponds To: The library this import comes from.
MustOverride	Operation Corresponds To: The 'MustOverride' keyword.
Narrowing	Operation with stereotype operator Corresponds To: The 'Narrowing' keyword.
NotOverrideable	Operation Corresponds To: The 'NotOverrideable' keyword.
Overloads	Operation Corresponds To: The 'overloads' keyword.
Overrides	Operation Corresponds To: The 'overrides' keyword.
parameterArray	Parameter Corresponds To: A parameter list using the 'ParamArray' keyword.
partial	Class, Interface Corresponds To: The 'partial' keyword.
readonly	Operation with stereotype property Corresponds To: This property only defining 'read' code.
shadows	Class, Interface, Operation Corresponds To: The 'Shadows' keyword.
Shared	Attribute Corresponds To: The 'Shared' keyword.
Widening	Operation with stereotype operator Corresponds To: The 'Widening' keyword.
writeonly	Operation with stereotype property Corresponds To: This property only defining 'write' code.

## Other Conventions

- Namespaces are generated for each Package below a namespace root
- The Is Leaf property of a Class corresponds to the NotInheritable keyword
- The Abstract property of a Class corresponds to the MustInherit keyword
- The Static property of an attribute or operation corresponds to the Shared keyword
- The Abstract property of an operation corresponds to the MustOverride keyword
- The value of in for the Kind property of a parameter corresponds to the ByVal keyword
- The value of inout or out for the Kind property of a parameter corresponds to the ByRef keyword



# Verilog Conventions

Enterprise Architect supports round-trip engineering of Verilog, where these conventions are used.

## Stereotypes

Stereotype	Applies To
asynchronous	Method Corresponds To: A concurrent process.
enumeration	Inner Class Corresponds To: An enum type.
initializer	Method Corresponds To: An initializer process.
module	Class Corresponds To: A module.
part	Attribute Corresponds To: A component instantiation.
port	Attribute Corresponds To: A port.
synchronous	Method Corresponds To: A sequential process.

## Tagged Values

Tag	Applies To
kind	Attribute (signal) Corresponds To: The signal kind (such as register, bus).
mode	Attribute (port) Corresponds To: The port mode (in, out, inout).
Portmap	Attribute (part) Corresponds To: The generic / port map of the component instantiated.
sensitivity	Method Corresponds To: The sensitivity list of a sequential process.

type	Attribute Corresponds To: The range or type value of an attribute.
------	---

## Verilog Toolbox Pages

Access: Diagram | Toolbox : More tools | HDL | Verilog Constructs

Drag these icons onto a diagram to model a Verilog design.

Item	Action
Module	Defines a Verilog Module. A module-stereotyped Class element.
Enumeration	Defines an Enumerated Type. An enumeration element.
Port	Defines a Verilog Port. A port-stereotyped attribute.
Part	Defines a Verilog component instantiation. A part-stereotyped attribute.
Attribute	Defines an attribute.
Procedure	Defines a Verilog process: <ul style="list-style-type: none"><li>• Concurrent - An asynchronous-stereotyped method</li><li>• Sequential - A synchronous-stereotyped method</li><li>• Initializer - An initializer-stereotyped method</li></ul>

# VHDL Conventions

Enterprise Architect supports round-trip engineering of VHDL, where these conventions are used.

## Stereotypes

Stereotype	Applies To
architecture	Class Corresponds To: An architecture.
asynchronous	Method Corresponds To: An asynchronous process.
configuration	Method Corresponds To: A configuration.
enumeration	Inner Class Corresponds To: An enumerated type.
entity	Interface Corresponds To: An entity.
part	Attribute Corresponds To: A component instantiation.
port	Attribute Corresponds To: A port.
signal	Attribute Corresponds To: A signal declaration.
struct	Inner Class Corresponds To: A record definition.
synchronous	Method Corresponds To: A synchronous process.
typedef	Inner Class Corresponds To: A type or subtype definition.

## Tagged Values



Tag	Applies To
-----	------------

isGeneric	Attribute (port) Corresponds To: The 'port' declaration in a generic interface.
isSubType	Inner Class (typedef) Corresponds To: A subtype definition.
kind	Attribute (signal) Corresponds To: The signal kind (such as 'register', 'bus').
mode	Attribute (port) Corresponds To: The port mode ('in', 'out', 'inout', 'buffer', 'linkage').
portmap	Attribute (part) Corresponds To: The generic / port map of the component instantiated.
sensitivity	Method (synchronous) Corresponds To: The 'sensitivity' list of a synchronous process.
type	Inner Class (typedef) Corresponds To: The 'type' indication of a 'type' declaration.
typeNameSpace	Attribute (part) Corresponds To: The 'type' namespace of the instantiated component.

## VHDL Toolbox Pages

### Access

To model a VHDL design, drag icons from the VHDL toolbox pages and drop them on your diagram.

Ribbon	Design > Diagram > Toolbox : More tools   HDL   VHDL Constructs
Menu	Diagram > Toolbox : More tools   HDL   VHDL Constructs
Keyboard Shortcuts	<b>Alt</b> + 5 : More tools   HDL   VHDL Constructs
Other	You can display or hide the <b>Diagram Toolbox</b> by clicking on the  or  icons at the left-hand end of the Caption Bar at the top of the <b>Diagram View</b> .

## VHDL Toolbox Page

Item	Action
Architecture	Defines an architecture to be associated with a VHDL entity. An architecture-stereotyped Class element.
Entity	Defines a VHDL entity to contain the Port definitions. An entity-stereotyped interface element.
Enumeration	Defines an Enumerated Type. An Enumeration element.
Struct	Defines a VHDL record. A struct-stereotyped Class element.
Typedef	Defines a VHDL type or subtype. A typedef-stereotyped Class element.

## VHDL Features Toolbox Page

Item	Action
Part	Defines a VHDL component instantiation. A part-stereotyped attribute.
Port	Defines a VHDL Port. A port-stereotyped attribute.
Signal	Defines a VHDL signal. A signal-stereotyped attribute.
Procedure	Defines a VHDL process: <ul style="list-style-type: none"><li>• Concurrent - An asynchronous-stereotyped method</li><li>• Sequential - A synchronous-stereotyped method</li><li>• Configuration - An configuration-stereotyped method</li></ul>

## Visual Basic Conventions

Enterprise Architect supports the round trip engineering of Visual Basic 5 and 6, where these conventions are used. Visual Basic .NET is supported as a different language.

### Stereotypes

Stereotype	Applies To
global	Attribute Corresponds To: The 'Global' keyword.
import	Operation Corresponds To: An operation to be imported from another library.
property get	Operation Corresponds To: A property 'get'.
property set	Operation Corresponds To: A property 'set'.
property let	Operation Corresponds To: A property 'let'.
with events	Attribute Corresponds To: The 'WithEvents' keyword.

### Tagged Values

Tag	Applies To
Alias	Operation with stereotype import Corresponds To: The alias for this imported operation.
attribute_name	Operation with stereotype property get, property set or property let Corresponds To: The name of the variable behind this property.
Lib	Operation with stereotype import Corresponds To: The library this import comes from.
New	Attribute Corresponds To: The 'new' keyword.

## Other Conventions

- The value of in for the Kind property of a parameter corresponds to the ByVal keyword
- The value of inout or out for the Kind property of a parameter corresponds to the ByRef keyword

## Language Options

You can set up various options for how Enterprise Architect handles a particular language when generating and reverse-engineering code. These options are either specific to:

- Your user ID, for all models or
- The model in which they are defined, for all users

### Access

Ribbon	Start > Workspace > Preferences > Preferences > Source Code Engineering > <language name> Configure > Reference Data > Settings > Project Options > Source Code Engineering > <language name>
Menu	Tools   Preferences   Source Code Engineering   <language name> (user-specific) or Project   Settings   Project Options   Source Code Engineering   <language name> (model specific)
Keyboard Shortcuts	<b>Ctrl+F9</b> ('Preferences' dialog)

## Languages Supported

Language
Action Script
Ada 2012 (in the Systems Engineering and Ultimate editions of Enterprise Architect)
ArcGIS
ANSI C
C#
C++
Delphi
Java
PHP
Python



SystemC
Verilog (Systems Engineering and Ultimate editions)
VHDL (Systems Engineering and Ultimate editions)
Visual Basic
Visual Basic .NET

## ActionScript Options - User


If you intend to generate ActionScript code from your model, you can configure the code generation options using the 'ActionScript Specifications' page of the 'Preferences' dialog to:

- Specify the default source directory
- Specify the editor for ActionScript code

### Access

Ribbon	Start > Workspace > Preferences > Preferences > Source Code Engineering > ActionScript
Menu	Tools   Preferences   Source Code Engineering   ActionScript
Keyboard Shortcuts	<b>Ctrl+F9</b>

### Options

Field/Option/Button	Action
Disable Language	Leave this checkbox unselected to support ActionScript code generation. Select this checkbox to disable ActionScript code support.
Options for the current user	In the 'Default Source Directory' and 'Editor' fields, click on the  button and browse for the source directory and external file editor that you will use.

### Notes

- These options apply to all models that you access

## ActionScript Options - Model

If you intend to generate ActionScript code from your model, you can configure the model-specific code generation options using the 'ActionScript Specifications' page of the 'Manage Project Options' dialog to:

- Specify default ActionScript version to generate (AS2.0 or AS3.0)
- Specify default file extensions
- Specify the Collection Class definitions for Association connectors

### Access

Ribbon	Configure > Reference Data > Settings > Project Options > Source Code Engineering > ActionScript
Menu	Project   Settings   Project Options   Source Code Engineering   ActionScript

### Options

Field/Option/Button	Action
Options for the current model	Type in the default ActionScript version and default file extension to apply when generating ActionScript source code.
Collection Classes	Click on this button to open the 'Collection Classes for Association Roles' dialog, through which you specify the collection class definitions for Association connectors.

### Notes

- These options affect all users of the current model; however, they do not apply to other models

## Ada 2012 Options - User

If you intend to generate Ada 2012 code from your model, you can configure the code generation options using the 'Ada' page of the 'Options' dialog to:

- Inform the reverse engineering process whether the name of the Tagged Record is the same as the Package name
- Advise the engine of the alternate Tagged Record name to locate
- Specify whether the engine should create a reference type for the Tagged Record (if one is not defined)
- Supply the name of the reference type to be created (default is Ref)
- Specify the reference parameter of a Reference / Access type
- Tell the engine to ignore the name of the reference parameter
- Indicate the name of the reference parameter to locate

### Access

Ribbon	Start > Workspace > Preferences > Preferences > Source Code Engineering > Ada
Menu	Tools   Preferences   Source Code Engineering   Ada
Keyboard Shortcuts	<b>Ctrl+F9</b>

### Options

Field/Option/Button	Action
Disable Language	Leave this checkbox unselected to support Ada 2012 code generation. Select this check box to disable Ada 2012 code support.
Options for the current user	Specifies the options used for the current user; these options apply to all models that are accessed by the user.

### Notes

- Ada 2012 support is available in the System Engineering and Ultimate editions of Enterprise Architect

## Ada 2012 Options - Model

If you intend to generate Ada 2012 code from your model, you can configure the model-specific code generation options using the 'Ada' page of the 'Manage Project Options' dialog to:

- Specify the default file extension and
- Specify the Collection Class definitions for Association connectors

### Access

Ribbon	Configure > Reference Data > Settings > Project Options > Source Code Engineering > Ada
Menu	Project   Settings   Project Options   Source Code Engineering   Ada

### Options

Field/Option/Button	Action
Options for the current model	Type in the default file extension to apply when generating Ada source code.
Collection Classes	Click on this button to open the 'Collection Classes for Association Roles' dialog, through which you specify the collection class definitions for Association connectors.

### Notes

- These options affect all users of the current model; however, they do not apply to other models
- Ada 2012 support is available in the System Engineering and Ultimate editions of Enterprise Architect

## ArcGIS Options - User

If you intend to generate ArcGIS code from your model, you can configure the code generation options using the 'ArcGIS' page of the 'Options' dialog to:

- Specify default source directory
- Specify the editor for ArcGIS code

ArcGIS must be enabled in the 'MDG Technologies' dialog (Configure > Technology > Manage) in order for the 'ArcGIS' page to be available.

### Access

Ribbon	Start > Workspace > Preferences > Preferences > Source Code Engineering > ArcGIS
Menu	Tools   Preferences   Source Code Engineering   ArcGIS
Keyboard Shortcuts	<b>Ctrl+F9</b>

### Options

Field/Option/Button	Action
Disable Language	Leave this checkbox unselected to support ArcGIS code generation. Select this check box to disable ArcGIS code support.
Options for the current user	Specifies the options used for the current user; these options apply to all models that are accessed by the user.

## ArcGIS Options - Model

If you intend to generate ArcGIS code from your model, you can configure the model-specific code generation options using the 'ArcGIS' page of the 'Manage Project Options' dialog to:

- Specify default file extensions
- Specify the Collection Class definitions for Association connectors

### Access

Ribbon	Configure > Reference Data > Settings > Project Options > Source Code Engineering > ArcGIS
Menu	Project   Settings   Project Options   Source Code Engineering   ArcGIS

### Options

Field/Option/Button	Action
Options for the current model	Type in the default file extension to apply when generating ArcGIS source code.
Collection Classes	Click on this button to open the 'Collection Classes for Association Roles' dialog, through which you specify the collection class definitions for Association connectors.

### Notes

- These options affect all users of the current model; however, they do not apply to other models



## C Options - User

If you intend to generate C code from your model, you can configure the code generation options using the 'C Specifications' page of the 'Preferences' dialog.

### Access

Ribbon	Start > Workspace > Preferences > Preferences > Source Code Engineering > C
Menu	Tools   Preferences   Source Code Engineering   C
Keyboard Shortcuts	<b>Ctrl+F9</b>

### Options

Field/Option/Button	Action
Disable Language	<p>Leave this checkbox unselected to support C code generation.</p> <p>Select this option to disable C code support.</p>
Options for the current user	<p>In the value fields, specify the options that apply under your own user ID in all models that you access:</p> <ul style="list-style-type: none"> <li>• The default attribute type to create (fixed as int)</li> <li>• Whether a #define constant is imported as an attribute in imported C code (if 'Object Oriented programming' is set to <b>True</b> on the 'C Specifications' page of the 'Manage Project Options' dialog)</li> <li>• Whether to generate comments for C methods to the declaration, and to reverse engineer comments from the declaration</li> <li>• Whether to generate comments for C methods to the implementation, and to reverse engineer comments from the implementation</li> <li>• Whether to update comments in regenerating code from the model</li> <li>• Whether to update the implementation file in re-generating code from the model</li> <li>• The default source code directory location (click on the  button)</li> <li>• The default file extensions to read when importing a directory of C code</li> <li>• The Code Editor to use (click on the  button)</li> <li>• The search path for the implementation file relative to the header file path</li> </ul>



## C Options - Model

If you intend to generate C code from your model, you can configure the model-specific code generation options using the 'C Specifications' page of the 'Manage Project Options' dialog to:

- Specify default file extensions (header and source)
- Define support for Object Oriented programming
- Set the Statemachine Engineering options
- Specify the Collection Class definitions for Association connectors

### Access

Ribbon	Configure > Reference Data > Settings > Project Options > Source Code Engineering > C
Menu	Project   Settings   Project Options   Source Code Engineering   C

### Options

Field/Option/Button	Action
Options for the current model	<p>In the value fields, specify these options:</p> <ul style="list-style-type: none"> <li>• The default header and source file extensions for the code files</li> <li>• Support for Object Oriented programming; if this is <b>True</b>, then set: <ul style="list-style-type: none"> <li>- The Namespace delimiter character</li> <li>- Whether the first parameter of an operation is a Class reference</li> <li>- The parameter reference style in generated C code</li> <li>- The reference parameter name in generated code</li> <li>- The default Constructor name in generated code</li> <li>- The default Destructor name in generated code</li> </ul> </li> </ul>
Statemachine Engineering	<p>In the value fields, use the drop-down arrows to set the options to <b>True</b> or <b>False</b>; these options apply to generating code from State Machine models in the current model only:</p> <ul style="list-style-type: none"> <li>• 'Use the new Statemachine Template' - set to True to use the code generation templates from Enterprise Architect Release 11 and later, set to False to apply the EASL Legacy templates</li> <li>• Generate Trace Code - set to True to generate Trace code, False to omit it</li> </ul>
Collection Classes	Click on this button to open the 'Collection Classes for Association Roles' dialog, through which you specify the collection class definitions for Association connectors.

### Notes

- These options affect all users of the current model; however, they do not apply to other models



## C# Options - User

If you intend to generate C# code from your model, you can configure the code generation options using the 'C# Specifications' page of the 'Preferences' dialog

### Access

Ribbon	Start > Workspace > Preferences > Preferences > Source Code Engineering > C#
Menu	Tools   Preferences   Source Code Engineering   C#
Keyboard Shortcuts	<b>Ctrl+F9</b>

### Options

Field/Option/Button	Action
Disable Language	Leave this checkbox unselected to support C# code generation. Select this check box to disable C# code support.
Options for the current user	<p>In the value fields, specify the options that apply under your own user ID in all models that you access:</p> <ul style="list-style-type: none"><li>• The default attribute type to create</li><li>• Whether Namespaces should be generated when generating C# Classes</li><li>• Whether to remove new lines (hard carriage returns) from the summary tag when importing XML.NET style comments</li><li>• Whether to generate a Finalizer method when generating code for a C# Class</li><li>• Whether to generate a Dispose method when generating code for a C# Class</li><li>• The default source code directory location (click on the  button)</li><li>• The Code Editor to use (click on the  button)</li></ul>

## C# Options - Model

If you intend to generate C# code from your model, you can configure the model-specific code generation options using the 'C# Specifications' page of the 'Manage Project Options' dialog to:

- Specify the default file extension
- Indicate additional Collection Classes - to define custom Collection Classes, which can be simple substitutions (such as CArray<#TYPE#>) or a mix of other strings and substitutions (such as Cmap<CString,LPCTSTR,#TYPE#\*,#TYPE#\*>); these Collection Classes are defined by default:  
- List<#TYPE#>;Stack<#TYPE#>;Queue<#TYPE#>;
- Set the Statemachine Engineering options
- Specify the Collection Class definitions for Association connectors

### Access

Ribbon	Configure > Reference Data > Settings > Project Options > Source Code Engineering > C#
Menu	Project   Settings   Project Options   Source Code Engineering   C#

### Options

Field/Option/Button	Action
Options for the current model	Type in the default file extension to apply when generating C# source code, and a list of any additional Collection Classes you want to define.
Statemachine Engineering	In the value fields, use the drop-down arrows to set the options to <b>True</b> or <b>False</b> ; these options apply to generating code from State Machine models in the current model only: <ul style="list-style-type: none"> <li>• 'Use the new Statemachine Template' - set to True to use the code generation templates from Enterprise Architect Release 11 and later, set to False to apply the EASL Legacy templates</li> <li>• 'Generate Trace Code' - set to True to generate Trace code, False to omit it</li> </ul>
Collection Classes	Click on this button to open the 'Collection Classes for Association Roles' dialog, through which you specify the collection class definitions for Association connectors.

### Notes

- These options affect all users of the current model; however, they do not apply to other models



## C++ Options - User

If you intend to generate C++ code from your model, you can configure the code generation options using the 'C++ Specifications' page of the 'Preferences' dialog.

### Access

Ribbon	Start > Workspace > Preferences > Preferences > Source Code Engineering > C++
Menu	Tools   Preferences   Source Code Engineering   C++
Keyboard Shortcuts	<b>Ctrl+F9</b>

### Options

Field/Option/Button	Action
Disable Language	<p>Leave this checkbox unselected to support C++ code generation.</p> <p>Select this option to disable C++ code support.</p>
Options for the current user	<p>In the value fields, specify the options that apply under your own user ID in all models that you access:</p> <ul style="list-style-type: none"> <li>• The default attribute type to create</li> <li>• Whether Namespaces should be generated when generating C++ Classes</li> <li>• What style to apply when generating and processing comments for C++</li> <li>• Whether to generate comments for C++ methods to the declaration, or reverse engineer comments from the declaration</li> <li>• Whether to generate comments for C++ methods to the implementation, or reverse engineer comments from the implementation</li> <li>• Whether to update comments in re-generating code from the model</li> <li>• Whether to update the implementation file in re-generating code from the model</li> <li>• The default source code directory location (click on the  button)</li> <li>• The default file extensions to read when importing a directory of C++ code</li> <li>• The Code Editor to use (click on the  button)</li> <li>• The search path for the implementation file relative to the header file path</li> </ul>

## C++ Options - Model

If you intend to generate C++ code from your model, you can configure the model-specific code generation options using the 'C++ Specifications' page of the 'Manage Project Options' dialog to:

- Indicate the version of C++ to generate; this controls the set of templates used and how properties are created
- Specify the default reference type used when a type is specified by reference
- Specify the default file extensions
- Specify default Get/Set prefixes
- Specify the Collection Class definitions for Association connectors
- Define additional Collection Classes - to define custom Collection Classes, which can be simple substitutions (such as `CArray<#TYPE#>`) or a mix of other strings and substitutions (such as `Cmap<CString,LPCTSTR,#TYPE#*,#TYPE#*>`); these Collection Classes are defined by default:
  - `CArray<#TYPE#>;CMap<CString,LPCTSTR,#TYPE#*,#TYPE#*>;`
- Set the Statemachine Engineering options

### Access

Ribbon	Configure > Reference Data > Settings > Project Options > Source Code Engineering > C++
Menu	Project   Settings   Project Options   Source Code Engineering   C++

### Options

Field/Option/Button	Action
Options for the current model	<p>In the value fields, specify the options that affect all users of the current model:</p> <ul style="list-style-type: none"> <li>• The version of C++ you are using (which determines which templates to use when generating code)</li> <li>• The default reference type to use when creating properties for C++ attributes by reference</li> <li>• The default header and source file extensions for the code files</li> <li>• The default 'Get' prefix</li> <li>• The default 'Set' prefix</li> <li>• The additional Collection Classes</li> </ul>
Statemachine Engineering Options	<p>In the value fields, use the drop-down arrows to set the options to <b>True</b> or <b>False</b>; these options apply to generating code from State Machine models in the current model only:</p> <ul style="list-style-type: none"> <li>• 'Use the new Statemachine Template' - set to True to use the code generation templates from Enterprise Architect Release 11 and later, set to False to apply the EASL Legacy templates</li> <li>• 'Generate Trace Code' - set to True to generate Trace code, False to omit it</li> </ul>

Collection Classes	Click on this button to open the 'Collection Classes for Association Roles' dialog, through which you specify the collection class definitions for Association connectors.
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## Notes

- These options affect all users of the current model; however, they do not apply to other models

## Delphi Options - User

If you intend to generate Delphi code from your model, you can configure the code generation options using the 'Delphi Specifications' page of the 'Preferences' dialog to:

- Set the default attribute type
- Indicate a default source directory
- Set the default code editor to use to edit Delphi source code

### Access

Ribbon	Start > Workspace > Preferences > Preferences > Source Code Engineering > Delphi
Menu	Tools   Preferences   Source Code Engineering   Delphi
Keyboard Shortcuts	<b>Ctrl+F9</b>

### Options

Field/Option/Button	Action
Disable Language	Leave this checkbox unselected to support Delphi code generation. Select this option to disable Delphi code support.
Options for the current user	Specifies the options used for the current user; these options apply to all models that are accessed by the user.



## Delphi Options - Model

If you intend to generate Delphi code from your model, you can configure the model-specific code generation options using the 'Delphi Specifications' page of the 'Manage Project Options' dialog to:

- Specify default file extensions (header and source)
- Specify the Collection Class definitions for Association connectors

### Access

Ribbon	Configure > Reference Data > Settings > Project Options > Source Code Engineering > Delphi
Menu	Project   Settings   Project Options   Source Code Engineering   Delphi

### Options

Field/Option/Button	Action
Options for the current model	Type in the default file extension to apply when generating Delphi source code.
Collection Classes	Click on this button to open the 'Collection Classes for Association Roles' dialog, through which you specify the collection class definitions for Association connectors.

### Notes

- These options affect all users of the current model; however, they do not apply to other models

# Delphi Properties

Enterprise Architect has comprehensive support for Delphi properties. These are implemented as **Tagged Values**, with a specialized property editor to help create and modify Class properties. By using the 'Feature Visibility' element context menu option, you can display the 'tags' compartment that contains the properties. Imported Delphi Classes with properties have this feature automatically made visible for your convenience.

## Manually activate the property editor

- In the selected Class set the code generation language to 'Delphi'
- Right-click on the Class and select 'Delphi Properties' to open the editor

Using the Delphi Properties editor, you can build properties quickly and simply; from here you can:

- Change the name and scope (only Public and Published are currently supported)
- Change the property type (the drop-down list includes all defined Classes in the project)
- Set the Read and Write information (the drop-down lists have all the attributes and operations from the current Class; you can also enter free text)
- Set 'Stored' to **True** or **False**
- Set the Implements information
- Set the default value, if one exists

## Notes

- When you use the 'Create Property' dialog from the 'Attribute' screen, the system generates a pair of Get and Set functions together with the required property definition as **Tagged Values**; you can manually edit these Tagged Values if required
- Public properties are displayed with a '+' symbol prefix and published with a '^'
- When creating a property in the 'Create Property Implementation' dialog (accessed through the 'Attributes' dialog), you can set the scope to 'Published' if the property type is Delphi
- Only 'Public' and 'Published' are supported
- If you change the name of a property and forward engineer, a new property is added, but you must manually delete the old one from the source file



## Java Options - User

If you intend to generate Java code from your model, you can configure the code generation options using the 'Java Specifications' page of the 'Preferences' dialog.

### Access

Ribbon	Start > Workspace > Preferences > Preferences > Source Code Engineering > Java
Menu	Tools   Preferences   Source Code Engineering   Java
Keyboard Shortcuts	<b>Ctrl+F9</b>

### Options

Field/Option/Button	Action
Disable Language	Leave this checkbox unselected to support Java code generation. Select this checkbox to disable Java code support.
Options for the current user	In the value fields, specify the options that apply under your own user ID in all models that you access; the: <ul style="list-style-type: none"><li>• Default attribute type to create (select from the drop-down list)</li><li>• Default source code directory location (click on the  button)</li><li>• Code Editor to use (click on the  button)</li></ul>

## Java Options - Model

If you intend to generate Java code from your model, you can configure the model-specific code generation options using the 'Java Specifications' page of the 'Manage Project Options' dialog to:

- Specify the default file extension
- Specify a default 'Get' prefix
- Specify a default 'Set' prefix
- Set the Statemachine Engineering options
- Specify the Collection Class definitions for Association connectors
- Define additional Collection Classes - to define custom Collection Classes, which can be simple substitutions (such as CArray<#TYPE#>) or a mix of other strings and substitutions (such as Cmap<CString,LPCTSTR,#TYPE#\*,#TYPE#\*>); these Collection Classes are defined by default:
  - HashSet<#TYPE#>;Map<String,#TYPE#>;

### Access

Ribbon	Configure > Reference Data > Settings > Project Options > Source Code Engineering > Java
Menu	Project   Settings   Project Options   Source Code Engineering   Java

### Options

Field/Option/Button	Action
Options for the current model	<p>In the value fields, specify the options that affect all users of the current model; the:</p> <ul style="list-style-type: none"> <li>• Default file extension for the code files</li> <li>• The default Get and Set prefixes</li> <li>• The default and additional Collection Classes</li> </ul>
Statemachine Engineering	<p>In the value fields, use the drop-down arrows to set the options to <b>True</b> or <b>False</b>; these options apply to generating code from State Machine models in the current model only:</p> <ul style="list-style-type: none"> <li>• 'Use the new Statemachine Template' - set to True to use the code generation templates from Enterprise Architect Release 11 and later, set to False to apply the EASL Legacy templates</li> <li>• 'Generate Trace Code' - set to True to generate Trace code, False to omit it</li> </ul>
Collection Classes	<p>Click on this button to open the 'Collection Classes for Association Roles' dialog, through which you specify the collection class definitions for Association connectors.</p>

## Notes

- These options affect all users of the current model; however, they do not apply to other models

## PHP Options - User

If you intend to generate PHP code from your model, you can configure the code generation options using the 'PHP Specifications' page of the 'Preferences' dialog to:

- Define a semi-colon separated list of extensions to look at when doing a directory code import for PHP
- Set a default directory for opening and saving PHP source code
- Specify the default editor to use when editing PHP code

### Access

Ribbon	Start > Workspace > Preferences > Preferences > Source Code Engineering > PHP
Menu	Tools   Preferences   Source Code Engineering   PHP
Keyboard Shortcuts	<b>Ctrl + F9</b>   Source Code Engineering   PHP

### Options

Field/Option/Button	Action
Disable Language	Leave this checkbox unselected to support PHP code generation. Select this option to disable PHP code support.
Options for the current user	Specifies the options used for the current user; these options apply to all models that are accessed by the user.

## PHP Options - Model

If you intend to generate PHP code from your model, you can configure the model-specific code generation options using the 'PHP Specifications' page of the 'Manage Project Options' dialog to:

- Specify the default PHP version to generate
- Define the default file extension
- Specify a default 'Get' prefix
- Specify a default 'Set' prefix

### Access

Ribbon	Configure > Reference Data > Settings > Project Options > Source Code Engineering > PHP
Menu	Project   Settings   Project Options   Source Code Engineering   PHP

### Options

Field/Option/Button	Action
Options for the current model	Type in the default PHP version, the default file extension to apply when generating PHP source code, and the default 'Get' and 'Set' prefixes.

### Notes

- These options affect all users of the current model; however, they do not apply to other models

## Python Options - User

If you intend to generate Python code from your model, you can configure the code generation options using the 'Python Specifications' page of the 'Preferences' dialog to:

- Specify the default source directory to be used
- Specify the default editor used to write and edit Python code

### Access

Ribbon	Start > Workspace > Preferences > Preferences > Source Code Engineering > Python
Menu	Tools   Preferences   Source Code Engineering   Python
Keyboard Shortcuts	<b>Ctrl+F9</b>

### Options

Field/Option/Button	Action
Disable Language	Leave this checkbox unselected to support Python code generation. Select this option to disable Python code support.
Options for the current user	Specifies the options used for the current user; these options apply to all models that are accessed by the user.



## Python Options - Model

If you intend to generate Python code from your model, you can configure the model-specific code generation options using the 'Python Specifications' page of the 'Manage Project Options' dialog to:

- Specify the default file extension

### Access

Ribbon	Configure > Reference Data > Settings > Project Options > Source Code Engineering > Python
Menu	Project   Settings   Project Options   Source Code Engineering   Python

### Options

Field/Option/Button	Action
Options for the current model	Type in the default file extension to apply when generating Python source code.

### Notes

- These options affect all users of the current model; however, they do not apply to other models

## SystemC Options - User

If you intend to generate SystemC code from your model, you can configure the code generation options using the 'SystemC' page of the 'Preferences' dialog to:

- Specify a default source directory
- Specify an editor for changing code

### Access

Ribbon	Start > Workspace > Preferences > Preferences > Source Code Engineering > SystemC
Menu	Tools   Preferences   Source Code Engineering   SystemC
Keyboard Shortcuts	<b>Ctrl+F9</b>

### Options

Field/Option/Button	Action
Disable Language	Leave this checkbox unselected to support SystemC code generation. Select this option to disable SystemC code support.
Options for the current user	Specifies the options used for the current user; these options apply to all models that are accessed by the user.

## SystemC Options - Model

If you intend to generate SystemC code from your model, you can configure the model-specific code generation options using the 'SystemC' page of the 'Manage Project Options' dialog to:

- Specify the default file extension
- Specify the Collection Class definitions for Association connectors

### Access

Ribbon	Configure > Reference Data > Settings > Project Options > Source Code Engineering > SystemC
Menu	Project   Settings   Project Options   Source Code Engineering   SystemC

### Options

Field/Option/Button	Action
Options for the current model	Type in the default file extension to apply when generating SystemC source code.
Collection Classes	Click on this button to open the 'Collection Classes for Association Roles' dialog, through which you specify the collection class definitions for Association connectors.

### Notes

- These options affect all users of the current model; however, they do not apply to other models

## VB.NET Options - User

If you intend to generate VB.NET code from your model, you can configure the code generation options using the 'VB.NET Specifications' page of the 'Preferences' dialog to:

- Specify the default attribute type
- Indicate whether to generate namespaces
- Specify a default source directory
- Specify an editor for changing code

### Access

Ribbon	Start > Workspace > Preferences > Preferences > Source Code Engineering > VB.Net
Menu	Tools   Preferences   Source Code Engineering   VB.Net
Keyboard Shortcuts	<b>Ctrl+F9</b>

### Options

Field/Option/Button	Action
Disable Language	Leave this checkbox unselected to support VB.NET code generation. Select this option to disable VB.NET code support.
Options for the current user	Specifies the options used for the current user; these options apply to all models that are accessed by the user.

## VB.NET Options - Model

If you intend to generate VB.NET code from your model, you can configure the model-specific code generation options using the 'VB.Net Specifications' page of the 'Manage Project Options' dialog to:

- Specify the default file extension
- Specify the Collection Class definitions for Association connectors

### Access

Ribbon	Configure > Reference Data > Settings > Project Options > Source Code Engineering > VB.Net
Menu	Project   Settings   Project Options   Source Code Engineering   VB.Net

### Options

Field/Option/Button	Action
Options for the current model	Type in the default file extension to apply when generating VB.Net source code.
Collection Classes	Click on this button to open the 'Collection Classes for Association Roles' dialog, through which you specify the collection class definitions for Association connectors.

### Notes

- These options affect all users of the current model; however, they do not apply to other models

## Verilog Options - User

If you intend to generate Verilog code from your model, you can configure the code generation options using the 'Verilog' page of the 'Preferences' dialog to:

- Specify a default source directory
- Specify an editor for changing code

### Access

Ribbon	Start > Workspace > Preferences > Preferences > Source Code Engineering > Verilog
Menu	Tools   Preferences   Source Code Engineering   Verilog
Keyboard Shortcuts	<b>Ctrl+F9</b>

### Options

Field/Option/Button	Action
Disable Language	Leave this checkbox unselected to support Verilog code generation. Select this option to disable Verilog code support.
Options for the current user	Specifies the options used for the current user; these options apply to all models that are accessed by the user.

## Verilog Options - Model

If you intend to generate Verilog code from your model, you can configure the model-specific code generation options using the 'Verilog' page of the 'Manage Project Options' dialog to:

- Specify the default file extension
- Specify the Collection Class definitions for Association connectors

### Access

Ribbon	Configure > Reference Data > Settings > Project Options > Source Code Engineering > Verilog
Menu	Project   Settings   Project Options   Source Code Engineering   Verilog

### Options

Field/Option/Button	Action
Options for the current model	Type in the default file extension to apply when generating Verilog source code.
Collection Classes	Click on this button to open the 'Collection Classes for Association Roles' dialog, through which you specify the collection class definitions for Association connectors.

### Notes

- These options affect all users of the current model; however, they do not apply to other models

## VHDL Options - User

If you intend to generate VHDL code from your model, you can configure the code generation options using the 'VHDL' page of the 'Preferences' dialog to:

- Specify a default source directory
- Specify an editor for changing code

### Access

Ribbon	Start > Workspace > Preferences > Preferences > Source Code Engineering > VHDL
Menu	Tools   Preferences   Source Code Engineering   VHDL
Keyboard Shortcuts	<b>Ctrl+F9</b>

### Options

Field/Option/Button	Action
Disable Language	Leave this checkbox unselected to support VHDL code generation. Select this option to disable VHDL code support.
Options for the current user	Specifies the options used for the current user; these options apply to all models that are accessed by the user.



## VHDL Options - Model

If you intend to generate VHDL code from your model, you can configure the model-specific code generation options using the 'VHDL' page of the 'Manage Project Options' dialog to:

- Specify the default file extension
- Specify the Collection Class definitions for Association connectors

### Access

Ribbon	Configure > Reference Data > Settings > Project Options > Source Code Engineering > VHDL
Menu	Project   Settings   Project Options   Source Code Engineering   VHDL

### Options

Field/Option/Button	Action
Options for the current model	Type in the default file extension to apply when generating VHDL source code.
Collection Classes	Click on this button to open the 'Collection Classes for Association Roles' dialog, through which you specify the collection class definitions for Association connectors.

### Notes

- These options affect all users of the current model; however, they do not apply to other models

## Visual Basic Options - User

If you intend to generate Visual Basic code from your model, you can configure the code generation options using the 'VB Specifications' page of the 'Preferences' dialog to:

- Specify the default attribute type
- Define the default source directory
- Define the file extensions to search for code files to import
- Define the default editor to use for editing source code

### Access

Ribbon	Start > Workspace > Preferences > Preferences > Source Code Engineering > Visual Basic
Menu	Tools   Preferences   Source Code Engineering   Visual Basic
Keyboard Shortcuts	<b>Ctrl+F9</b>

### Options

Field/Option/Button	Action
Disable Language	Leave this checkbox unselected to support Visual Basic code generation. Select this option to disable Visual Basic code support.
Options for the current user	Specifies the options used for the current use; these options apply to all models that are accessed by the user.

## Visual Basic Options - Model

If you intend to generate Visual Basic code from your model, you can configure the model-specific code generation options using the 'VB Specifications' page of the 'Manage Project Options' dialog to:

- Specify the default Visual Basic version to generate
- Indicate the default file extension when reading/writing
- Indicate the MTS transaction mode for MTS objects
- Specify if a Class uses Multi use (**True** or **False**)
- Specify if a Class uses the Persistable property
- Indicate data binding and data source behaviors
- Set the global namespace
- Set the Exposed attribute
- Indicate if the Creatable attribute is True or False
- Specify the Collection Class definitions for Association connectors

### Access

Ribbon	Configure > Reference Data > Settings > Project Options > Source Code Engineering > Visual Basic
Menu	Project   Settings   Project Options   Source Code Engineering   Visual Basic

### Options

Field/Option/Button	Action
Options for the current model	Type in the default file extension to apply when generating Visual Basic source code, and click on the drop-down arrow in each of the other fields and select the appropriate value.
Collection Classes	Click on this button to open the 'Collection Classes for Association Roles' dialog, through which you specify the collection class definitions for Association connectors.

### Notes

- These options affect all users of the current model; however, they do not apply to other models

# MDG Technology Language Options

If you have loaded an MDG Technology that specifies a code module into your *Sparx Systems > EA > MDG Technologies* folder, the language is included in the 'Source Code Engineering' list on the 'Preferences' dialog. The language is only listed on the 'Preferences' dialog if an MDG Technology file actually uses it in your model.

## Access

Ribbon	Start > Workspace > Preferences > Preferences > Source Code Engineering > MDG
Menu	Tools   Preferences   Source Code Engineering   MDG
Keyboard Shortcuts	<b>Ctrl+F9</b>

## Options

Field	Action
Default Extension	Default extension for generated source files; shown if the option is in the technology. This is saved per project.
Import File Extensions	Default folder to import source files from; shown if the technology supports namespaces. This is saved once for all projects.
Generate Namespaces	Indicates if namespaces are generated or not.
Default Source Directory	The default directory to save generated source files. This is always shown.
Editor	Indicates the editor that is used to edit source files.
Att Type	Indicates the default attribute type.

## Notes

- These options are set in the technology inside the `<CodeOptions>` tag of a code module, as shown:  
`<CodeOption name="DefaultExtension">.rb</CodeOption>`

## Reset Options

Enterprise Architect stores some of the options for a Class when it is first created. Some are global; for example, \$LinkClass is stored when you first create the Class, so in existing Classes the global change in the 'Preferences' dialog won't automatically be picked up. You must modify the options for the existing Class.

### Modify options for a single Class

Step	Action
1	Right-click on the Class to change, and select the 'Generate Code' option. The 'Generate Code' dialog displays.
2	Click on the <b>Advanced button</b> . The 'Object Options' dialog displays.
3	Click on the Attributes/ <b>Operations button</b> .
4	Change the options, and click on the <b>Close button</b> to apply the changes.

### Modify options for all Classes within a Package

Step	Action
1	Right-click on the Package in the <b>Project Browser</b> . The context menu displays.
2	Select the 'Code Engineering   Reset Options for this Package' menu option. The 'Manage Code Generation' dialog displays.
3	Reset the required defaults for each existing Class.
4	Click on the <b>OK button</b> to apply the changes.

## Set Collection Classes

Using Enterprise Architect, you can define Collection Classes for generating code from Association connectors where the target role has a multiplicity setting greater than 1.

### Tasks

Task	Detail
Defining Collection Classes	<p>On the 'Source Code Engineering' section of the 'Manage Project Options' dialog (select the 'Configure &gt; Reference Data &gt; Settings &gt; Project Options &gt; Source Code Engineering' ribbon option), on each language page click on the <b>Collection Classes button</b>.</p> <p>The 'Collection Classes for Association Roles' dialog displays. On this dialog, you can define:</p> <ul style="list-style-type: none"> <li>• The default Collection Class for 1..* roles</li> <li>• The ordered Collection Class to use for 1..* roles</li> <li>• The qualified Collection Class to use for 1..* roles</li> </ul>
Defining Collection Classes for a specific Class	<p>Class-specific Collection Classes can be defined by clicking the <b>Collection Classes button</b> in the Class 'Properties' dialog of the element.</p>
Code Generation Precedence	<p>When Enterprise Architect generates code for a connector that has a multiplicity role &gt;1:</p> <ol style="list-style-type: none"> <li>1. If the Qualifier is set, use the qualified collection: <ul style="list-style-type: none"> <li>- for the Class if set</li> <li>- else use the code language qualified collection</li> </ul> </li> <li>2. If the 'Order' option is set, use the ordered collection: <ul style="list-style-type: none"> <li>- for the Class if set</li> <li>- else use the code language ordered collection</li> </ul> </li> <li>3. Else use the default collection: <ul style="list-style-type: none"> <li>- for the Class if set</li> <li>- else use the code language default collection</li> </ul> </li> </ol>
Using Markers	<p>You can include the marker #TYPE# in the collection name; Enterprise Architect replaces this with the name of the Class being collected at source generation time (for example, Vector&lt;#TYPE#&gt; would become Vector&lt;foo&gt;).</p> <p>Conversely, when reverse engineering, an Association connector is also created if a matching entry (for example, foo if foo is found in the model) is defined as a Collection Class.</p>
Additional Collection Classes	<p>Additional Collection Classes can be defined within the model-specific language options pages for C#, C++ and Java.</p>
Member Type	<p>On the 'Role(s)' tab of the Association 'Properties' dialog (accessible from the right-click context menu of any Association) there is a 'Member Type' field for each of the Source and Target Roles.</p> <p>If you set this, the value you enter overrides all the above options.</p>



## Example Use of Collection Classes

Consider this source code:

```
class Class1
{
public:
    Class1();
    virtual ~Class1();
    CMap<CString,LPCTSTR,Class3*,Class3*> att;
    Vector<Class2> *att1;
    TemplatedClass<class1,class2> *att2;
    CList<Class4> *att3;
};

class Class2
{
public:
    Class2();
    virtual ~Class2();
};

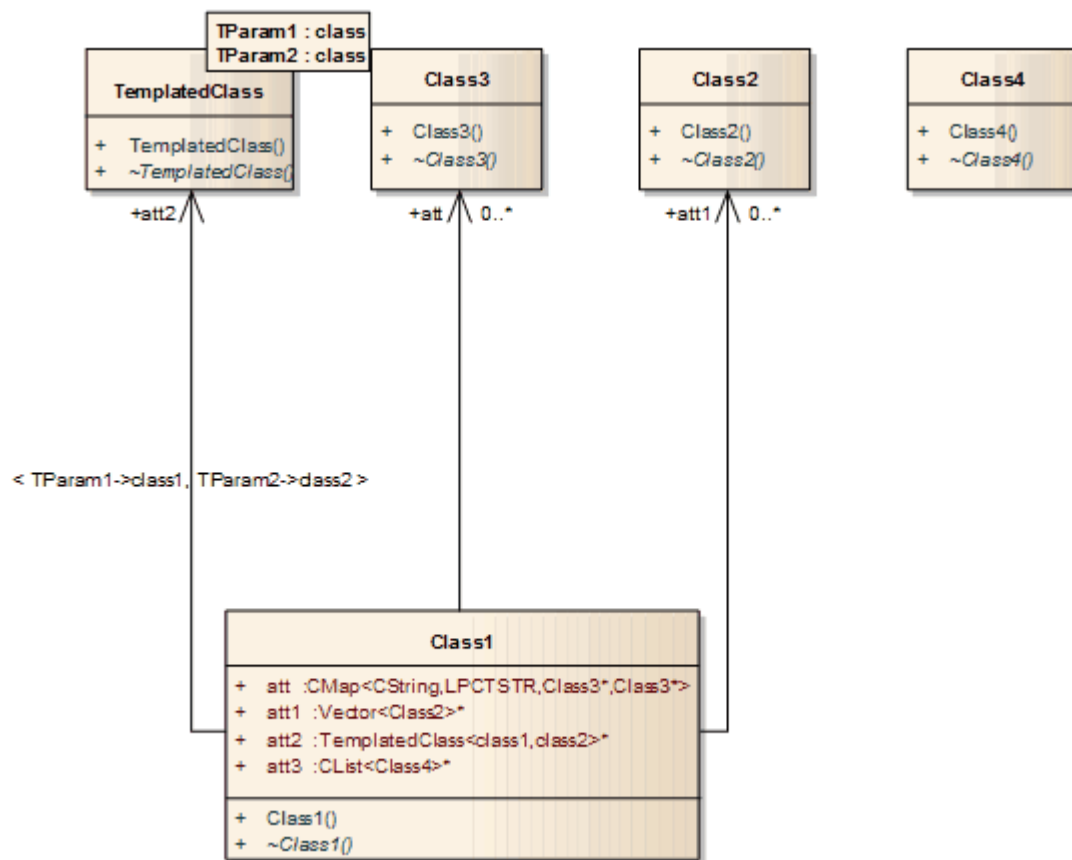
class Class3
{
public:
    Class3();
    virtual ~Class3();
};

class Class4
{
public:
    Class4();
    virtual ~Class4();
};

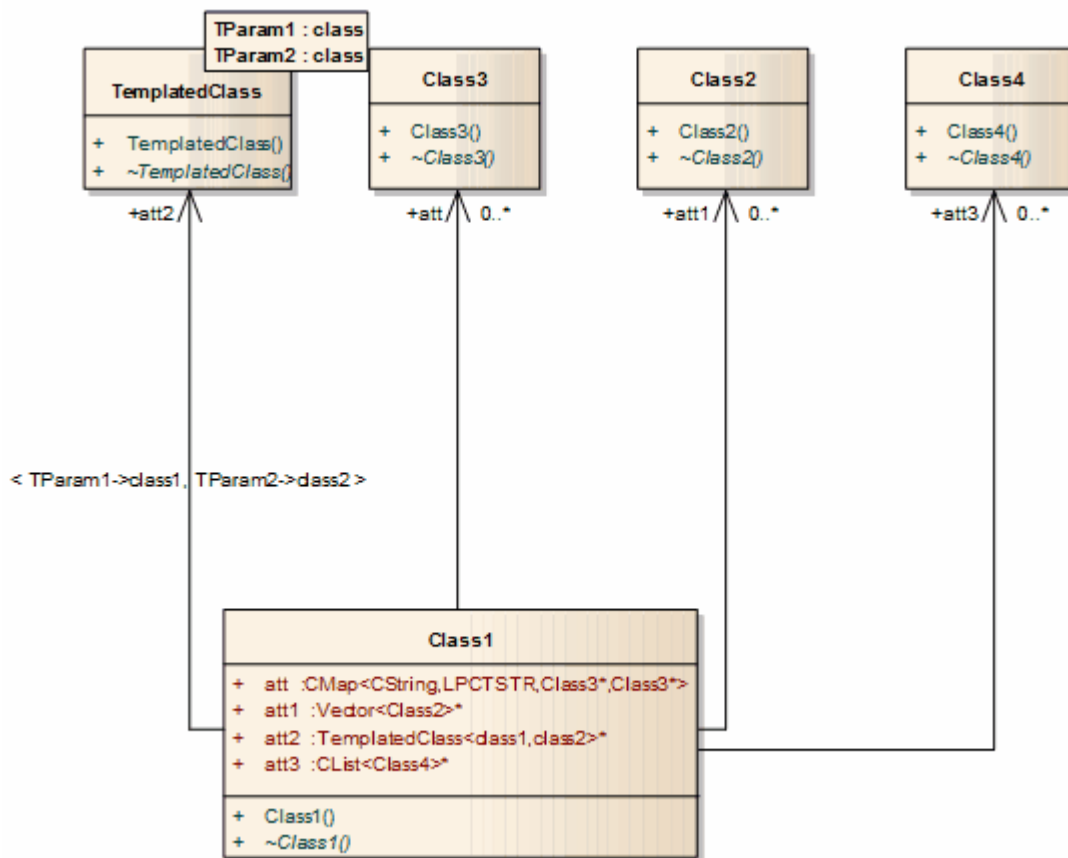
template<class TParam1, class TParam2>
class TemplatedClass
{
public:
    TemplatedClass() {
    }
    virtual ~TemplatedClass() {
    }
};
```



If this code is imported into the system with default import options, this diagram is generated:



If, however, you enter the value 'CList<#Type#>' in the 'Additional Collection Classes' field in the model-specific language options page (C#, Java, C++), an Association connector is also created to Class 4:



## Local Paths

When a team of developers are working on the same Enterprise Architect model, each developer might store their version of the source code in their local file system, but not always at the same location as their fellow developers. To manage this scenario in Enterprise Architect, you can define local paths for each user, on the 'Local Paths' dialog.

You can use local paths in generating code and reverse engineering, and in version control, developing XML schemas and generating document and web reports.

Local paths might take a little time to set up, but if you want to work collaboratively on source and model concurrently, the effort is well worth while.

For example, if:

- Developer A stores her .java files in a C:\Java\Source directory, while developer B stores his in D:\Source, and
- Both developers want to generate and reverse engineer into the same Enterprise Architect model located on a shared (or replicated) network drive

Developer A might define a local path of:

```
JAVA_SOURCE = "C:\Java\Source"
```

All Classes generated and stored in the Enterprise Architect project are stored as:

```
%JAVA_SOURCE%\<xxx.java>
```

Developer B defines a local path as:

```
JAVA_SOURCE = "D:\Source"
```

Now, Enterprise Architect stores all java files in these directories as:

```
%JAVA_SOURCE%\<filename>
```

On each developer's machine, the filename is expanded to the correct local version.

## Access

Ribbon	Code > Source Code > Configure > Manage Local Paths
Menu	Tools   Local Directories and Paths



## Local Paths Dialog

Using the 'Local Paths' dialog, you can set up local paths for a single user on a particular machine. For a description of the use of local paths, see the *Local Paths* topic.

### Access

Ribbon	Code > Source Code > Configure > Manage Local Paths
Menu	Tools   Local Directories and Paths

### Options

Field/Option/Button	Action
Path	Type in or browser for the path of the local directory in the file system (for example, d:\java\source).
ID	Type in the shared ID that is substituted for the Local Path (for example, JAVA_SRC).
Type	Click on the drop-down arrow and select the type of path to apply to (for example, Java).
Relative Paths	Lists the paths currently defined for the model, defaulting to most recent at the top. If you want to change the sequence of paths in the list, click on a path and use the   buttons to move the path up or down one position in the list.
Apply Path	Click on a path in the 'Relative Paths' list and click on this button to update any existing full path names in the model to the shared relative path name. For example: d:\java\source\main.java might become %JAVA_SRC%\main.java
Expand Path	Click on a path in the 'Relative Paths' list and click on this button to remove the relative path and substitute the full path name (the opposite effect of the <b>Apply Path button</b> ).
New	Click on this button to clear the data fields so that you can define another local path.
Save	When you have defined a local path, click on this button to save it and add it to the 'Relative Paths' list.
Delete	Click on a path in the 'Relative Paths' list and click on this button to remove the path from the list altogether.
Close	Click on this button to close the dialog, saving any changes to the list.

## Notes

- You can also set up a hyperlink (for an Enterprise Architect command) on a diagram to access the 'Local Paths' dialog, to switch, update or expand your current local path
- If the act of expanding or applying a path for a linked file will create a duplicate record, the process will skip that record and display a message at the end of the process

## Language Macros

When reverse engineering a language such as C++, you might find preprocessor directives scattered throughout the code. This can make code management easier, but can hamper parsing of the underlying C++ language.

To help remedy this, you can include any number of macro definitions, which are ignored during the parsing phase of the reverse engineering. It is still preferable, if you have the facility, to preprocess the code using the appropriate compiler first; this way, complex macro definitions and defines are expanded out and can be readily parsed. If you don't have this facility, then this option provides a convenient substitute.

### Access

Ribbon	Configure > Reference Data > Settings > Preprocessor Macros
Menu	Project   Settings   Preprocessor Macros

### Define a macro

Step	Action
1	Select the 'Preprocessor Macros' menu option. The 'Language Macros' dialog displays.
2	Click on the <b>Add New button</b> .
3	Enter details for your macro.
4	Click on the <b>OK button</b> .

### Macros Embedded Within Declarations

Macros are sometimes used within the declaration of Classes and operations, as in these examples:

```
class __declspec Foo
{
    int __declspec Bar(int p);
};
```

If `declspec` is defined as a C++ macro, as outlined, the imported Class and operation contain a **Tagged Value** called `DeclMacro1` with value `__declspec` (subsequent macros would be defined as `DeclMacro2`, `DeclMacro3` and so on).

During forward engineering, these **Tagged Values** are used to regenerate the macros in code.

### Define Complex Macros

It is sometimes useful to define rules for complex macros that can span multiple lines; Enterprise Architect ignores the entire code section defined by the rule.

Such macros can be defined in Enterprise Architect as in these two examples; both types can be combined in one definition.

#### **Block Macros**

```
BEGIN_INTERFACE_PART ^ END_INTERFACE_PART
```

The ^ symbol represents the body of the macro - this enables skipping from one macro to another; the spaces surrounding the ^ symbol are required.

#### **Function Macros**

```
RTTI_EMULATION()
```

Enterprise Architect skips over the token including everything inside the parentheses.

### **Notes**

- You can transport these language macro (or preprocessor macro) definitions between models, using the 'Configure > Model > Transfer > Export Reference Data' and 'Import Reference Data' options; the macros are exported as a Macro List

# ICONIX

The ICONIX process is a proprietary software development methodology based on UML. The process is use case driven and uses UML based diagrams to define four milestones. The main feature of the process is a concept called robustness modeling, based on the early work of Ivar Jacobson, which helps bridge the gap between analysis and design.

This text is derived from the ICONIX entry in the online Wikipedia:

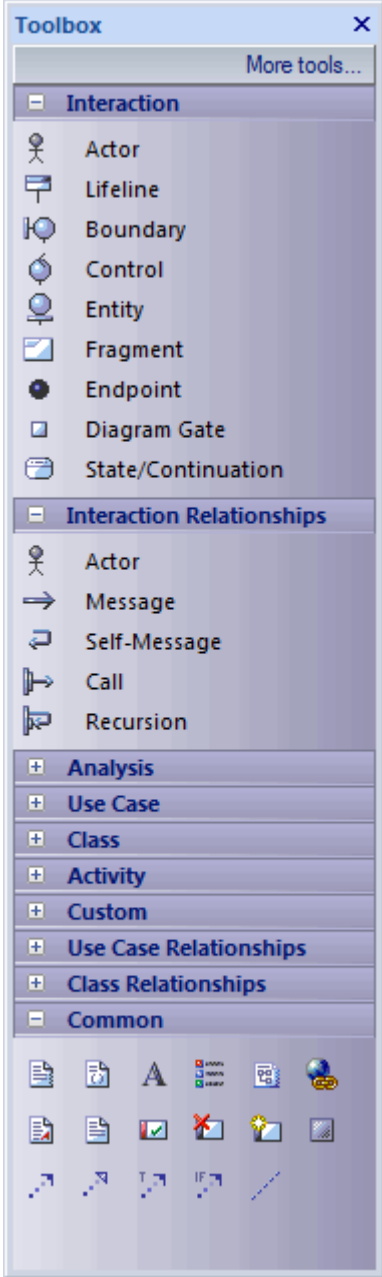
'The ICONIX Process is a minimalist, streamlined approach to Use Case driven UML modeling that uses a core subset of UML diagrams and techniques to provide thorough coverage of object-oriented analysis and design. Its main activity is robustness analysis, a method for bridging the gap between analysis and design. Robustness analysis reduces the ambiguity in use case descriptions, by ensuring that they are written in the context of an accompanying domain model. This process makes the use cases much easier to design, test and estimate.'

The ICONIX Process was developed by Doug Rosenberg; for more information on ICONIX, refer to ICONIX Software Engineering Inc.

## Aspects

Aspect	Detail
ICONIX in Enterprise Architect	<p>Enterprise Architect enables you to develop models under ICONIX quickly and simply, through use of an MDG Technology integrated with the Enterprise Architect installer.</p> <p>The ICONIX facilities are provided in the form of:</p> <ul style="list-style-type: none"> <li>• A set of ICONIX pages in the Toolbox</li> <li>• ICONIX element and relationship entries in the Toolbox Shortcut Menu and Quick Linker</li> </ul> <p>To further help you develop and manage a project under ICONIX, Enterprise Architect also provides a white paper on the ICONIX Roadmap.</p> <p>In addition, Enterprise Architect has an alternative visual layout specific to ICONIX.</p>
ICONIX Toolbox Pages	<p>Within the Toolbox, Enterprise Architect provides ICONIX versions of the pages for UML Analysis, Use Case, Class, Interaction (Sequence), Activity and Custom diagrams (which often form the basis for Robustness diagrams).</p> <p>Compared to the standard Toolbox pages, these have slightly different element and relationship sets; you can access them by either:</p> <ul style="list-style-type: none"> <li>• Selecting the 'More tools   ICONIX   &lt;Diagram Type&gt;' menu option for a specific Toolbox page</li> <li>• Selecting the 'ICONIX' option in the drop-down field of the Default Tools toolbar, which adds all six pages to the Toolbox; the first page and the 'Common' page are expanded, and the others are closed up</li> </ul>



	
ICONIX Layout	<p>The ICONIX layout re-organizes the Enterprise Architect work area, opening the:</p> <ul style="list-style-type: none"> <li>• Toolbox on the right hand side of the screen (follow the earlier instructions to display the 'ICONIX' pages)</li> <li>• 'Learning Center' window auto-hidden in the top right of the screen</li> <li>• <b>Project Browser</b> window in the top left of the screen, and</li> <li>• Notes, Properties and <b>Tagged Values</b> windows nested on the bottom left of the screen</li> </ul> <p>To apply this layout, select the 'Basic - Reversed' option in the drop-down list in the Workspace Layout toolbar.</p>
Disable ICONIX	<p>If you prefer not to use ICONIX in Enterprise Architect, you can disable it (and subsequently re-enable it) using the 'MDG Technologies' dialog ('Extensions   MDG Technologies').</p> <p>This does not affect the ICONIX layout, which you can switch back to your own layout or the Enterprise Architect default layout using the 'View   <b>Perspectives</b>'</p>

	menu option.
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## Developing Programming Languages

You can make use of a range of established programming languages in Enterprise Architect, but if these are not suitable to your needs you can develop your own. You would then apply it to your models through an MDG Technology that you might develop just for this purpose, or for broader purposes. After developing the language, you could also write MDA Transformation templates to convert a Platform Independent Model or a model in another language into a model for your new language, or vice-versa.

### Access

Ribbon	Code > Source Code > Configure > <b>Code Template Editor</b>
Menu	Package   Code Engineering   Code Generation Templates
Keyboard Shortcuts	<b>Ctrl + Shift + P</b>

### Develop a Programming Language

Step	Description
1	<p>In the <b>Code Template Editor</b>, click on the <b>New Language button</b> and, on the 'Programming Languages Datatypes' dialog, click on the <b>Add Product button</b>.</p> <p>Enter your new programming language name and define the datatypes for it. You cannot access the new language in the Code Template Editor until at least one datatype has been added to the language.</p>
2	<p>After you have defined all the datatypes you need, click on the <b>Close button</b>, select the language in the 'Language' field of the <b>Code Template Editor</b>, and start to edit or create the code templates for the new language.</p> <p>The code templates define how the system should perform:</p> <ul style="list-style-type: none"> <li>• Forward code engineering of your models in the new language</li> <li>• Behavioral Code generation (if this is appropriate)</li> </ul>
3	<p>If you prefer, you can also define source code options for your new language. These are additional settings for the language that are not covered by the data types or code templates, that help define how the system handles that language when generating and reverse-engineering code.</p> <p>The code options are made available to your models only through an MDG Technology.</p>
4	<p>Defining a grammar for your language is an optional step that provides two primary benefits:</p> <ul style="list-style-type: none"> <li>• Reverse engineering of existing code into your model</li> <li>• Synchronization during code generation so that changes made to the file since it was last generated are not lost.</li> </ul> <p>To access the grammar editor select 'Tools   <b>Language Grammars</b>'.</p>
5	<p>If you intend MDA transformations to be made to (or from) your new programming language, you can also edit and create transformation templates for it. The process of creating transformation templates is very similar to that for creating code templates.</p>

6	Having created the datatypes, code templates, code options, grammar and transformation templates for your new language, you can incorporate and distribute them in an MDG Technology.
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# Code Template Framework

When you use Enterprise Architect to generate code from a model, or transform the model, the system refers to the **Code Template Framework (CTF)** for the parameters that define how it should:

- Forward engineer a UML model
- Generate Behavioral Code
- Perform a Model Driven Architecture (MDA) Transformation
- Generate DDL in database modeling

A range of standard templates is available for the direct generation of code and for transformation; if you do not want to use the standard CTF configurations, you can customize them to meet your needs.

## CTF Templates

Template Type	Detail
Code Templates	<p>When you forward engineer a Class model, the code templates define how the skeletal code is to be generated for a given programming language. The templates for a language are automatically associated with the language.</p> <p>The templates are written as plain text with a syntax that shares some aspects of both mark-up languages and scripting languages.</p>
Model Transformation Templates	<p>Model Transformation Templates provide a fully configurable method of defining how Model Driven Architecture (MDA) Transformations convert model elements and model fragments from one domain to another.</p> <p>This process is two-tiered. It creates an intermediary language (which can be viewed for debugging) which is then processed to create the objects.</p>
Behavioral Code Generation Templates	<p>Enterprise Architect supports user-definable code generation of the UML Behavioral models.</p> <p>This applies the standard <b>Code Template Framework</b> but includes specific Enterprise Architect Simulation Library (EASL) code generation macros.</p>
DDL Templates	<p>DDL Templates are very similar to Code generation templates, but they have been extended to support DDL generation with their own set of base templates, macros, function macros and template options.</p>

## Code Template Customization

Enterprise Architect helps you to generate source code from UML models for a wide range of programming languages. Standard templates (mappings) are provided out-of-the-box but you can customize the way that code is generated by using the powerful and flexible **Code Template Framework (CTF)**. This sophisticated framework allows you to customize every detail of the way code is generated, including the facility to create new templates for languages not supported in the base product. For example, JavaScript is not one of the supported languages but a series of templates can be written quickly to generate JavaScript from UML models. In these cases existing templates act as a useful starting point and reference for new languages.

The code template framework also provides the mechanism for generation of behavioral models and is used for the transformation templates.

### Features

Feature	Detail
Default Templates	Default Code Templates are built into Enterprise Architect for forward engineering supported languages.
Code Template Editor	A <b>Code Template Editor</b> is provided for creating and maintaining user-defined Code Templates.
Customizing Code Templates	Descriptions of the template syntax and the macros and functions you can use to control the effects of the templates.
Synchronize Code	A subset of the default Code Templates to synchronize code.

## Code and Transform Templates

Code templates and transform (Model Transformation) templates define how the system should generate or transform code in one or other of the programming languages that Enterprise Architect supports. Each language has a wide range of base templates, each of which defines how a particular code structure is generated. You can use these base templates as they are, or you can customize and add to the templates to better support your use of the standard languages, or of other languages that you might define to the system. You review, update and create templates through the Code Template editor or Transformation Template editor.

The order in which the base templates are listed in the two editors relates to the hierarchical order of the objects and their parts that are to be processed. Calls are made from certain base templates to others, and you can add further calls to both base templates and to your own custom templates. By default, the File template is the starting point of a code generation process through the templates; a File consists of Classes which can contain Attributes and Operations.

### Access

Ribbon	Code > Source Code > Configure > <b>Code Template Editor</b> Design > Tools > Transform > Transform Templates
Menu	Package   Code Engineering   Code Generation Templates ( <b>Ctrl+Shift+P</b> ) Package   Model Transformation (MDA)   MDA Transformation Templates ( <b>Ctrl+Alt+H</b> )
Keyboard Shortcuts	<b>Ctrl + Shift + P</b> (Code Generation Templates) <b>Ctrl + Alt + H</b> (MDA Transformation Templates)

### Application of Templates

Action	Detail
Calling Templates	<p>Within any template, you can call other templates using %TemplateName%. The enclosing percent (%) signs indicate a macro.</p> <p>You would use this for a single call to the ClassBody template, %ClassBody%, as shown:</p> <pre>% list = "TemplateName" @separator= "\n" @indent= " " %</pre> <p>The %list macro performs an iterative pass on all the objects in the scope of the current template and calls the TemplateName for each of them:</p> <pre>% list = "ClassBody" @separator= "\n" @indent= " " %</pre> <p>After generation or transformation, each macro is substituted to produce the generated output; for a language such as C++, the result of processing the above template might be:</p> <pre>/**  * This is an example class note generated using code templates  * @author Sparx Systems  */ class ClassA: public ClassB</pre>

	<pre>{ ... }</pre>
Execution of Code Templates	<p>Each template might act only on a particular element type; for example, the ClassNotes template only acts on <b>UML Class</b> and Interface elements.</p> <p>The element from which code is currently being generated is said to be in scope; if the element in scope is stereotyped, the system searches for a template that has been defined for that stereotype. If a specialized template is found, it is executed; otherwise the default implementation of the base template is used.</p> <p>Templates are processed sequentially, line by line, replacing each macro with its underlying text value from the model.</p>
Transfer Templates Between Projects	<p>If you edit a base Code Generation or Transformation template, or create a customized template, you can copy them from one project to another as Reference Data.</p>



## Base Templates

The **Code Template Framework** consists of a number of base templates. Each base template transforms particular aspects of the UML to corresponding parts of object-oriented languages.

The base templates form a hierarchy, which varies slightly across different programming languages. In a typical template hierarchy relevant to a language like C# or Java (which do not have header files) the templates can be modeled as Classes, but usually are just plain text. This hierarchy would be slightly more complicated for languages like C++ and Delphi, which have separate implementation templates.

Each of the base templates must be specialized to be of use in code engineering; in particular, each template is specialized for the supported languages (or 'products'). For example, there is a ClassBody template defined for C++, another for C#, another for Java, and so on; by specializing the templates, you can tailor the code generated for the corresponding UML entity.

Once the base templates are specialized for a given language, they can be further specialized based on:

- A Class's stereotype, or
- A feature's stereotype (where the feature can be an operation or attribute)

This type of specialization enables, for example, a C# operation that is stereotyped as «property» to have a different Operation Body template from an ordinary operation; the Operation Body template can then be specialized further, based on the Class stereotype.

### Base templates used in the CTF

Template	Description
Attribute	A top-level template to generate member variables from UML attributes.
Attribute Declaration	Used by the Attribute template to generate a member variable declaration.
Attribute Notes	Used by the Attribute template to generate member variable notes.
Class	A top-level template for generating Classes from UML Classes.
Class Base	Used by the Class template to generate a base Class name in the inheritance list of a derived Class, where the base Class doesn't exist in the model.
Class Body	Used by the Class template to generate the body of a Class.
Class Declaration	Used by the Class template to generate the declaration of a Class.
Class Interface	Used by the Class template to generate an interface name in the inheritance list of a derived Class, where the interface doesn't exist in the model.
Class Notes	Used by the Class template to generate the Class notes.
File	A top-level template for generating the source file. For languages such as C++, this corresponds to the header file.
Import Section	Used in the File template to generate external dependencies.
Linked Attribute	A top-level template for generating attributes derived from UML Associations.

Linked Attribute Notes	Used by the Linked Attribute template to generate the attribute notes.
Linked Attribute Declaration	Used by the Linked Attribute template to generate the attribute declaration.
Linked Class Base	Used by the Class template to generate a base Class name in the inheritance list of a derived Class, for a Class element in the model that is a parent of the current Class.
Linked Class Interface	Used by the Class template to generate an Interface name in the inheritance list of a derived Class, for an Interface element in the model that is a parent of the current Class.
Namespace	A top-level template for generating namespaces from UML Packages (although not all languages have namespaces, this template can be used to generate an equivalent construct, such as Packages in Java).
Namespace Body	Used by the Namespace template to generate the body of a namespace.
Namespace Declaration	Used by the Namespace template to generate the namespace declaration.
Operation	A top-level template for generating operations from a <b>UML Class</b> 's operations.
Operation Body	Used by the Operation template to generate the body of a UML operation.
Operation Declaration	Used by the Operation template to generate the operation declaration.
Operation Notes	Used by the Operation template to generate documentation for an operation.
Parameter	Used by the Operation Declaration template to generate parameters.

## Templates for generating code for languages with separate interface and implementation sections

Template	Description
Class Impl	A top-level template for generating the implementation of a Class.
Class Body Impl	Used by the Class Impl template to generate the implementation of Class members.
File Impl	A top-level template for generating the implementation file.
File Notes Impl	Used by the File Impl template to generate notes in the source file.
Import Section Impl	Used by the File Impl template to generate external dependencies.
Operation Impl	A top-level template for generating operations from a <b>UML Class</b> 's operations.
Operation Body Impl	Used by the Operation template to generate the body of a UML operation.

Operation Declaration Impl	Used by the Operation template to generate the operation declaration.
Operation Notes Impl	Used by the Operation template to generate documentation for an operation.

## Export Code Generation and Transformation Templates

It is possible to export Code Generation and Transformation templates from your model to a .xml file. You can then import that file - and hence the templates - into other models, as reference data. You can export customized templates, which includes those that you or other users have created and updated, and base (standard) templates that have been tailored. You do not need to export base templates that have not been changed, as these are available in every installation of Enterprise Architect.

### Access

Ribbon	Configure > Model > Transfer > Export Reference Data
Menu	Project   Data Management  Export Reference Data

### Export a Code Generation template or Transformation template

Step	Action
1	<p>On the 'Export Reference Data' dialog, in the 'Name' list, select the templates to export.</p> <p>The list includes any standard Code Generation or Transformation templates that have been changed, and any customized templates that you have created or changed.</p> <p>You can select one or more templates to be exported to a single XML file, by pressing <b>Ctrl</b> or <b>Shift</b> as you click on the template names.</p>
2	<p>Click on the <b>Export button</b>.</p>
3	<p>When prompted to do so, enter a valid file name with a .xml extension.</p>
4	<p>Click on the <b>Save button</b> and on the <b>OK button</b>.</p> <p>This exports the template(s) to the file; you can use any text or XML viewer to examine the file.</p>

# Import Code Generation and Transformation Templates

If you have exported Code Generation and/or Transformation templates from an Enterprise Architect model, you can import them into other Enterprise Architect models as reference data.

## Access

Ribbon	Configure > Model > Transfer > Import Reference Data
Menu	Project   Data Management   Import Reference Data

## Import Code Generation and/or Transformation Templates

Step	Action
1	On the 'Import Reference Data' dialog, click on the <b>Select File</b> button and browse to the .xml file containing the required Code Generation or Transformation templates.
2	Select the name of one or more template datasets and click on the <b>Import button</b> .

## Synchronize Code

Enterprise Architect uses code templates during the forward synchronization of these programming languages:

- ActionScript
- C
- C++
- C#
- Delphi
- Java
- PHP
- Python
- VB
- VB.Net

Three types of change can occur in the source when it is synchronized with the UML model:

- Existing sections are synchronized: for example, the return type in an operation declaration is updated
- New sections are added to existing features: for example, Notes are added to a Class declaration where there were previously none
- New features and elements are added: for example, a new operation is added to a Class

Each of these changes has a different effect on the CTF and must be handled differently by Enterprise Architect (see [Learn more](#)).

### Code sections that can be synchronized

Only a subset of the CTF base templates is used during synchronization. This subset corresponds to the distinct sections that Enterprise Architect recognizes in the source code.

Code Template	Code Section
Class Notes	Comments preceding the Class declaration.
Class Declaration	Up to and including the Class parents.
Attribute Notes	Comments preceding an Attribute declaration.
Attribute Declaration	Up to and including the terminating character.
Operation Notes	Comments preceding an operation declaration.
Operation Notes Impl	As for Operation Notes.
Operation Declaration	Up to and including the terminating character.
Operation Declaration Impl	Up to and including the terminating character.
Operation Body	Everything between and including the braces.
Operation Body Impl	As for Operation Body.



## Synchronize Existing Sections

When an existing section in the source code differs from the result generated by the corresponding template, that section is replaced.

Consider, for example, this C++ Class declaration:

```
(asm) class A: public B
```

Now assume that you add an inheritance relationship from Class A to Class C; the entire Class declaration would be replaced with something resembling this:

```
(asm) class A: public B, public C
```



## Add New Sections

These sections can be added to existing features in the source code, as new sections:

- Class Notes
- Attribute Notes
- Operation Notes
- Operation Notes Impl
- Operation Body
- Operation Body Impl

Assume that, in this example, Class A had no note when you originally generated the code:

```
(asm) class A: public B, public C
```

If you now specify a note in the model for Class A, Enterprise Architect attempts to add the new note from the model during synchronization, by executing the Class Notes template.

To make room for the new section to be inserted, you can specify how much white space to append to the section via synchronization macros.

## Add New Features and Elements

These features and elements can be added to the source code during synchronization:

- Attributes
- Inner Classes
- Operations

They are added by executing the relevant templates for each new element or feature in the model.

Enterprise Architect attempts to preserve the appropriate indenting of new features in the code, by finding the indents specified in list macros of the Class; for languages that make use of namespaces, the 'synchNamespaceBodyIndent' macro is available.

Classes defined within a (non-global) namespace are indented according to the value set for this macro, during synchronization.

The value is ignored:

- For Classes defined within a Package setup as a root namespace, or
- If the Generate Namespaces option is set to **False** in the appropriate language page (C#, C++ or VB.Net) on the 'Options' dialog ('Tools | Options | Source Code Engineering | <language>')

# The Code Template Editor

The **Code Template Editor** provides the facilities of the Common Code Editor, including Intelli-sense for the various macros. For more information on Intelli-sense and the Common Code Editor, see the *Editing Source Code* topic.

## Access

Ribbon	Code > Source Code > Configure > <b>Code Template Editor</b>
Menu	Package   Code Engineering   Code Generation Templates
Keyboard Shortcuts	<b>Ctrl + Shift + P</b>

## Options

Option	Action
Language	Select the programming language.
New Language	Display the 'Programming Languages Datatypes' dialog, which enables you to include programming languages other than those supported for Enterprise Architect, for which to create or edit code templates.
Template	Display the contents of the active template, and open the editor for modifying templates.
Templates	List the base code templates; the active template is highlighted. The 'Modified' field indicates whether you have changed the default template for the current language.
Stereotype Overrides	List the stereotyped templates, for the active base template. The 'Modified' field indicates whether you have modified a default stereotyped template.
Add New Custom Template	Invoke a dialog for creating a custom stereotyped template.
Add New Stereotyped Override	Invoke a dialog for adding a stereotyped template, for the currently selected base template.
Get Default Template	Update the editor display with the default version of the active template.
Save	Overwrite the active templates with the contents of the editor.
Delete	If you have overridden the active template, the override is deleted and replaced by the corresponding default code template.

## Notes

User-modified and user-defined Code Templates can be imported and exported as reference data (see the *Sharing Reference Data* topic); the templates defined for each language are indicated in the 'Export Reference Data' dialog by the language name with the suffix `_Code_Templates` - if no templates exist for a language, there is no entry for the language in the dialog.

# Code Template Syntax

Code Templates are written using Enterprise Architect's **Code Template Editor**. The Code Template Editor supports syntax highlighting of the **Code Template Framework** language.

## Syntax Elements

Elements	Detail
Basic Constructs	<p>Templates can contain:</p> <ul style="list-style-type: none"><li>• Literal Text</li><li>• Variables</li><li>• Macros</li><li>• Calls to other templates</li></ul>
Comments	<p>If you want to add comments to the templates, use the command:</p> <p><code>\$COMMENT="text"</code></p> <p>where "text" is the text of the comment; this must be enclosed in quotes.</p> <p>The command is case-sensitive, and must be typed in upper case.</p>

## Literal Text

All text within a given template that is not part of a macro or a variable definition/reference, is considered literal text. With the exception of blank lines, which are ignored, literal text is directly substituted from the template into the generated code.

Consider this excerpt from the Java Class Declaration template:

```
$bases = "Base"
class % className % $bases
```

On the final line, the word 'class ', including the subsequent space, would be treated as literal text and thus for a Class named 'foo' would return the output:

```
class fooBase
```

A blank line following the variable \$bases would have no effect on the output.

### Inserting System Characters:

The %, \$, " and \ characters have special meaning in the template syntax and cannot always be used as literal text. If these characters must be generated from within the templates, they can be safely reproduced using these direct substitution macros:

Macro	Action
%dl%	Produce a literal \$ character.
%pc%	Produce a literal % character.
%qt%	Produce a literal " character.
%sl%	Produce a literal \ character

### Notes

String conjunction operators (“+”, “+=”) are not required but can be used

# Variables

Template variables provide a convenient way of storing and retrieving data within a template. This section explains how variables are defined and referenced.

## Variable Definitions

Variable definitions take the basic form:

```
$<name> = <value>
```

where <name> can be any alpha-numeric sequence and <value> is derived from a macro or another variable.

A simple example definition would be:

```
$foo = %className%
```

Variables can be defined using values from:

- Substitution, function or list macros
- String literals, enclosed within double quotation marks
- Variable references

## Definition Rules

These rules apply to variable definitions:

- Variables have global scope within the template in which they are defined and are not accessible to other templates
- Each variable must be defined at the start of a line, without any intervening white space
- Variables are denoted by prefixing the name with \$, as in \$foo
- Variables do not have to be declared, prior to being defined
- Variables must be defined using either the assignment operator (=), or the addition-assignment operator (+=)
- Multiple terms can be combined in a single definition using the addition operator (+)

## Examples

Using a substitution macro:

```
$foo = %opTag:"bar"%
```

Using a literal string:

```
$foo = "bar"
```

Using another variable:

```
$foo = $bar
```

Using a list macro:

```
$ops = %list="Operation" @separator="\n\n" @indent="\t"%
```

Using the addition-assignment operator (+=):

```
$body += %list="Operation" @separator="\n\n" @indent="\t"%
```

That definition is equivalent to:

```
$body = $body + %list="Operation" @separator="\n\n" @indent="\t"%
```

Using multiple terms:

```
$templateArgs = %list="ClassParameter" @separator=", "%  
$template ="template<" + $templateArgs + ">"
```

## Variable References

Variable values can be retrieved by using a reference of the form:

```
$<name>
```

where <name> can be a previously defined variable.

Variable references can be used:

- As part of a macro, such as the argument to a function macro
- As a term in a variable definition
- As a direct substitution of the variable value into the output

It is legal to reference a variable before it is defined. In this case, the variable is assumed to contain an empty string value: ""

### Variable References - Example 1

Using variables as part of a macro. This is an excerpt from the default C++ ClassNotes template.

```
$wrapLen = %genOptWrapComment%  
$style = %genOptCPPCommentStyle% (Define variables to store the style and wrap length options)  
%if $style == "XML.NET"% (Reference to $style as part of a condition)  
%XML_COMMENT($wrapLen)%  
%else%  
%CSTYLE_COMMENT($wrapLen)% (Reference to $wrapLen as an argument to function macro)  
%endif%
```

### Variable References - Example 2

Using variable references as part of a variable definitions.

```
$foo = "foo" (Define our variables)  
$bar = "bar"  
  
$foobar = $foo + $bar ($foobar now contains the value foobar)
```

### Variable References - Example 3

Substituting variable values into the output.

```
$bases=%classInherits% (Store the result of the ClassInherits template in $bases)  
Class %className%$bases (Now output the value of $bases after the Class name)
```





# Macros

Macros provide access to element fields within the UML model and are also used to structure the generated output. All macros are enclosed within percent (%) signs in the form of:

`%<macroname>%`

In general, macros (including the % delimiters) are substituted for literal text in the output. For example, consider this item from the Class Declaration template:

`... class %className% ...`

The field substitution macro, `%className%`, would result in the current Class name being substituted in the output. So if the Class being generated was named `Foo`, the output would be:

`... class Foo ...`

The CTF contains a number of types of macros:

- [Template Substitution Macros](#)
- [Field Substitution Macros](#)
- [Substitution Examples](#)
- [Attribute Field Substitution Macros](#)
- [Class Field Substitution Macros](#)
- [Code Generation Option Field Substitution Macros](#)
- [Connector Field Substitution Macros](#)
- [Constraint Field Substitution Macros](#)
- [Effort Field Substitution Macros](#)
- [File Field Substitution Macros](#)
- [File Import Field Substitution Macros](#)
- [Link Field Substitution Macros](#)
- [Linked File Field Substitution Macros](#)
- [Metric Field Substitution Macros](#)
- [Operation Field Substitution Macros](#)
- [Package Field Substitution Macros](#)
- [Parameter Field Substitution Macros](#)
- [Problem Field Substitution Macros](#)
- [Requirement Field Substitution Macros](#)
- [Resource Field Substitution Macros](#)
- [Risk Field Substitution Macros](#)
- [Scenario Field Substitution Macros](#)
- [Tagged Value Substitution Macros](#)
- [Template Parameter Substitution Macros](#)
- [Test Field Substitution Macros](#)
- [Function Macros](#)
- [Control Macros](#)
- [List Macro](#)
- [Branching Macros](#)
- [Synchronization Macros](#)

- [The Processing Instruction \(PI\) Macro](#)
- [EASL Code Generation Macros](#)

# Template Substitution Macros

Template substitution macros correspond to Base templates, and result in the execution of the named template. By convention, template macros are named according to Pascal casing.

Structure: %<TemplateName>%

where <TemplateName> can be one of the templates listed in this topic.

When a template is referenced from within another template, it is generated with respect to the elements currently in scope. The specific template is selected based on the stereotypes of the elements in scope.

As noted previously, there is an implicit hierarchy among the various templates. Some care should be taken in order to preserve a sensible hierarchy of template references. For example, it does not make sense to use the %ClassInherits% macro within any of the attribute or operation templates. Conversely, the Operation and Attribute templates are designed for use within the ClassBody template.

## Template substitution macros in the CTF

- Attribute
- AttributeDeclaration
- AttributeDeclarationImpl
- AttributeNotes
- Class
- ClassBase
- ClassBody
- ClassBodyImpl
- ClassDeclaration
- ClassDeclarationImpl
- ClassImpl
- ClassInherits
- ClassInterface
- ClassNotes
- ClassParameter
- File
- FileImpl
- ImportSection
- ImportSectionImpl
- InnerClass
- InnerClassImpl
- LinkedAttribute
- LinkedAttributeDeclaration
- LinkedAttributeNotes
- LinkedClassBase
- LinkedClassInterface
- Namespace
- NamespaceBody

- NamespaceDeclaration
- NamespaceImpl
- Operation
- OperationBody
- OperationBodyImpl
- OperationDeclaration
- OperationDeclarationImpl
- OperationImpl
- OperationNotes
- Parameter

## Field Substitution Macros

The field substitution macros provide access to data in your model. In particular, they are used to access data fields from:

- Packages
- Classes
- Attributes
- Operations, and
- Parameters

Field substitution macros are named according to Camel casing. By convention, the macro is prefixed with an abbreviated form of the corresponding model element. For example, attribute-related macros begin with att, as in the %attName% macro, to access the name of the attribute in scope.

Macros that represent checkboxes return a value of T if the box is selected. Otherwise the value is empty.

This table lists a small number of project field substitution macros. See the *Learn more* section for tables listing groups of type-specific macros.

### Project Macros

Macro Name	Description
eaDateTime	The current time with format: DD-MMM-YYYY HH:MM:SS AM/PM.
eaGUID	A unique GUID for this generation.
eaVersion	Program Version (located in the 'About Enterprise Architect' dialog by selecting 'Help   About EA').

# Substitution Examples

Field substitution macros can be used in one of two ways:

- Direct Substitution or
- Conditional Substitution

## Direct Substitution

This form directly substitutes the corresponding value of the element in scope into the output.

Structure: %<macroName>%

Where <macroName> can be any of the macros listed in the Field Substitution Macros tables.

## Examples

- %className%
- %opName%
- %attName%

## Conditional Substitution

This form of the macro enables alternative substitutions to be made depending on the macro's value.

Structure: %<macroName> ( == "<text>" ) ? <subTrue> ( : <subFalse> ) %

Where:

- ( ) denotes that values between the parentheses are optional
- <text> is a string representing a possible value for the macro
- <subTrue> and <subFalse> can be a combination of quoted strings and the keyword value; where the value is used, it is replaced with the macro's value in the output.

## Examples

- %classAbstract=="T" ? "pure" : ""%
- %opStereotype=="operator" ? "operator" : ""%
- %paramDefault != "" ? " = " value : ""%

Those three examples output nothing if the condition fails. In this case the **False** condition can be omitted, resulting in this usage:

- %classAbstract=="T" ? "pure"%
- %opStereotype=="operator" ? "operator"%
- %paramDefault != "" ? " = " value%

The third example of both blocks shows a comparison checking for a non-empty value or existence. This test can also be omitted.

- %paramDefault ? " = " value : ""%

- `%paramDefault ? " = " value%`

All of the above examples containing `paramDefault` are equivalent. If the parameter in scope had a default value of 10, the output from each of them would normally be:

= 10

## Notes

- In a conditional substitution macro, any white space following `<macroName>` is ignored; if white space is required in the output, it should be included within the quoted substitution strings



# Attribute Field Substitution Macros

This table lists each of the attribute field substitution macros.

Field substitution macros are named according to Camel casing. Macros that represent checkboxes return a value of 'T' if the box is selected. Otherwise the value is empty.

## Attribute Macros

Macro Name	Description
attAlias	Attributes dialog: Alias.
attAllowDuplicates	Attributes Detail dialog: 'Allow Duplicates' checkbox.
attClassifierGUID	The unique GUID for the classifier of the current attribute.
attCollection	Attributes Detail dialog: 'Attribute is a Collection' checkbox.
attConst	Attributes dialog: 'Const' checkbox.
attContainerType	Attributes Detail dialog: Container Type.
attContainment	Attributes dialog: Containment.
attDerived	Attributes dialog: 'Derived' checkbox.
attGUID	The unique GUID for the current attribute.
attInitial	Attributes dialog: Initial.
attIsEnumLiteral	Attributes dialog: 'Is Literal' checkbox.
attIsID	Attributes Detail dialog: 'isID' checkbox.
attLength	Column dialog: Length.
attLowerBound	Attributes Detail dialog: Lower Bound.
attName	Attributes dialog: Name.
attNotes	Attributes dialog: Notes.
attOrderedMultiplicity	Attributes Detail dialog: 'Ordered Multiplicity' checkbox.
attProperty	Attributes dialog: 'Property' checkbox.
attQualType	The attribute type qualified by the namespace path (if generating namespaces) and the classifier path (dot delimited). If the attribute classifier has not been set, is equivalent to the attType macro.

attScope	Attributes dialog: Scope.
attStatic	Attributes dialog: 'Static' checkbox.
attStereotype	Attributes dialog: Stereotype.
attType	Attributes dialog: Type.
attUpperBound	Attributes Detail dialog: Upper Bound.
attVolatile	Attributes Detail dialog: 'Transient' checkbox.

## Class Field Substitution Macros

This table provides a list of methods for accessing each available Class property in the Code Generation and Transformation templates.

Field substitution macros are named according to Camel casing. Macros that represent checkboxes return a value of 'T' if the box is selected. Otherwise the value is empty.

### Class Macros

Macro Name	Description
elemType	The element type: Interface or Class.
classAbstract	Class dialog: 'Abstract' checkbox.
classAlias	Class dialog: Alias.
classArguments	Class Detail dialog: C++ Templates: Arguments.
classAuthor	Class dialog: Author.
classBaseName	'Type Hierarchy' dialog: Class Name (for use where no connector exists between child and base Classes).
classBaseScope	The scope of the inheritance as reverse engineered. (For use where no connector exists between child and base Classes.)
classBaseVirtual	The virtual property of the inheritance as reverse engineered. (For use where no connector exists between child and base Classes.)
classComplexity	Class dialog: Complexity.
classCreated	The date and time the Class was created.
classGUID	The unique GUID for the current Class.
classHasConstructor	Looks at the list of methods in the current object and, depending on the conventions of the current language, returns T if one is a default constructor. Typically used with the genOptGenConstructor macro.
classHasCopyConstructor	Looks at the list of methods in the current object and, depending on the conventions of the current language, returns T if one is a copy constructor. Typically used with the genOptGenCopyConstructor macro.
classHasDestructor	Looks at the list of methods in the current object and, depending on the conventions of the current language, returns T if one is a destructor. Typically used with the genOptGenDestructor macro.
classHasParent	<b>True</b> , if the Class in scope has one or more base Classes.

classImports	Code Gen dialog: Imports.
classIsActive	Class Advanced dialog: 'Is Active' checkbox.
classIsAssociationClass	<b>True</b> , if the Association is an AssociationClass connector.
classIsInstantiated	<b>True</b> , if the Class is an instantiated template Class.
classIsLeaf	Class Advanced dialog: 'Is Leaf' checkbox.
classIsRoot	Class Advanced dialog: 'Is Root' checkbox.
classIsSpecification	Class Advanced dialog: 'Is Specification' checkbox.
classKeywords	Class dialog: Keywords.
classLanguage	Class dialog: Language.
classMacros	A space separated list of macros defined for the Class.
classModified	The date and time the Class was last modified.
classMultiplicity	Class Advanced dialog: Multiplicity.
className	Class dialog: Name.
classNotes	Class dialog: Note.
classParamDefault	Class Detail dialog.
classParamName	Class Detail dialog.
classParamType	Class Detail dialog.
classPersistence	Class dialog: Persistence.
classPhase	Class dialog: Phase.
classQualName	The Class name prefixed by its outer Classes. Class names are separated by double colons (::).
classScope	Class dialog: Scope.
classStereotype	Class dialog: Stereotype.
classStatus	Class dialog: Status.
classVersion	Class dialog: Version.

## Code Generation Option Field Substitution Macros

Code generation option field substitution macros operate on the source code generation options defined in the 'Source Code Engineering' pages of the 'Options' dialog ('Tools | Options | Source Code Engineering'). This table lists each of the code generation option field substitution macros.

Field substitution macros are named according to Camel casing. Macros that represent checkboxes return a value of 'T' if the box is selected. Otherwise the value is empty.

### Code Generation Option Macros

Macro Name	Description
genOptActionScriptVersion	ActionScript Specifications page: Default Version.
genOptCDefaultAttributeType	C Specifications page: Default Attribute Type.
genOptCGenMethodNotesInBody	C Specifications page: Method Notes In Implementation.
genOptCGenMethodNotesInHeader	C Specifications page: Method Notes In Header.
genOptCSynchNotes	C Specifications page: Synchronize Notes in Generation.
genOptCSynchCFile	C Specifications page: Synchronise Implementation file in Generation.
genOptCDefaultSourceDirectory	C Specifications page: Default Source Directory.
genOptCNamespaceDelimiter	C Specifications page: Namespace Delimiter.
genOptCOperationRefParameter	C Specifications page: Reference as Operation Parameter.
genOptCOperationRefParameterStyle	C Specifications page: Reference Parameter Style.
genOptCOperationRefParameterName	C Specifications page: Reference Parameter Name.
genOptCConstructorName	C Specifications page: Default Constructor Name.
genOptCDestructorName	C Specifications page: Default Destructor Name.
genOptCPPCommentStyle	C++ Specifications page: Comment Style.
genOptCPPDefaultAttribute	C++ Specifications page: Default Attribute Type.

eType	
genOptCPPDefaultReferenceType	C++ Specifications page: Default Reference Type.
genOptCPPDefaultSourceDirectory	C++ Specifications page: Default Source Directory.
genOptCPPGenMethodNotesInHeader	C++ Specifications page: 'Method Notes In Header' checkbox.
genOptCPPGenMethodNotesInBody	C++ Specifications page: Method Notes In Body checkbox.
genOptCPPGetPrefix	C++ Specifications page: Get Prefix.
genOptCPPHeaderExtension	C++ Specifications page: Header Extension.
genOptCPPSetPrefix	C++ Specifications page: Set Prefix.
genOptCPPSourceExtension	C++ Specifications page: Source Extension.
genOptCPPSynchCPPFile	C++ Specifications page: Synchronize Notes.
genOptCPPSynchNotes	C++ Specifications page: Synchronize CPP File.
genOptCSDDefaultAttributeType	C# Specifications page: Default Attribute Type.
genOptCSSourceExtension	C# Specifications page: Default file extension.
genOptCSGenDispose	C# Specifications page: Generate Dispose.
genOptCSGenFinalizer	C# Specifications page: Generate Finalizer.
genOptCSGenNamespace	C# Specifications page: Generate Namespace.
genOptCSDDefaultSourceDirectory	C# Specifications page: Default Source Directory.
genOptDefaultAssocAttName	Attribute/Operations Specifications page: Default name for associated.
genOptDefaultConstructorScope	Object Lifetimes page: Default Constructor Visibility.
genOptDefaultCopyConstructorScope	Object Lifetimes page: Default Copy Constructor Visibility.
genOptDefaultDatabase	<b>Code Editors</b> page: Default Database.

genOptDefaultDestructorScope	Object Lifetimes page: Default Destructor Constructor Visibility.
genOptGenCapitalisedProperties	Source Code Engineering page: Capitalize Attribute Names for Properties checkbox.
genOptGenComments	Source Code Engineering page: Generate Comments checkbox.
genOptGenConstructor	Object Lifetimes page: 'Generate Constructor' checkbox.
genOptGenConstructorInline	Object Lifetimes page: 'Constructor Inline' checkbox.
genOptGenCopyConstructor	Object Lifetimes page: 'Generate Copy Constructor' checkbox.
genOptGenCopyConstructorInline	Object Lifetimes page: 'Copy Constructor Inline' checkbox.
genOptGenDestructor	Object Lifetimes page: 'Generate Destructor' checkbox.
genOptGenDestructorInline	Object Lifetimes page: 'Destructor Inline' checkbox.
genOptGenDestructorVirtual	Object Lifetimes page: 'Virtual Destructor' checkbox.
genOptGenImplementedInterfaceOps	Attribute/Operations Specifications page: Generate methods for implemented interfaces checkbox.
genOptGenPrefixBoolProperties	Source Code Engineering page: Use is prefix for boolean property Get().
genOptGenRoleNames	Source Code Engineering page: Autogenerate role names when creating code.
genOptGenUnspecAssocDir	Source Code Engineering page: 'Do not generate members where Association direction is unspecified' checkbox.
genOptJavaDefaultAttributeType	Java Specifications page: Default attribute type.
genOptJavaGetPrefix	Java Specifications page: Get Prefix.
genOptJavaDefaultSourceDirectory	Java Specifications page: Default Source Directory.
genOptJavaSetPrefix	Java Specifications page: Set Prefix.
genOptJavaSourceExtension	Java Specifications page: Source code extension.
genOptPHPDefaultSourceDirectory	PHP Specifications page: Default Source Directory.

genOptPHPGetPrefix	PHP Specifications page: Get Prefix.
genOptPHPSetPrefix	PHP Specifications page: Set Prefix.
genOptPHPSourceExtension	PHP Specifications page: Default file extension.
genOptPHPVersion	PHP Specifications page: PHP Version.
genOptPropertyPrefix	Source Code Engineering page: Remove prefixes when generating Get/Set properties.
genOptVBMultiUse	VB Specifications page: 'Multiuse' checkbox.
genOptVBPersistable	VB Specifications page: 'Persistable' checkbox.
genOptVBDataBindingBehavior	VB Specifications page: 'Data binding behavior' checkbox.
genOptVBDataSourceBehavior	VB Specifications page: 'Data source behavior' checkbox.
genOptVBGlobal	VB Specifications page: 'Global namespace' checkbox.
genOptVBCreatable	VB Specifications page: 'Creatable' checkbox.
genOptVBExposed	VB Specifications page: 'Exposed' checkbox.
genOptVBMTS	VB Specifications page: MTS Transaction Mode.
genOptVBNetGenNamespace	VB.Net Specifications page: Generate Namespace.
genOptVBVersion	VB Specifications page: Default Version.
genOptWrapComment	Source Code Engineering page: Wrap length for comment lines.



## Connector Field Substitution Macros

This table lists each of the connector field substitution macros.

Field substitution macros are named according to Camel casing. Macros that represent checkboxes return a value of 'T' if the box is selected. Otherwise the value is empty.

### Connector Macros

Macro Name	Description
connectorAlias	Connector Properties dialog: Alias.
connectorAssociationClass ElemGUID	The GUID of the connector's Association Class element.
connectorAssociationClass ElemName	The name of the connector's Association Class element.
connectorDestAccess	Connector 'Properties' dialog, 'Target Role' tab: Access.
connectorDestAggregation	Connector 'Properties' dialog, 'Target Role' tab: Aggregation.
connectorDestAlias	Connector 'Properties' dialog, 'Target Role' tab: Alias.
connectorDestAllowDuplic ates	Connector 'Properties' dialog, 'Target Role' tab: 'Allow Duplicates' checkbox.
connectorDestChangeable	Connector 'Properties' dialog, 'Target Role' tab: Changeable.
connectorDestConstraint	Connector 'Properties' dialog, 'Target Role' tab: Constraint(s).
connectorDestContainment	Connector 'Properties' dialog, 'Target Role' tab: Containment.
connectorDestDerived	Connector 'Properties' dialog, 'Target Role' tab: 'Derived' checkbox.
connectorDestDerivedUnio n	Connector 'Properties' dialog, 'Target Role' tab: 'DerivedUnion' checkbox.
connectorDestElem*	A set of macros that access a property of the element at the target end of a connector. The * (asterisk) is a wildcard that corresponds to any Class substitution macro in the Class macro list. For example: <ul style="list-style-type: none"> <li>connectorDestElemAlias (classAlias)</li> <li>connectorDestElemAuthor (classAuthor)</li> </ul>
connectorDestElemType	The element type of the connector destination element. (Separate from the connectorDestElem* macros because there is no classType substitution macro.)
connectorDestFeature*	A set of macros that access a property of the feature at the target end of a connector. The * (asterisk) is a wildcard that corresponds to any attribute or operation substitution macro in the Attribute macro or Operation macro list, depending on the

	<p>connectorDestFeatureType.</p> <p>For example:</p> <ul style="list-style-type: none"> <li>connectorDestFeatureReturnClassifierGUID - an Operation's return classifier GUID</li> <li>connectorDestFeatureContainment - an Attribute's containment</li> </ul>
connectorDestFeatureType	<p>The type of the connector destination feature.</p> <ul style="list-style-type: none"> <li>connectorDestFeatureType="Attribute" or "Operation"</li> </ul>
connectorDestMemberType	Connector 'Properties' dialog, 'Target Role' tab: Member Type.
connectorDestMultiplicity	Connector 'Properties' dialog, 'Target Role' tab: Multiplicity.
connectorDestNavigability	Connector 'Properties' dialog, 'Target Role' tab: Navigability.
connectorDestNotes	Connector 'Properties' dialog, 'Target Role' tab: Role Notes.
connectorDestOrdered	Connector 'Properties' dialog, 'Target Role' tab: 'Ordered' checkbox.
connectorDestOwned	Connector 'Properties' dialog, 'Target Role' tab: 'Owned' checkbox.
connectorDestQualifier	Connector 'Properties' dialog, 'Target Role' tab: Qualifier(s).
connectorDestRole	Connector 'Properties' dialog, 'Target Role' tab: Role.
connectorDestScope	Connector 'Properties' dialog, 'Target Role' tab: Target Scope.
connectorDestStereotype	Connector 'Properties' dialog, 'Target Role' tab: Stereotype.
connectorDirection	Connector Properties: Direction.
connectorEffect	Transition Constraints dialog: Effect.
connectorGuard	Object Flow and Transition Constraints dialog: Guard.
connectorGUID	The unique GUID for the current connector.
connectorIsAssociationClass	<b>True</b> , if the connector is an AssociationClass connector.
connectorName	Connector Properties: Name.
connectorNotes	Connector Properties: Notes.
connectorSourceAccess	Connector 'Properties' dialog, 'Source Role' tab: Access.
connectorSourceAggregation	Connector 'Properties' dialog, 'Source Role' tab: Aggregation.
connectorSourceAlias	Connector 'Properties' dialog, 'Source Role' tab: Alias.

connectorSourceAllowDuplicates	Connector 'Properties' dialog, 'Source Role' tab: Allow Duplicates checkbox.
connectorSourceChangeable	Connector 'Properties' dialog, 'Source Role' tab: Changeable.
connectorSourceConstraint	Connector 'Properties' dialog, 'Source Role' tab: Constraint(s).
connectorSourceContainment	Connector 'Properties' dialog, 'Source Role' tab: Containment.
connectorSourceDerived	Connector 'Properties' dialog, 'Source Role' tab: 'Derived' checkbox.
connectorSourceDerivedUnion	Connector 'Properties' dialog, 'Source Role' tab: 'DerivedUnion' checkbox.
connectorSourceElem*	<p>A set of macros that access a property of the element at the source end of a connector. The * (asterisk) is a wildcard that corresponds to any class substitution macro in the Class macro list. For example:</p> <ul style="list-style-type: none"> <li>connectorSourceElemAlias (classAlias)</li> <li>connectorSourceElemAuthor (classAuthor)</li> </ul>
connectorSourceElemType	The element type of the connector source element. (Separate from the connectorSourceElem* macros because there is no classType substitution macro.)
connectorSourceFeature*	<p>A set of macros that access a property of the feature at the source end of a connector. The * (asterisk) is a wildcard that corresponds to any attribute or operation substitution macro in the Attribute macro or Operation macro list, depending on the connectorSourceFeatureType. For example:</p> <ul style="list-style-type: none"> <li>connectorSourceFeatureCode - Operation's Code</li> <li>connectorSourceFeatureInitial - Attribute's Initial</li> </ul>
connectorSourceFeatureType	<p>The type of the connector source feature.</p> <ul style="list-style-type: none"> <li>connectorSourceFeatureType="Attribute" or "Operation"</li> </ul>
connectorSourceMemberType	Connector 'Properties' dialog, 'Source Role' tab: Member Type.
connectorSourceMultiplicity	Connector 'Properties' dialog, 'Source Role' tab: Multiplicity.
connectorSourceNavigability	Connector 'Properties' dialog, 'Source Role' tab: Navigability.
connectorSourceNotes	Connector 'Properties' dialog, 'Source Role' tab: Role Notes.
connectorSourceOrdered	Connector 'Properties' dialog, 'Source Role' tab: 'Ordered' checkbox.
connectorSourceOwned	Connector 'Properties' dialog, 'Source Role' tab: 'Owned' checkbox.
connectorSourceQualifier	Connector 'Properties' dialog, 'Source Role' tab: Qualifier(s).

connectorSourceRole	Connector 'Properties' dialog, 'Source Role' tab: Role.
connectorSourceScope	Connector 'Properties' dialog, 'Source Role' tab: Target Scope.
connectorSourceStereotype	Connector 'Properties' dialog, 'Source Role' tab: Stereotype.
connectorStereotype	Connector Properties dialog: Stereotype.
connectorTrigger	Transition Constraints dialog: Trigger.
connectorType	The connector type; for example, Association or Generalization.
connectorWeight	Object Flow Constraints dialog: Weight.

## Constraint Field Substitution Macros

This table lists each of the 'Constraint' field substitution macros.

Field substitution macros are named according to Camel casing. Macros that represent checkboxes return a value of 'T' if the box is selected. Otherwise the value is empty.

### Constraint Macros

Macro Name	Description
constraintName	'Class' dialog, 'Constraints' tab: Name.
constraintNotes	'Class' dialog, 'Constraints' tab: Notes.
constraintStatus	'Class' dialog, 'Constraints' tab: Status.
constraintType	'Class' dialog, 'Constraints' tab: Type.
constraintWeight	'Class' dialog, 'Constraints' tab: ordering (hand up/down) keys.

## Effort Field Substitution Macros

This table lists each of the 'Effort' field substitution macros.

Field substitution macros are named according to Camel casing. Macros that represent checkboxes return a value of 'T' if the box is selected. Otherwise the value is empty.

### Effort Macros

Macro Name	Description
effortName	<b>Effort window:</b> Effort.
effortNotes	<b>Effort window:</b> Notes (unlabelled).
effortTime	<b>Effort window:</b> Time.
effortType	<b>Effort window:</b> Type.

## File Field Substitution Macros

This table lists each of the file field substitution macros.

Field substitution macros are named according to Camel casing. Macros that represent checkboxes return a value of T if the box is selected. Otherwise the value is empty.

### File Macros

Macro Name	Description
fileExtension	The file type extension of the file being generated.
fileName	The name of the file being generated.
fileNameImpl	The filename of the implementation file for this generation, if applicable.
fileHeaders	Code Gen dialog: Headers.
fileImports	Code Gen dialog: Imports. For supported languages this also includes dependencies derived from associations.
filePath	The full path of the file being generated.
filePathImpl	The full path of the implementation file for this generation, if applicable.

## File Import Field Substitution Macros

This table lists each of the file import field substitution macros.

Field substitution macros are named according to Camel casing. Macros that represent checkboxes return a value of T if the box is selected. Otherwise the value is empty.

### File Import Macros

Macro Name	Description
importClassName	The name of the Class being imported.
importFileName	The filename of the Class being imported.
importFilePath	The full path of the Class being imported.
importFromAggregation	T if the Class has an Aggregation connector to a Class in this file, F otherwise.
importFromAssociation	T if the Class has an Association connector to a Class in this file, F otherwise.
importFromAtt	T if an attribute of a Class in the current file is of the type of this Class, F otherwise.
importFromDependency	T if the Class has a Dependency connector to a Class in this file, F otherwise.
importFromGeneralization	T if the Class has a Generalization connector to a Class in this file, F otherwise.
importFromMeth	T if a method return type of a Class in the current file is the type of this Class, F otherwise.
importFromParam	T if an method parameter of a Class in the current file is of the type of this Class, F otherwise.
importFromRealization	T if the Class has a Realization connector to a Class in this file, F otherwise.
importFromTemplateBinding	T if the Class has a TemplateBinding connector to a Class in this file, F otherwise.
importInFile	T if the Class is in the current file, F otherwise.
importPackagePath	The Package path with a '.' separator of the Class being imported.
ImportRelativeFilePath	The relative file path of the Class being imported from the file path of the file being generated.



## Link Field Substitution Macros

If you want to provide access to data concerning connectors in the model, particularly Associations and Generalizations, you can use the 'Link field substitution' macros. The macro names are in Camel casing. Macros that represent checkboxes return a value of 'T' if the box is selected; otherwise the value is empty.

### Link Macros

Macro Name	Description/Result
linkAttAccess	Association Properties dialog, Target Role: Access.
linkAttAggregation	Association Properties dialog, Source or Target Role: Aggregation.
linkAttCollectionClass	The collection appropriate for the linked attribute in scope.
linkAttContainment	Association Properties dialog, Target Role: Containment.
linkAttName	Association Properties dialog: Target.
linkAttNotes	Association Properties dialog, Target Role: Role Notes.
linkAttOwnedByAssociation	<b>True</b> , if the 'Owned' checkbox on the 'Role(s)' page of the Association 'Properties' dialog is not selected.
linkAttOwnedByClass	<b>True</b> , if the 'Owned' checkbox on the 'Role(s)' page of the Association 'Properties' dialog is selected.
linkAttQualName	The Association target qualified by the namespace path (if generating namespaces) and the classifier path (dot delimited).
linkAttRole	Association Properties dialog, Target Role: Role.
linkAttRoleAlias	'Association Properties Target Role' dialog: Alias
linkAttStereotype	Association Properties dialog, Target Role: Stereotype.
linkAttTargetScope	Association Properties dialog, Target Role: Target Scope.
linkCard	Link Properties dialog, Target Role: Multiplicity.
linkGUID	The unique GUID for the current connector.
linkIsAssociationClass	<b>True</b> , if the Association is an AssociationClass connector.
linkIsBound	Returns T if any TemplateBindings are specified on the connector.
linkParamSubs	Returns a comma-separated list of the arguments specified.
linkParentName	Generalization Properties dialog: Target.

linkParentQualName	The Generalization target qualified by the namespace path (if generating namespaces) and the classifier path (dot delimited).
linkStereotype	The stereotype of the current connector.
linkVirtualInheritance	Generalization Properties dialog: Virtual Inheritance.

## Linked File Field Substitution Macros

This table lists each of the 'Linked File' field substitution macros.

Field substitution macros are named according to Camel casing. Macros that represent checkboxes return a value of 'T' if the box is selected. Otherwise the value is empty.

### Linked File Macros

Macro Name	Description
linkedFileLastWrite	Class Properties dialog: Last Write.
linkedFileNotes	Class Properties dialog: Notes.
linkedFilePath	Class Properties dialog: File Path.
linkedFileSize	Class Properties dialog: Size.
linkedFileType	Class Properties dialog: Type.

## Metric Field Substitution Macros

This table lists each of the Metric field substitution macros.

Field substitution macros are named according to Camel casing. Macros that represent checkboxes return a value of 'T' if the box is selected. Otherwise the value is empty.

### Metric Macros

Macro Name	Description
metricName	Metrics screen: 'Metric' field.
metricNotes	Metrics screen: (Notes) field.
metricType	Metrics screen: 'Type' field.
metricWeight	Metrics screen: 'Weight' field.

# Operation Field Substitution Macros

The 'Operation field substitution' macros provide access to data concerning operations in the model. The macro names are in Camel casing. Macros that represent checkboxes return a value of 'T' if the box is selected; otherwise the value is empty.

## Operation field substitution macros

Macro Name	Description/Result
opAbstract	Operation dialog: 'Virtual' checkbox.
opAlias	Operation dialog: Alias.
opBehavior	Operation Behavior dialog: Behavior.
opCode	Operation Behavior dialog: Initial Code.
opConcurrency	Operation dialog: Concurrency.
opConst	Operation dialog: 'Const' checkbox.
opGUID	The unique GUID for the current operation.
opHasSelfRefParam	Scans the list of parameters in the current Operation, returning 'T' if one type is the Class reference (this could be ClassA* or ClassA&, depending on the value of the genOptCOperationRefParamStyle code generation option field substitution macro).
opImplMacros	A space-separated list of macros defined in the implementation of this operation.
opIsQuery	Operation dialog: 'IsQuery' checkbox.
opMacros	A space-separated list of macros defined in the declaration for this operation.
opName	Operation dialog: Name.
opNotes	Operation dialog: Notes.
opPure	Operation dialog: 'Pure' checkbox.
opReturnArray	Operation dialog: 'Return Array' checkbox.
opReturnClassifierGUID	The unique GUID for the classifier of the current operation.
opReturnQualType	The operation return type qualified by the namespace path (if generating namespaces) and the classifier path (dot delimited). If the return type classifier has not been set, it is equivalent to the opReturnType macro.
opReturnType	Operation dialog: Return Type.

opScope	Operation dialog: Scope.
opStatic	Operation dialog: 'Static' checkbox.
opStereotype	Operation dialog: Stereotype.
opSynchronized	Operation dialog: 'Synchronized' checkbox.

## Package Field Substitution Macros

This table lists the Package field substitution macros.

Field substitution macros are named according to Camel casing. Macros that represent checkboxes return a value of 'T' if the box is selected. Otherwise the value is empty.

### Package Macros

Macro Name	Description
packageAbstract	Package dialog: Abstract.
packageAlias	Package dialog: Alias.
packageAuthor	Package dialog: Author.
packageComplexity	Package dialog: Complexity.
packageGUID	The unique GUID for the current Package.
packageKeywords	Package dialog: Keywords.
packageLanguage	Package dialog: Language.
packageName	Package dialog: Name.
packagePath	The string representing the hierarchy of Packages, for the Class in scope. Each Package name is separated by a dot (.).
packagePhase	Package dialog: Phase.
packageScope	Package dialog: Scope.
packageStatus	Package dialog: Status.
packageStereotype	Package dialog: Stereotype.
packageVersion	Package dialog: Version.

## Parameter Field Substitution Macros

This table lists each of the Parameter field substitution macros.

Field substitution macros are named according to Camel casing. Macros that represent checkboxes return a value of 'T' if the box is selected. Otherwise the value is empty.

### Parameter Macros

Macro Name	Description
paramClassifierGUID	The unique GUID for the classifier of the current parameter.
paramDefault	Operation Parameters dialog: Default.
paramFixed	Operation Parameters dialog: 'Fixed' checkbox.
paramGUID	The unique GUID for the current parameter.
paramIsEnum	<b>True</b> , if the parameter uses the enum keyword (C++).
paramKind	Operation Parameters dialog: Kind.
paramName	Operation Parameters dialog: Name.
paramNotes	Operation Parameters dialog: Notes.
paramQualType	The parameter type qualified by the namespace path (if generating namespaces) and the classifier path (dot delimited). If the parameter classifier has not been set, is equivalent to the paramType macro.
paramType	Operation Parameters dialog: Type.



## Problem Field Substitution Macros

This table lists each of the Problem field substitution macros.

Field substitution macros are named according to Camel casing. Macros that represent checkboxes return a value of 'T' if the box is selected. Otherwise the value is empty.

### Problem Macros

Macro Name	Description
problemCompletedBy	'Maintenance' dialog, 'Element Issues' tab: Completed by.
problemCompletedDate	'Maintenance' dialog, 'Element Issues' tab: Completed.
problemHistory	'Maintenance' dialog, 'Element Issues' tab: History.
problemName	'Maintenance' dialog, 'Element Issues' tab: Name.
problemNotes	'Maintenance' dialog, 'Element Issues' tab: Description.
problemPriority	'Maintenance' dialog, 'Element Issues' tab: Priority.
problemRaisedBy	'Maintenance' dialog, 'Element Issues' tab: Raised by.
problemRaisedDate	'Maintenance' dialog, 'Element Issues' tab: Raised.
problemStatus	'Maintenance' dialog, 'Element Issues' tab: Status.
problemVersion	'Maintenance' dialog, 'Element Issues' tab: Version.

## Requirement Field Substitution Macros

This table lists each of the Requirement field substitution macros with a description of the result.

Field substitution macros are named according to Camel casing. Macros that represent checkboxes return a value of 'T' if the box is selected. Otherwise the value is empty.

### Requirement Macros

Macro Name	Description
requirementDifficulty	'Properties' dialog: 'Require' tab: Difficulty.
requirementLastUpdated	'Properties' dialog: 'Require' tab: Last Update.
requirementName	'Properties' dialog: 'Require' tab: Short Description.
requirementNotes	'Properties' dialog: 'Require' tab: Notes.
requirementPriority	'Properties' dialog: 'Require' tab: Priority.
requirementStatus	'Properties' dialog: 'Require' tab: Status.
requirementType	'Properties' dialog: 'Require' tab: Type.

## Resource Field Substitution Macros

This table lists each of the Resource field substitution macros.

Field substitution macros are named according to Camel casing. Macros that represent checkboxes return a value of 'T' if the box is selected. Otherwise the value is empty.

### Resource Macros

Macro Name	Description
resourceAllocatedTime	<b>Resource Allocation window:</b> Allocated Time.
resourceEndDate	<b>Resource Allocation window:</b> End Date.
resourceExpectedTime	<b>Resource Allocation window:</b> Expected Time.
resourceExpendedTime	<b>Resource Allocation window:</b> Time Expended.
resourceHistory	<b>Resource Allocation window:</b> History.
resourceName	<b>Resource Allocation window:</b> Resource.
resourceNotes	<b>Resource Allocation window:</b> Description.
resourcePercentCompleted	<b>Resource Allocation window:</b> Completed(%).
resourceRole	<b>Resource Allocation window:</b> Role.
resourceStartDate	<b>Resource Allocation window:</b> Start Date.

## Risk Field Substitution Macros

This table lists each of the Risk field substitution macros.

Field substitution macros are named according to Camel casing. Macros that represent checkboxes return a value of 'T' if the box is selected. Otherwise the value is empty.

### Risk Macros

Macro Name	Description
riskName	<b>Risks window:</b> Risk.
riskNotes	<b>Risks window:</b> (Notes).
riskType	<b>Risks window:</b> Type.
riskWeight	<b>Risks window:</b> Weight.

## Scenario Field Substitution Macros

This table lists each of the Scenario field substitution macros with a description of the result.

Field substitution macros are named according to Camel casing. Macros that represent checkboxes return a value of 'T' if the box is selected. Otherwise the value is empty.

### Scenario Macros

Macro Name	Description
scenarioGUID	The unique ID for a scenario. Identifies the scenario unambiguously within a model.
scenarioName	'Properties' dialog, 'Scenario' tab: Scenario.
scenarioNotes	'Properties' dialog, 'Scenario' tab: (Notes).
scenarioType	'Properties' dialog, 'Scenario' tab: Type.

# Tagged Value Substitution Macros

**Tagged Value** macros are a special form of field substitution macros, which provide access to element tags and the corresponding **Tagged Values**. They can be used in one of two ways:

- Direct Substitution
- Conditional Substitution

## Direct Substitution

This form of the macro directly substitutes the value of the named tag into the output.

Structure: %<macroName>:"<tagName>"%

<macroName> can be one of:

- attTag
- classTag
- connectorDestElemTag
- connectorDestTag
- connectorSourceElemTag
- connectorSourceTag
- connectorTag
- linkAttTag
- linkTag
- opTag
- packageTag
- paramTag

This corresponds to the tags for attributes, Classes, operations, Packages, parameters, connectors with both ends, elements at both ends of connectors and connectors including the attribute end.

<tagName> is a string representing the specific tag name.

## Example

```
%opTag:"attribute"%
```

## Conditional Substitution

This form of the macro mimics the conditional substitution defined for field substitution macros.

Structure: %<macroName>:"<tagName>" ( == "<test>" ) ? <subTrue> ( : <subFalse> ) %

Where:

- < macroName > and < tagName > are as defined above
- ( < text > ) denotes that <text> is optional
- <test> is a string representing a possible value for the macro
- < subTrue > and < subFalse > can be a combination of quoted strings and the keyword value; where the value is used, it gets replaced with the macro's value in the output

## Examples

```
%opTag:"opInline" ? "inline" : ""%
```

```
%opTag:"opInline" ? "inline"%
```

```
%classTag:"unsafe" == "true" ? "unsafe" : ""%
```

```
%classTag:"unsafe" == "true" ? "unsafe"%
```

**Tagged Value** macros use the same naming convention as field substitution macros.

## Template Parameter Substitution Macros

If you want to provide access in a transformation template to data concerning the transformation of a Template Binding connector's binding parameter substitution in the model, you can use the Template Parameter substitution macros. The macro names are in Camel casing. Macros that represent checkboxes return a value of 'T' if the box is selected; otherwise the value is empty.

### Template Parameter substitution macros

Macro Name	Description
parameterSubstitutionFormal	'Template Binding Properties' dialog, 'Binding Parameter' tab, 'Parameter Substitution(s)' panel: Formal Template Parameter name.
parameterSubstitutionActual	'Template Binding Properties' dialog, 'Binding Parameter' tab, 'Parameter Substitution(s)' panel: Actual parameter name/expression.
parameterSubstitutionActualClassifier	'Template Binding Properties' dialog, 'Binding Parameter' tab, 'Parameter Substitution(s)' panel: Actual parameter classifier.



## Test Field Substitution Macros

This table lists each of the Test field substitution macros with a description of the result.

Field substitution macros are named according to Camel casing. Macros that represent checkboxes return a value of 'T' if the box is selected. Otherwise the value is empty.

### Test Macros

Macro Name	Description
testAcceptanceCriteria	<b>Testing window:</b> Acceptance Criteria.
testCheckedBy	<b>Testing window:</b> Checked By.
testDateRun	<b>Testing window:</b> Last Run.
testClass	<b>Testing window:</b> Test Class (the type of test defined: Unit, Integration, System, Acceptance, Inspection, Scenario)
testInput	<b>Testing window:</b> Input.
testName	<b>Testing window:</b> Test.
testNotes	<b>Testing window:</b> Description.
testResults	<b>Testing window:</b> Results.
testRunBy	<b>Testing window:</b> Run By.
testStatus	<b>Testing window:</b> Status.
testType	<b>Testing window:</b> Type.

## Function Macros

Function macros are a convenient way of manipulating and formatting various element data items. Each function macro returns a result string. There are two primary ways to use the results of function macros:

- Direct substitution of the returned string into the output, such as: `%TO_LOWER(attName)%`
- Storing the returned string as part of a variable definition such as: `$name = %TO_LOWER(attName)%`

Function macros can take parameters, which can be passed to the macros as:

- String literals, enclosed within double quotation marks
- Direct substitution macros without the enclosing percent signs
- Variable references
- Numeric literals

Multiple parameters are passed using a comma-separated list.

Function macros are named according to the All-Caps style, as in:

`%CONVERT_SCOPE(opScope)%`

The available function macros are described here. Parameters are denoted by square brackets, as in:

`FUNCTION_NAME([param]).`

### CONVERT\_SCOPE([umlScope])

For use with supported languages, to convert [umlScope] to the appropriate scope keyword for the language being generated. This table shows the conversion of [umlScope] with respect to the given language.

Language	Conversions
C++	Package ==> public Public ==> public Private ==> private Protected ==> protected
C#	Package ==> internal Public ==> public Private ==> private Protected ==> protected
Delphi	Package ==> protected Public ==> public Private ==> private Protected ==> protected
Java	Package ==> {blank} Public ==> public Private ==> private Protected ==> protected
PHP	Package ==> public

	Public ==> public Private ==> private Protected ==> protected
VB	Package ==> Protected Public ==> Public Private ==> Private Protected ==> Protected
VB .Net	Package ==> Friend Public ==> Public Private ==> Private Protected ==> Protected

## COLLECTION\_CLASS([language])

Gives the appropriate collection Class for the language specified for the current linked attribute.

## CSTYLE\_COMMENT([wrap\_length])

Converts the notes for the element currently in scope to plain C-style comments, using /\* and \*/.

## DELPHI\_PROPERTIES([scope], [separator], [indent])

Generates a Delphi property.

## DELPHI\_COMMENT([wrap\_length])

Converts the notes for the element currently in scope to Delphi comments.

## EXEC\_ADD\_IN(, [function\_name], , ..., )

Invokes an Enterprise Architect **Add-In** function, which can return a result string.

[addin\_name] and [function\_name] specify the names of the Add-In and function to be invoked.

Parameters to the Add-In function can be specified via parameters [prm\_1] to [prm\_n].

```
$result = %EXEC_ADD_IN("MyAddin", "ProcessOperation", classGUID, opGUID)%
```

Any function that is to be called by the EXEC\_ADD\_IN macro must have two parameters: an EA.Repository object, and a Variant array that contains any additional parameters from the EXEC\_ADD\_IN call. Return type should be Variant.

```
Public Function ProcessOperation(Repository As EA.Repository, args As Variant) As Variant
```

**FIND([src], [subString])**

Position of the first instance of [subString] in [src]; -1 if none.

**GET\_ALIGNMENT()**

Returns a string where all of the text on the current line of output is converted into spaces and tabs.

**JAVADOC\_COMMENT([wrap\_length])**

Converts the notes for the element currently in scope to javadoc -style comments.

**LEFT([src], [count])**

The first [count] characters of [src].

**LENGTH([src])**

Length of [src]. Returns a string.

**MID([src], [start]) MID([src], [start], [count])**

Substring of [src] starting at [start] and including [count] characters. Where [count] is omitted the rest of the string is included.

**PI([option], [value], {[option], [value]})**

Sets the PI for the current template to [value]. Valid values for [value] are:

- "\n"
- "\t "
- " " "
- " " "

<option> controls when the new PI takes effect. Valid values for <option> are:

- I, Immediate: the new PI is generated before the next non-empty template line
- N, Next: the new PI is generated after the next non-empty template line

Multiple pairs of options are allowed in one call. An example of the situation where this would be used is where one keyword is always on a new line, as illustrated here:

```
%PI=" %"
```

```
%classAbstract ? "abstract"%
```

```
%if classTag:"macro" != ""%
```

```
%PI("I", "\n", "N", " ")%  
%classTag:"macro"%  
%endIf%  
class  
%className%
```

For more details, see the [The Processing Instruction \(PI\) Macro](#).

## **PROCESS\_END\_OBJECT([template\_name])**

Enables the Classes that are one Class further away from the base Class, to be transformed into objects (such as attributes, operations, Packages, parameters and columns) of the base Class. [template\_name] refers to the working template that temporarily stores the data.

## **REMOVE\_DUPLICATES([source], [separator])**

Where [source] is a [separator] separated list; this removes any duplicate or empty strings.

## **REPLACE([string], [old], [new])**

Replaces all occurrences of [old] with [new] in the given string <string>.

## **RESOLVE\_OP\_NAME()**

Resolves clashes in interface names where two method-from interfaces have the same name.

## **RESOLVE\_QUALIFIED\_TYPE() RESOLVE\_QUALIFIED\_TYPE([separator]) RESOLVE\_QUALIFIED\_TYPE([separator], [default])**

Generates a qualified type for the current attribute, linked attribute, linked parent, operation, or parameter. Enables the specification of a separator other than . and a default value for when some value is required.

## **RIGHT([src], [count])**

The last [count] characters of [src].

## **TO\_LOWER([string])**

Converts [string] to lower case.

**TO\_UPPER([string])**

Converts [string] to upper case.

**TRIM([string]) TRIM([string], [trimChars])**

Removes trailing and leading white spaces from [string]. If [trimChars] is specified, all leading and trailing characters in the set of <trimChars> are removed.

**TRIM\_LEFT([string]) TRIM\_LEFT([string], [trimChars])**

Removes the specified leading characters from <string>.

**TRIM\_RIGHT([string]) TRIM\_RIGHT([string], [trimChars])**

Removes the specified trailing characters from <string>.

**VB\_COMMENT([wrap\_length])**

Converts the notes for the element currently in scope to Visual Basic style comments.

**WRAP\_COMMENT([comment], [wrap\_length], [indent], [start\_string])**

Wraps the text [comment] at width [wrap\_length] putting [indent] and [start\_string] at the beginning of each line.

```
$behavior = %WRAP_COMMENT(opBehavior, "40", " ", "//")%
```

<wrap\_length> must still be passed as a string, even though WRAP\_COMMENT treats this parameter as an integer.

**WRAP\_LINES([text], [wrap\_length], [start\_string] {, [end\_string] })**

Wraps [text] as designated to be [wrap\_length], adding [start\_string] to the beginning of every line and [end\_string] to the end of the line if it is specified.

**XML\_COMMENT([wrap\_length])**

Converts the notes for the element currently in scope to XML-style comments.

## Control Macros

Control macros are used to control the processing and formatting of the templates. The basic types of control macro include:

- The list macro, for generating multiple element features, such as attributes and operations
- The branching macros, which form if-then-else constructs to conditionally execute parts of a template
- The PI macro for formatting new lines in the output, which takes effect from the next non-empty line
- A PI function macro that enables setting PI to a variable and adds the ability to set the PI that is generated before the next line
- The synchronization macros

In general, control macros are named according to Camel casing.

## List Macro

If you need to loop or iterate through a set of Objects that are contained within or are under the current object, you can do so using the `%list` macro. This macro performs an iterative pass on all the objects in the scope of the current template, and calls another template to process each one.

The basic structure is:

```
%list=<TemplateName> @separator=<string> @indent=<string> ( <conditions> ) %
```

where `<string>` is a double-quoted literal string and `<TemplateName>` can be one of these template names:

- Attribute
- AttributeImpl
- Class
- ClassBase
- ClassImpl
- ClassInterface
- Constraint
- Custom Template (custom templates enable you to define your own templates)
- Effort
- InnerClass
- InnerClassImpl
- LinkedFile
- Metric
- Namespace
- Operation
- OperationImpl
- Parameter
- Problem
- Requirement
- Resource
- Risk
- Scenario
- Test

`<conditions>` is optional and looks the same as the conditions for 'if' and 'elsif' statements.

### Example

In a Class transform, the Class might contain multiple Attributes; this example calls the Attribute transform and outputs the result of processing the transform for each attribute of the Class in scope. The resultant list separates its items with a single new line and indents them two spaces respectively. If the Class in scope had any stereotyped attributes, they would be generated using the appropriately specialized template.

```
%list="Attribute" @separator="\n" @indent="  "%
```

The separator attribute, denoted above by `@separator`, specifies the space that should be used between the list items, excluding the last item in the list.

The indent attribute, denoted by `@indent`, specifies the space by which each line in the generated output should be indented.



## Special Cases

There are some special cases to consider when using the %list macro:

- If the Attribute template is used as an argument to the %list macro, this also generates attributes derived from Associations by executing the appropriate LinkedAttribute template
- If the ClassBase template is used as an argument to the %list macro, this also generates Class bases derived from links in the model by executing the appropriate LinkedClassBase template
- If the ClassInterface template is used as an argument to the %list macro, this also generates Class bases derived from links in the model by executing the appropriate LinkedClassInterface template
- If InnerClass or InnerClassImpl is used as an argument to the %list macro, these Classes are generated using the Class and ClassImpl templates respectively; these arguments direct that the templates should be processed based on the inner Classes of the Class in scope

## Branching Macros

Branching macros provide if-then-else constructs. The CTF supports a limited form of branching through these macros:

- if
- elseif
- else
- endif
- endTemplate (which exits the current template)

The basic structure of the if and elseif macros is:

```
%if <test> <operator> <test>%
```

where <operator> can be one of:

- ==
- !=
- < (mathematics comparison, less than)
- > (mathematics comparison, greater than)
- <= (mathematics comparison, less than or equal to)
- >= (mathematics comparison, greater than or equal to)

and <test> can be one of:

- a string literal, enclosed within double quotation marks
- a direct substitution macro, without the enclosing percent signs
- a variable reference

Note that if you are using one of the mathematics comparison operators, <test> must be a decimal number in string format.

Branches can be nested, and multiple conditions can be specified using one of:

- and, or
- or

When specifying multiple conditions, 'and' and 'or' have the same order of precedence, and conditions are processed left to right.

If conditional statements on strings are case sensitive, 'a String' does not equal 'A STRING'. Hence in some situations it is better to set the variable \$str= TO\_LOWER(variable) or TO\_UPPER(variable) and then compare to a specific case.

Macros are not supported in the conditional statements. It is best to assign the results of a macro (string) to a variable, and then use the variable in the comparison.

```
$fldType = % TO_LOWER ($parameter1)%
$COMMENT = "Use the first 4 characters for Date and Time field types"
$fldType4 = % LEFT ($fldType, 4)%
%if $fldType4 == "date"%
  Datetime
%endif%
```

This takes a parameter of value "Datetime", "DATETIME" or "Date", and returns "Datetime".

The endif or endTemplate macros must be used to signify the end of a branch. In addition, the endTemplate macro causes the template to return immediately, if the corresponding branch is being executed.

### Example 1

```
%if elemType == "Interface"%
```

```
;
```

```
%else%
```

```
%OperationBody%
```

```
%endif%
```

In this case:

- If the elemType is "Interface" a semi-colon is returned
- If the elemType is not "Interface", a template called Operation Body is called

## Example 2

```
$bases="ClassBase"
```

```
$interfaces=""
```

```
%if $bases != "" and $interfaces != ""%
```

```
: $bases, $interfaces
```

```
%elsif $bases != ""%
```

```
: $bases
```

```
%elsif $interfaces != ""%
```

```
: $interfaces
```

```
%endif%
```

In this case the text returned is ':ClassBase'.

## Conditions using Boolean Value

When setting up branching using conditions that involve a system checkbox (boolean fields), such as Attribute.Static (attStatic) the conditional statement would be written as:

```
%if attStatic == "T"%
```

For example:

```
% if attCollection == "T" or attOrderedMultiplicity == "T" %
```

```
% endTemplate %
```

## Synchronization Macros

The synchronization macros are used to provide formatting hints to Enterprise Architect when inserting new sections into the source code, during forward synchronization. The values for synchronization macros must be set in the File templates.

The structure for setting synchronization macros is:

%<name>=<value>%

where <name> can be one of the macros listed here and <value> is a literal string enclosed by double quotes.

### Synchronization Macros

Macro Name	Description
synchNewClassNotesSpace	Space to append to a new Class note. Default value: \n.
synchNewAttributeNotesSpace	Space to append to a new attribute note. Default value: \n.
synchNewOperationNotesSpace	Space to append to a new operation note. Default value: \n.
synchNewOperationBodySpace	Space to append to a new operation body. Default value: \n.
synchNamespaceBodyIndent	Indent applied to Classes within non-global namespaces. Default value: \t.

## The Processing Instruction (PI) Macro

The PI (Processing Instruction) macro provides a means of defining the separator text to be inserted between the code pieces (which represent entities) that are generated using a template.

The structure for setting the Processing Instruction is:

```
%PI=<value>%
```

In this structure, <value> is a literal string enclosed by double quotes, with the following options:

- "\n" - New line (the default)
- " " - Space
- "\t" - Tab
- "" - Null

By default, the PI is set to generate a new line (\n) for each non-empty substitution, which behavior can be changed by resetting the PI macro. For instance, a Class's Attribute declaration in simple VB code would be generated to a single line statement (with no new lines). These properties are derived from the Class-Attribute Properties in the model to generate, for example:

```
Private Const PrintFormat As String = "Portrait"
```

The template for generating this starts with the PI being set to a space rather than a new line:

```
% PI = " " %
% CONVERT_SCOPE ( attScope )%
% endIf %
% if attConst == "T" %
Const
% endIf %
```

On transforming this, attscope returns the VB keyword 'Private' and attConst returns 'Const' on the same line spaced by a single space (fitting the earlier VB Class.Attribute definition example).

Alternatively, when generating a Class you might want the Class declaration, the notes and Class body all separated by double lines. In this case the %PI is set to '/n/n' to return double line spacing:

```
% PI = "\n\n" %
% ClassDeclaration %
% ClassNotes %
% ClassBody %
```

### PI Characteristics

- Blank lines have no effect on the output
- Any line that has a macro that produces an empty result does not result in a PI separator (space/new line)
- The last entry does not return a PI; for example, %Classbody% (above) does not have a double line added after the body

# Code Generation Macros for Executable State Machines

The templates are structured as follows:

StmContextStateMachineEnum  
    StmStateMachineEnum

StmContextStateEnum  
    StmAllStateEnum

StmContextTransitionEnum  
    StmTransitionEnum

StmContextEntryEnum  
    StmAllEntryEnum

StmContextStateMachineStringToEnum  
    StmStateMachineStringToEnum

StmContextStateEnumToString  
    StmStateEnumToString

StmContextTransitionEnumToString  
    StmTransitionEnumToString

StmContextStateNameToGuid  
    StmStateNameToGuid

StmContextTransitionNameToGuid  
    StmTransitionNameToGuid

StmContextDefinition  
    StmStateMachineEnum  
    StmAllStateEnum  
    StmTransitionEnum  
    StmAllEntryEnum  
    StmAllRegionVariableInitialize  
    StmStateWithDeferredEvent  
        StmDeferredEvent  
    StmTransitionProcMapping  
    StmTransitionProc

- StmTransitionExit
- StmTransitionEntry
- StmTargetOutgoingTransition
- StmTargetParentSubmachineState
- StmStateProcMapping
- StmStateProc
  - StmStateEntry
    - StmOutgoingTransition
    - StmConnectionPointReferenceEntry
    - StmParameterizedInitial
  - StmSubMachineInitial
  - StmRegionInitial
  - StmRegionDeactive
    - StmStateExitProc
- StmStateTransition
  - StmStateEvent
    - StmStateTriggeredTransition
  - StmStateCompletionTransition
  - StmSubmachineStateExitEvent
    - StmVertexOutgoingTransition
  - StmConnectionPointReferenceExitEvent
  - StmStateExitEvent
    - StmVertexOutgoingTransition
- StmAllRegionVariable
- StmStateMachineStringToEnum
- StmStateMachineRun
  - StmStateInitialData
  - StmStateMachineEntry
    - StmOutgoingTransition
- StmStateMachineRunInitial
  - StmStateMachineInitial
- StmStateMachineRuns

StmContextManager

StmSimulationManager

- StmContextInstanceDeclaration
- StmContextInstance
  - StmContextVariableRunstate
- StmContextInstanceAssociation
- StmContextInstanceClear

**StmEventProxy**

- StmSignalEnum
- StmContextJoinEventEnum
  - StmJoinEventEnum
- StmEventEnum
- StmSignalDefinition
  - StmSignalAttributeAssignment
  - StmSignalAttribute
- StmSignalInitialize
- StmEventStringToEnum
- StmEventEnumToString
- StmEventNameToGuid

**StmConsoleManager**

- StmContextInstanceDeclaration
- StmContextInstance
  - StmContextVariableRunstate
- StmContextInstanceAssociation
- StmContextInstanceClear

**StmStateMachineStrongToEnum****StmInitialForTransition****StmVertexOutgoingTransition****StmSendEvent****StmBroadcastEvent****StmContextRef****Signal & Event**

Macro name	Description
stmSignalVariable	The name of the Signal with the prefix 'm_' in lower case.
stmSignalName	The name of the Signal with spaces and asterixes removed.
stmSignalEnum	The name of the Signal with the prefix 'ENUM_', all upper case.
stmSignalFirstEvent	The name of the Event with the prefix 'ENUM_', all upper case.



stmSignalGuid	The GUID of the Signal.
stmEventVariable	The name of the Event with the prefix 'm_' in lower case.
stmEventName	The name of the Event with spaces and asterixes removed.
stmEventEnum	The name of the Event with the prefix 'ENUM_', all upper case.
StmEventGuid	The GUID of the Event.
stmIsSignalEvent	Is 'T' if the element is a SignalEvent.

## Context

Macro name	Description
stmContextName	The name of the Class with spaces and asterixes removed.
stmContextQualName	The qualified name of the Class for which code is being generated.
stmContextVariableName	
stmContextFileName	The output file name for the Class for which code is being generated.

## Writing Object Runstate to State Machine Initialization

Macro name	Description
stmContextVariableRunstateName	
stmContextVariableRunstateValue	
stmContextHasStatemachine	Is 'T' if the current context has one or more State Machines.
stmHasHistoryPattern	Is 'T' if the State Machine has a History Pattern.
stmHasTerminatePattern	Is 'T' if the State Machine has a Terminate Pattern.
stmHasDeferredEventPattern	Is 'T' if the State Machine has a Deferred Event Pattern.
stmHasSubmachinePattern	Is 'T' if the State Machine has a Submachine Pattern.

stmHasOrthogonalPattern	Is 'T' if the State Machine has an Orthogonal Pattern.
-------------------------	--

## State Machine

Macro name	Description
stmStatemachineName	The name of the State Machine with asterixes and spaces removed.
stmStatemachineEnum	The name of the State Machine plus 'ENUM_' plus the name of the State Machine in upper case.
stmStatemachineGuid	The GUID of the State Machine element.
stmStateCount	The number of State elements in the State Machine.
stmSubmachineInitialCount	The number of Initial elements in the Sub Machine State element.
stmStatemachineHasSubmachineState	Is 'T' if the State Machine has at least one Sub Machine State.
stmStatemachineInitialCount	The number of Initial elements in the State Machine.

## Region

stmRegionEnum	The name of the State Region plus 'ENUM_' plus the name of the State Region in upper case.
stmRegionFQName	The fully qualified name of the State Region.
stmRegionName	The name of the State Region with spaces and asterixes removed.
stmRegionVariable	The name of the State Region with the prefix 'm_' in lower case.
stmRegionFQVariable	The fully qualified name of the State Region with the prefix 'm_' in lower case.
stmRegionGuid	The GUID of the Region.
stmRegionInitial	
stmRegionIsOwnedByStateMachine	Is 'T' if the Region is owned by a State Machine.

## Transition

stmTransitionEnum	The name of the Transition with the prefix 'ENUM_', plus the name of the Transition in upper case.
stmTransitionGuid	The GUID of the Transition.
stmTransitionName	The name of the Transition with spaces and asterixes removed.
stmTransitionSourceGuid	The GUID of the Source element in the Transition.
stmTransitionTargetGuid	The GUID of the Target element in the Transition.
stmTransitionVariable	The name of the Transition with the prefix 'm_' in lower case.
stmTransitionSourceVariable	
stmTransitionTargetVariable	
stmTransitionFQVariable	
stmSourceVertexEnum	The name of the Transition's source vertex plus '_ENUM' plus the name of the Transition's source vertex in upper case.
stmTargetVertexEnum	The name of the Transition's target vertex plus '_ENUM' plus the name of the Transition's target vertex in upper case.
stmSourceIsInitial	Is 'T' if the Transition's source is an Initial.
stmSourceIsState	Is 'T' if the Transition's source is a State.
stmSourceIsEntryPoint	Is 'T' if the Transition's source is an Entry Point.
stmSourceIsExitPoint	Is 'T' if the Transition's source is an Exit Point.
stmSourceIsFork	Is 'T' if the Transition's source is a Fork.
stmSourceIsJoin	Is 'T' if the Transition's source is a Join element.
stmTargetIsFinalState	Is 'T' if the Transition's target is a Final State element.
stmTargetIsExitPoint	Is 'T' if the Transition's target is an Exit Point element.
stmTargetIsState	Is 'T' if the Transition's target is a State element.
stmTargetIsChoice	Is 'T' if the Transition's target is a Choice element.

stmTargetIsJunction	Is 'T' if the Transition's target is a Junction element.
stmTargetIsEntryPoint	Is 'T' if the Transition's target is an Entry Point element.
stmTargetIsConnectionPointReference	Is 'T' if the Transition's target is a Connection Point Reference element.
stmTargetIsFork	Is 'T' if the Transition's target is a Fork element.
stmTargetIsJoin	Is 'T' if the Transition's target is a Join element.
stmTransitionEffect	The Effect of the Transition.
stmTransitionGuard	The Guard of the Transition.
stmTransitionKind	The type or kind of the Transition.
stmTargetInitialTransition	
stmTargetIsSubmachineState	Is 'T' if the Transition's target is a Submachine State.
stmSourceStateEnum	The name of the Transition's source state with the prefix '_ENUM' in upper case.
stmTargetStateEnum	The name of the Transition's target state, with the prefix '_ENUM' in upper case.
stmTargetVertexFQName	The fully qualified name of the Transition's target vertex.
stmTargetIsDeepHistory	Is 'T' if the Transition's target is a Deep History State.
stmTargetIsShallowHistory	Is 'T' if the Transition's target is a Shallow History State.
stmTargetIsTerminate	Is 'T' if the Transition's target is a Terminate element.
stmParentIsStateMachine	Is 'T' if the vertex is an Entry Point or Exit Point, or if the container is a State Machine.
stmSourceParentStateEnum	
stmTargetParentStateEnum	
stmTargetSubmachineEnum	
stmTargetRegionIndex	
stmIsSelfTransition	Is 'T' if the Transition's source is the same as its target.
stmHistoryOwningRegionInitialTransition	

stmDefaultHistoryTransition	
-----------------------------	--

## Vertex and State

stmVertexName	The name of the Vertex.
stmStateName	The name of the State.
stmVertexGuid	The GUID of the Vertex.
stmVertexFQName	The fully qualified name of the Vertex.
stmStateFQName	The fully qualified name of the State.
stmVertexType	The type of the vertex; one of 'State', 'FinalState', 'Pseudostate', 'ConnectionPointReference' or '' (empty).
stmPseudostateKind	The kind of the Pseudostate; one of 'initial', 'deepHistory', 'shallowHistory', 'join', 'fork', 'junction', 'choice', 'entryPoint', 'exitPoint' or 'terminate'.
stmPseudostateName	The name of the Pseudostate.
stmPseudostateVariable	The name of the Pseudostate with the prefix 'm_' in lower case.
stmPseudostateStateMachineName	The name of the Pseudostate State Machine.
stmPseudostateStateMachineVariable	The name of the Pseudostate State Machine with the prefix 'm_' in lower case.
stmVertexVariable	The name of the Vertex with the prefix 'm_' in lower case.
stmVertexEnum	The name of the Vertex plus '_ENUM' plus the name of the Vertex in upper case.
stmStateEnum	The name of the State plus '_ENUM' plus the name of the State in upper case.
stmConnectionPointReferenceStateName	The name of the Connection Point Reference.
stmConnectionPointReferenceStateVariable	The name of the Connection Point Reference with the prefix 'm_' in lower case.
stmConnectionPointReferenceEntryCount	
stmParameterizedInitialCount	

stmInitialCountForTransition	
stmStateVariable	The name of the State with the prefix 'm_' in lower case.
stmStateEntryBehavior	The behavior defined for an 'entry' Action operation for a State (the text on the 'Behavior' tab for the 'entry' Action operation on the element's 'Operations' page).
stmStateEntryCode	The initial code defined for an 'entry' Action operation for a State (the text in the 'Initial Code' field on the 'Behavior' tab for the 'entry' Action operation on the element's 'Operations' page).
stmStateDoBehavior	The behavior defined for a 'do' Action operation for a State (the text on the 'Behavior' tab for the 'do' Action operation on the element's 'Operations' page).
stmStateDoCode	The initial code defined for a 'do' Action operation for a State (the text in the 'Initial Code' field on the 'Behavior' tab for the 'do' Action operation on the element's 'Operations' page).
stmStateExitBehavior	The behavior defined for an 'exit' Action operation for a State (the text on the 'Behavior' tab for the 'exit' Action operation on the element's 'Operations' page).
stmStateExitCode	The initial code defined for an 'exit' Action operation for a State (the text in the 'Initial Code' field on the 'Behavior' tab for the 'exit' Action operation on the element's 'Operations' page).
stmStateSubmachineName	The name of the Submachine.
stmStateSubmachineVariable	The name of the Submachine with the prefix 'm_' in lower case.
stmStateIsFinal	Is 'T' if the State is a FinalState.
stmStateIsSubmachineState	Is 'T' if the State is a Submachine State ('Properties' page   Advanced   'isSubmachineState' property).
stmSubMachineEnum	The name of the Submachine followed by '_ENUM' plus the name of Submachine in upper case.
stmStateHasChildrenToJoin	
stmStateIsTransitionTarget	
stmThisIsSource	
stmThisIsSourceState	
stmStateParentIsSubmachine	Is 'T' if the State's container is a State Machine.
stmStateContainerMatchTransitionContainer	

stmVertexRegionIndex	
stmStateRegionCount	The number of regions in the State.
stmStateInitialCount	The number of Initial elements in the State Machine.
stmVertexContainerVariable	
stmVertexParentEnum	
stmStateHasUnGuardedCompletionTransition	
stmStateEventHasUnGuardedTransition	
stmInitialTransition	

## Instance Association

Macro name	Description
stmSourceInstanceName	
stmTargetInstanceName	
stmSourceRoleName	
stmTargetRoleName	

## EASL Code Generation Macros

Enterprise Architect provides a number of Enterprise Architect Simulation Library (EASL) code generation macros to generate code from behavioral models. These are:

- EASL\_INIT
- EASL\_GET
- EASLList and
- EASL\_END

### EASL\_INIT

The EASL\_INIT macro is used to initialize an EASL behavior model. The behavior model code generation is dependent on this model.

Aspect	Description
Syntax	<pre>%EASL_INIT(&lt;&lt;GUID&gt;&gt;)%</pre> <p>where:</p> <ul style="list-style-type: none"> <li>• &lt;&lt;GUID&gt;&gt; is the GUID of the Object (usually a Class element) that is the owner of the behavior model</li> </ul>

### EASL\_GET

The EASL\_GET macro is used to retrieve a property or a collection of an EASL object. The EASL objects and the properties and collections for each object are identified in the *EASL Collections* and *EASL Properties* topics.

Aspect	Description
Syntax	<pre>\$result = %EASL_GET(&lt;&lt;Property&gt;&gt;, &lt;&lt;Owner ID&gt;&gt;, &lt;&lt;Name&gt;&gt;)%</pre> <p>where:</p> <ul style="list-style-type: none"> <li>• &lt;&lt;Property&gt;&gt; is one of "Property", "Collection", "At", "Count", or "IndexOf"</li> <li>• &lt;&lt;OwnerID&gt;&gt; is the ID of the owner object for which the property/collection is to be retrieved</li> <li>• &lt;&lt;Name&gt;&gt; is the name of the property or Collection being accessed</li> <li>• \$result is the returned value; this is "" if not a valid property</li> </ul> <p>If &lt;&lt;Property&gt;&gt; is:</p> <ul style="list-style-type: none"> <li>• "At", then &lt;&lt;OwnerID&gt;&gt; is the ID of a collection and &lt;&lt;Name&gt;&gt; is the index into the collection for which the item is to be retrieved</li> <li>• "Count", then &lt;&lt;Owner ID&gt;&gt; is the ID of a collection and &lt;&lt;Name&gt;&gt; is not used; it will retrieve the item number in the collection</li> <li>• "IndexOf", then &lt;&lt;Owner ID&gt;&gt; is the ID of a collection and &lt;&lt;Name&gt;&gt; is the ID of the item in the collection; it will retrieve the index (string format) of the item within the collection</li> </ul>
Example	<pre>\$sPropName = %EASL_GET("Property", \$context, "Name")%</pre>



## EASLList

The EASLList macro is used to render each object in an EASL collection using the appropriate template.

Aspect	Description
Syntax	<pre>\$result = %EASLList=&lt;&lt;TemplateName&gt;&gt; @separator=&lt;&lt;Separator&gt;&gt;     @indent=&lt;&lt;indent&gt;&gt; @owner=&lt;&lt;OwnedID&gt;&gt;     @collection=&lt;&lt;CollectionName&gt;&gt; @option1=&lt;&lt;OPTION1&gt;&gt;     @option2=&lt;&lt;OPTION2&gt;&gt;..... @optionN=&lt;&lt;OPTIONN&gt;&gt;%</pre> <p>where:</p> <ul style="list-style-type: none"> <li>• &lt;&lt;TemplateName&gt;&gt; is the name of any behavioral model template or custom template</li> <li>• &lt;&lt;Separator&gt;&gt; is a list separator (such as “\n”)</li> <li>• &lt;&lt;indent&gt;&gt; is any indentation to be applied to the result</li> <li>• &lt;&lt;OwnedID&gt;&gt; is the ID of the object that contains the required collection</li> <li>• &lt;&lt;CollectionName&gt;&gt; is the name of the required collection</li> <li>• &lt;&lt;OPTION1&gt;...&lt;&lt;OPTION99&gt;&gt; are miscellaneous options that might be passed on the template; each option is given as an additional input parameter to the template</li> <li>• \$result is the resultant value; this is “” if not a valid collection</li> </ul>
Example	<pre>\$sStates = %EASLList="State" @separator="\n" @indent="\t" @owner=\$StateMachineGUID @collection="States" @option=\$sOption%</pre>

## EASL\_END

The EASL\_END macro is used to release the EASL behavior model.

Aspect	Description
Syntax	%EASL_END%

## Behavioral Model Templates

- Action
- Action Assignment
- Action Break
- Action Call
- Action Create
- Action Destroy
- Action If

- Action Loop
- Action Opaque
- Action Parallel
- Action RaiseEvent
- Action RaiseException
- Action Switch
- Behavior
- Behavior Body
- Behavior Declaration
- Behavior Parameter
- Call Argument
- Decision Action
- Decision Condition
- Decision Logic
- **Decision Table**
- Guard
- Property Declaration
- Property Notes
- Property Object
- State
- State CallBack
- State Enumerate
- State EnumeratedName
- StateMachine
- StateMachine HistoryVar
- Transition
- Transition Effect
- Trigger

## EASL Collections

This topic lists the EASL collections for each of the EASL objects, as retrieved by the [EASL Code Generation Macros](#) code generation macro.

### Action

Collection Name	Description
Arguments	The Action's arguments.
SubActions	The sub-actions of the Action.

### Behavior

Collection Name	Description
Actions	The Behavior's Actions.
Nodes	The Behavior's nodes.
Parameters	The Behavior's parameters.
Variables	The Behavior's variables.

### Classifier

Collection Name	Description
AllStateMachines	All State Machines for the Classifier.
AsynchProperties	The asynchronous properties of the Classifier.
AsynchTriggers	The asynchronous triggers of the Classifier.
Behaviors	The behaviors of the Classifier.
Properties	The properties of the Classifier.
TimedProperties	The timed properties of the Classifier.
TimedTriggers	The timed triggers of the Classifier.

Triggers	All triggers of the Classifier.
----------	---------------------------------

## Construct

Collection Name	Description
AllChildren	The Construct's children.
ClientDependencies	The client dependencies on the Construct.
StereoTypes	The stereotypes of the Construct.
SupplierDependencies	The supplier dependencies on the Construct.

## Node

Collection Name	Description
IncomingEdges	The Node's incoming edges.
OutgoingEdges	The Node's outgoing edges.
SubNodes	The sub-nodes of the Node.

## State

Collection Name	Description
DoBehaviors	The State's Do behaviors.
EntryBehaviors	The State's Entry behaviors.
ExitBehaviors	The State's Exit behaviors.

## StateMachine

Collection Name	Description
AllFinalStates	The State Machine's final States.

AllStates	All States within the State Machine, including those within Submachine States.
DerivedTransitions	The State Machine's derived transitions with the associated valid effect.
States	The States within the State Machine.
Transitions	The transitions within the State Machine.
Vertices	The State Machine's vertices.

## Transition

Collection Name	Description
Effects	The Transition's effects.
Guards	The Transition's guards.
Triggers	The Transition's triggers.

## Trigger

Collection Name	Description
TriggeredTransitions	The triggered transitions associated with the Trigger.

## Vertex

Collection Name	Description
DerivedOutgoingTransitions	The Vertex's derived outgoing transitions after traversing the pseudo-nodes.
IncomingTransitions	The Vertex's incoming transitions.
OutgoingTransitions	The Vertex's outgoing transitions.

## EASL Properties

This topic lists the EASL properties for each of the EASL objects, as retrieved by the [EASL Code Generation Macros](#) code generation macro.

### Action

Property Name	Description
Behavior	The Action's associated behavior (Call Behavior Action or Call Operation Action).
Body	The Action's body.
Context	The Action's context.
Guard	The Action's guard.
IsFinal	A check on whether the action is a final Action.
IsGuarded	A check on whether the action is a guarded Action.
IsInitial	A check on whether the action is an initial Action.
Kind	The Action's kind.
Next	The Action's next action.
Node	The Action's associated node in the graph.

### Argument

Property Name	Description
Parameter	The ID of the Argument's associated parameter.
Value	The default value of the argument.

### Behavior

Property Name	Description
InitialAction	The Behavior's initial action.

isReadOnly	The isReadOnly of the Behavior.
isSingleExecution	The isSingleExecution of the Behavior.
Kind	The kind of Behavior.
ReturnType	The return type of the Behavior.
Specification	The specification of the Behavior.

## CallEvent

Property Name	Description
Operation	The operation of the CallEvent.

## ChangeEvent

Property Name	Description
ChangeExpression	The change expression of the ChangeEvent.

## Classifier

Property Name	Description
HasBehaviors	A check on whether the Classifier has behavioral models (Activity and Interaction).
Language	The Classifier's language.
StateMachine	The State Machine of the Classifier.

## Condition

Property Name	Description
Expression	The Condition's expression.
Lower	The Condition's lower value.

Upper	The Condition's upper value.
-------	------------------------------

## Construct

Property Name	Description
GetTaggedValue	The Property's <b>Tagged Value</b> .
IsStereotypeApplied	A check on whether a particular stereotype is applied to the Property.
Notes	Notes on the Property.
UMLType	The UML type of the Property.
Visibility	The visibility of the Property.

## Edge

Property Name	Description
From	The ID of the node from which the Edge arises.
To	The ID of the node at which the Edge is targeted.

## EventObject

Property Name	Description
EventKind	The event kind of the Event Object.

## Instance

Property Name	Description
Classifier	The classifier of the Instance.
Value	The value of the Instance.



## Parameter

Property Name	Description
Direction	The direction of the Parameter.
Type	The type of the Parameter.
Value	The value of the parameter.

## Primitive

Property Name	Description
FQName	The FQ name of the Primitive.
ID	The ID of the Primitive.
Name	The name of the Primitive.
ObjectType	The object type of the Primitive.
Parent	The IDParent of the Primitive.

## PropertyObject

Property Name	Description
BoundSize	The bound size of the PropertyObject (if it is a collection).
ClassifierStereoType	The stereotype of the PropertyObject's classifier.
IsAsynchProp	A check on whether the PropertyObject is an asynchronous property.
IsCollection	A check on whether the PropertyObject is a collection.
IsOrdered	A check on whether the PropertyObject is ordered (if it is a collection).
IsTimedProp	A check on whether the PropertyObject is a timed property.
Kind	The PropertyObject's kind.

LowerValue	The PropertyObject's lower value (if it is a collection).
Type	The PropertyObject's type.
UpperValue	The PropertyObject's upper value (if it is a collection).
Value	The PropertyObject's value.

## SignalEvent

Property Name	Description
Signal	The signal of the SignalEvent.

## State

Property Name	Description
HasSubMachine	A check on whether the State is a Submachine state.
IsFinalState	A check on whether the State is a final state.
SubMachine	Get the ID of the Submachine contained by the State (if applicable).

## StateMachine

Property Name	Description
HasSubMachineState	A check on whether the State Machine has a Submachine state.
InitialState	The State Machine's initial state.
SubMachineState	The State Machine's Submachine state.

## TimeEvent

Property Name	Description
When	The 'when' property of the TimeEvent.

## Transition

Property Name	Description
HasEffect	A check on whether the transition has a valid effect.
IsDerived	A check on whether the transition is a derived transition.
IsTranscend	A check on whether the transition transcends from one State Machine (Submachine state) to another.
IsTriggered	A check on whether the transition is triggered.
Source	The Transition's source.
Target	The Transition's target.

## Trigger

Property Name	Description
AsynchDestinationState	The asynchronous destination state of the Trigger (if it is an asynchronous trigger).
DependentProperty	The ID of the property associated with the Trigger.
Event	The Trigger's event.
Name	The Trigger's name.
Type	The Trigger's type.

## Vertex

Property Name	Description
IsHistory	A check on whether the vertex is a history state.
IsPseudoState	A check on whether the vertex is a pseudo state.
PseudoStateKind	The Vertex's pseudo-state kind.



## Call Templates From Templates

Using function calls with parameters, you can call templates from other templates, whether standard templates or user-defined templates created within your project. Also, called templates can return a value, and can be called recursively.

### Examples

A call statement returning a parameter to a variable:

```
$Source = %StateEnumeratedName($Source)%
```

A call statement to a template that has parameters:

```
%RuleTask($GUID, $index)%
```

Using the \$parameter statement in the called template:

```
$GUID = $parameter1
```

```
$index = $parameter2
```

Templates support recursive calls, such as this recursive call on the template RuleTask:

```
$GUID = $parameter1
```

```
$index = $parameter2
```

```
% PI = "" %
```

```
$nul = "Initialize condition and action object"
```

```
$count = %BR_GET("RuleCount")%
```

```
% if $count == "" or $count == $index %
```

```
%ComputeRulelet($GUID)%
```

```
\n
```

```
% endTemplate %
```

```
%Rulelet($index)%
```

```
\n
```

```
$index = %MATH_ADD($index, "1")%
```

```
%RuleTask($GUID, $index)%
```

# The Code Template Editor in MDG Development

These topics describe how you use the **Code Template Editor** window to create custom templates:

- [Create Custom Templates](#)
- [Customize Base Templates](#)
- [Add New Stereotyped Templates](#)

The Code Template Editor provides the facilities of the Common Code Editor, including Intelli-sense for the code generation template macros. For more information on Intelli-sense and the Common Code Editor, see the *Editing Source Code* topic.

# Create Custom Templates

Enterprise Architect provides a wide range of templates that define how code elements are generated. If these are not sufficient for your purposes - for example, if you want to generate code in a language not currently supported by Enterprise Architect - you can create completely new custom templates. You can also add stereotype overrides to your custom templates; for example, you might list all of your parameters and their notes in your method notes.

## Access

Ribbon	Code > Source Code > Configure > <b>Code Template Editor</b> Design > Tools > Transform > Transform Templates
Menu	Package   Code Engineering   Code Generation Templates Package   Model Transformation (MDA)   MDA Transformation Templates
Keyboard Shortcuts	<b>Ctrl + Shift + P</b> (code generation templates) <b>Ctrl + Alt + H</b> (MDA transformation templates)

## Create custom templates using the Code Templates Editor

Step	Description
1	In the 'Language' field, click on the drop-down arrow and select the appropriate programming language.
2	Click on the <b>Add New Custom Template button</b> . The 'Create New Custom Template' dialog displays.
3	In the 'Template Type' field, click on the drop-down arrow and select the appropriate modeling object. The '<None>' option requires special treatment; it enables the definition of a function macro that doesn't actually apply to any of the types, but must be called as a function to define variables \$parameter1, \$parameter2 and so on for each value passed in.
4	In the 'Template Name' field, type an appropriate name. Click on the <b>OK button</b> .
5	On the 'Code Templates Editor' tab, the new template is included in the 'Templates' list, with the value 'Yes' in the 'Modified' field. The template is called <Template Type>__<Template Name>. Note the double underscore character between the template type and template name.
6	Select the template from the Templates list and edit the contents in the Template field to meet your requirements.
7	Click on the <b>Save button</b> . This stores the new template, which is now available from the list of templates for use. You can also add a

	stereotype override to the template, if you wish.
--	---

## Notes

- For a custom language, you must define the File template so that it can call the Import Section, Namespace and Class templates, and any other templates that you decide are applicable



## Customize Base Templates

Enterprise Architect provides a wide range of templates that define how code elements are generated. If you want to change the way a code element is generated, you can customize the appropriate templates. Your changes might be to the effect of the template itself, or to its calls to other templates. You can also add stereotype overrides to your customized templates; for example, you might list all of your parameters and their notes in your method notes.

When you customize a system-provided (base) template, you effectively create a copy of the template that is used in preference to the original. All subsequent changes are to that copy, and the original base template is hidden. If you subsequently delete the copy it can no longer override the original, which is then brought into use again.

### Access

Ribbon	Code > Source Code > Configure > <b>Code Template Editor</b>
Menu	Package   Code Engineering   Code Generation Templates
Keyboard Shortcuts	<b>Ctrl + Shift + P</b>

### Customize a base template

Step	Description
1	On the <b>Code Template Editor</b> , in the 'Language' field, click on the drop-down arrow and select the programming language for which you want to customize the base templates.
2	In the Templates list, click on the base template to edit.
3	Update the template.
4	Click on the <b>Save button</b> to store your changes.
5	Repeat steps 2 to 4 for each of the relevant base templates you want to customize.
6	If you wish, add one or more stereotype overrides to any of the templates.

## Add New Stereotyped Templates

Sometimes it is useful to define a specific code generation template for use with elements of a given stereotype. This enables different code to be generated for elements, depending on their stereotype. Enterprise Architect provides some default templates, which have been specialized for commonly used stereotypes in supported languages. For example, the 'Operation Body' template for C# has been specialized for the property stereotype, so that it automatically generates its constituent 'get' and 'set' methods. You can override the default stereotyped templates as described in the *Override Default Templates* topic. Additionally, you can define templates for your own stereotypes, as described here.

### Access

Ribbon	Code > Source Code > Configure > <b>Code Template Editor</b>
Menu	Package   Code Engineering   Code Generation Templates
Keyboard Shortcuts	<b>Ctrl + Shift + P</b>

### Add a new stereotyped template using the Code Template Editor

Step	Description
1	Select the appropriate language, from the Language list.
2	Select one of the base templates, from the Templates list.
3	Click on the 'Add New Stereotyped Override' button. The 'New Template Override' dialog displays.
4	Select the required Feature and/or Class stereotype. Click on the <b>OK button</b> .
5	The new stereotyped template override displays in Stereotype Overrides list, marked as modified.
6	Make the required modifications in the Code Templates Editor.
7	Click on the <b>Save button</b> to store the new stereotyped template in the project file. Enterprise Architect can now use the stereotyped template, when generating code for elements of that stereotype.

### Notes

- Class and feature stereotypes can be combined to provide a further level of specialization for features; for example, if properties should be generated differently when the Class has a stereotype MyStereotype, then both property and

MyStereotype should be specified in the New Template Override dialog

# Override Default Templates

Enterprise Architect has a set of built-in or default code generation templates. The Code Templates Editor enables you to modify these default templates, hence customizing the way in which Enterprise Architect generates code. You can choose to modify any or all of the base templates to achieve your required coding style.

Any templates that you have overridden are stored in the project file. When generating code, Enterprise Architect first checks whether a template has been modified and if so, uses that template. Otherwise the appropriate default template is used.

## Access

Ribbon	Code > Source Code > Configure > <b>Code Template Editor</b>
Menu	Package   Code Engineering   Code Generation Templates
Keyboard Shortcuts	<b>Ctrl + Shift + P</b>

## Reference

Override a default code generation template using the Code Templates Editor.

When generating code, Enterprise Architect now uses the overriding template instead of the default template.

Field/Button	Description
Language	Select the appropriate language from the list.
Templates	Select one of the base templates from the list.
Stereotype Overrides	If the base template has stereotyped overrides, you can select one of these from the list.
<Other fields>	Make any other modifications required.
Save	Click on this button to store the modified version of the template to the project file. The template is marked as modified.

# Grammar Framework

Enterprise Architect provides reverse engineering support for a number of popular programming languages. However, if the language you are using is not supported, you can write your own grammar for it, using the in-built Grammar Editor. You can then incorporate the grammar into an MDG technology to provide both reverse engineering and code synchronization support for your target language.

The framework for writing a grammar and importing it into Enterprise Architect is the direct complement to the **Code Template Framework**. While code templates are for converting a model to a textual form, grammars are required to convert text to a model. Both are required to synchronize changes into your source files.

An example language source file and an example Grammar for that language are provided in the Code Samples directory, which you can access from your installation directory (the default location is C:\Program Files\Sparx Systems\EA). Two other grammar files are also provided, illustrating specific aspects of developing Grammars.

## Components

Component	Description
Grammar Syntax	<p>Grammars define how a text is to be broken up into a structure, which is necessary when you are converting code into a UML representation. At the simplest level, a grammar is instructions for breaking up an input to form a structure.</p> <p>Enterprise Architect uses a variation of Backus–Naur Form (nBNF) to include processing instructions, the execution of which returns structured information from the parsed results in the form of an Abstract Syntax Tree (AST), which is used to generate a UML representation.</p>
Grammar Editor	<p>The Grammar Editor is an in-built editor that you can use to open, edit, validate and save grammar files.</p>
Grammar Debugging	<p>You can debug the grammar files you create using two facilities:</p> <ul style="list-style-type: none"><li>• The Parser, which generates the AST for the Grammar</li><li>• The <b>Profiler</b>, which also parses the Grammar and generates the AST but which exposes the <b>Profiling</b> pathway to show exactly what happened at each step of the process</li></ul>

# Grammar Syntax

Grammars define how a text is to be broken up into a structure, which is exactly what is needed when you are converting code into a UML representation. At the simplest level, a grammar is just instructions for breaking up an input to form a structure. Enterprise Architect uses a variation of Backus–Naur Form (BNF) to express a grammar in a way that allows it to convert the text to a UML representation. What the grammar from Enterprise Architect offers over a pure BNF is the addition of processing instructions, which allow structured information to be returned from the parsed results in the form of an Abstract Syntax Tree (AST). At the completion of the AST, Enterprise Architect will process it to produce a UML model.

## Syntax

Syntax	Detail
Comments	<p>Comments have the same form as in many programming languages.</p> <p>// You can comment to the end of a line by adding two /s.</p> <p>/* You can comment multiple lines by adding a / followed by a *.</p> <p>The comment is ended when you add a * followed by a /. */</p>
Instructions	<p>Instructions specify the key details of how the grammar works. They are generally included at the top of the grammar, and resemble function calls in most programming languages.</p>
Rules	<p>Rules make up the body of a grammar. A rule may have one or more definitions separated by pipe delimiters ( ).</p> <p>For a rule to pass, any single complete definition must pass. Rules are terminated with the semi-colon character (;).</p>
Definitions	<p>A definition is one of the paths a rule can take. Each definition is made up of one or more terms.</p>
Definition Lists	<p>A definition list corresponds to one or more sets of terms. These will be evaluated in order until one succeeds. If none succeed then the containing rule fails. Each pair of definitions is separated by a   character.</p> <p>This is a simple rule with three definitions:</p> <pre>&lt;greeting&gt; ::= "hello"   "hi"   ["good"] "morning";</pre>
Terms	<p>A term can be a reference to a rule, a specific value, a range of values, a sub-rule or a command.</p>
Commands	<p>Like instructions, commands resemble function calls. They serve two main purposes:</p> <ul style="list-style-type: none"><li>• To process tokens in a specific way or</li><li>• To provide a result to the caller</li></ul>

# Grammar Instructions

Instructions specify the key details of how the grammar works. They are generally included at the top of the grammar, and resemble function calls in most programming languages.

## Instructions

Instruction	Description
<code>caseSensitive()</code>	One of these two instructions is expected to specify if token matching needs to be case sensitive or not. For example, languages in the BASIC family are case insensitive while languages in the C family are case sensitive.
<code>caseInsensitive()</code>	
<code>delimiters(DelimiterRule: Expression)</code>	The delimiters instruction tells the lexical analyzer which rule to use for delimiter discovery. Delimiters are used during keyword analysis, and can be defined as the characters that may be used immediately before or after language keywords.
<code>lex(TokenRule: Expression)</code>	The lex instruction tells the lexical analyzer the name of the root rule to use for its analysis.
<code>parse(RootRule: Expression)</code> <code>parse(RootRule: Expression, SkipRule: Expression)</code>	The parse instruction tells the parser the name of the root rule to use for its processing. The optional second argument specifies a skip (or escape) rule which is generally used to handle comments.

# Grammar Rules

Rules are run to break up text into structure. A rule is made up of one or more definitions, each of which is made up of one or more terms.

## Types of Rule

Rule	Description
Named rules	A name, followed by a definition list. For example: <code>&lt;rule&gt; ::= &lt;term1&gt; &lt;term2&gt;   "-" &lt;term1&gt;;</code>
Inline Rules	Inside a definition, a rule defined within parentheses. These act in exactly the same way as if they were a named rule being called by a term. For example: <code>&lt;rule&gt; ::= (&lt;inline&gt;);</code>
Optional Rules	Inside a definition, a rule defined within square brackets. This rule succeeds even if the contents fail. For example: <code>&lt;rule&gt; ::= [&lt;inline&gt;];</code>
Repeating Rules	Inside a definition, a term followed by a plus sign. This rule matches the inner rule once or more than once. For example: <code>&lt;rule&gt; ::= &lt;inline&gt;+;</code> <code>rule ::= (&lt;term1&gt; &lt;term2&gt;)+;</code>
Optional Repeating Rules	Inside a definition, a rule followed by a star. This rule matches the inner rule zero or more times, meaning it succeeds even if the inner rule never succeeds. For example: <code>&lt;rule&gt; ::= &lt;inline&gt;*;</code> <code>rule ::= (&lt;term1&gt; &lt;term2&gt;)*;</code>



# Grammar Terms

Terms identify where tokens are consumed.

## Types of Term

Type	Description
Concrete terms	Quoted strings. e.g. "class"
Unicode characters	A lexer-only term, having the prefix of U+0x followed by a hexadecimal number. For example: U+0x1234
Ranges	A lexer-only term, matching any character between the two characters specified. e.g. "a".. "z"    or    U+0x1234..U+2345
References	The name of another rule, in angled brackets. The token will match if that rule succeeds. e.g. <anotherRule>
Commands	A call to a specific command.

# Grammar Commands

Commands, like Instructions, resemble function calls. They serve two main purposes:

- To process tokens in a specific way or
- To provide a result to the caller

## Commands

Command	Description
attribute(Name: String, Value: Expression)	Creates an attribute on the current AST node. The attribute will be created with the Name specified in the grammar source, and will be given the value of all tokens consumed as a part of executing the Value expression. This command produces the AST node attributes that Enterprise Architect operates on in code engineering.
attributeEx(Name: String) attributeEx(Name: String, Value: String)	Creates an attribute on the current AST node without consuming any tokens. The attribute will be created with the same name as is specified in the grammar source, and with either an empty value or the value specified by the optional Value argument. This command produces the AST node attributes that Enterprise Architect operates on in code engineering.
node(Name: String, Target: Expression)	Creates an AST node under the current AST node (the nodes that Enterprise Architect operates on in code engineering). The node will be created with the Name specified in the grammar source.
token(Target: Expression)	Creates a token during lexical analysis for processing during parsing. The value of the token will be the value of all characters consumed as a result of executing the Target expression.
keywords()	Matches any literal string used as a grammar term; that is, if you enter an explicit string that you are searching for, it becomes a key word.
skip(Target: Expression) skip(Target: Expression, Escape: Expression)	Consumes input data (characters when lexing, and tokens when parsing) until the 'Target' expression is matched. The optional 'Escape' expression can be used to handle instances such as escaped quotes within strings.
skipBalanced(Origin: Expression, Target: Expression) skipBalanced(Origin: Expression, Target: Expression, Escape: Expression)	Consumes input data (characters or tokens) until the 'Target' expression is matched and the nesting level reaches zero. If the 'Origin' expression is matched during this process, the nesting level is increased. If the 'Target' expression is matched, the nesting level is decreased. When the nesting level reaches zero, the command exits with success. An optional 'Escape' expression can be provided.
skipEOF()	Consumes all remaining data (characters or tokens) until the end of the file.
fail()	Causes the parser to fail the current rule, including any remaining definitions.

warning()	Inserts a warning into the resulting AST.
except(Target: Expression, Exception: Expression)	Consumes input data that matches the Target expression, but fail on data that matches the Exception expression. This operates somewhat similar to, but exactly the opposite of, the skip command.
preProcess(Target: Expression)	Evaluates an expression and uses that pre-processed data in multiple definitions. This is most useful within expression parsing, where the same left hand side expression will be evaluated against a number of operators. This command reduces the work the parser must do to make this happen.

## AST Nodes

In defining a grammar, you would use AST nodes and AST node attributes that can be recognized in code engineering in Enterprise Architect, in the AST results that are returned by the attribute, attributeEx and node commands. The nodes and attributes are identified in these tables. Any others will be ignored in code engineering.

### FILE Node

The FILE node represents a file. It isn't mapped to anything, but contains all the required information.

Multiplicity / Nodes	Description
0..* / PACKAGE	See <i>PACKAGE Node</i> .
0..* / CLASS	See <i>CLASS Node</i> .
0..* / IMPORT	
0..* / COMMENT	Field labels as part of a skip rule will be at the root level; the code generator looks for comments of this sort by position relative to the node.
0..1 / INSERT_POSITION	This gives the position where new Classes, Packages and method implementations can be inserted into the file. If it is not found, the code generator will automatically insert new items immediately after the last one is found in code.

### PACKAGE node

The PACKAGE node corresponds to a namespace or equivalent in the file. When importing with 'package per namespace', Enterprise Architect will create a Package directly under the import for this and place all Classes within it. When not importing namespaces, Enterprise Architect will look for Classes under this point, but it will do nothing with this node.

Additionally, if you are generating with namespaces enabled (see the *Code Options* topics for generic languages) a generated Class will not match a Class in code unless they are under the same Package structure.

Contained in nodes: FILE

Multiplicity / Nodes	Description
1 / NAME	See <i>NAME Node</i> .
0..* / CLASS	See <i>CLASS Node</i> .
0..* / PACKAGE	
0..1 / OPEN_POSITION	Gives the position where the Package body opens. This can also be used as an insert position.
0..1 / INSERT_POSITION	Gives the position where new Classes and Packages can be inserted into the file. If it is not found, the code generator will automatically insert new items immediately after the last one is found in code.

0..1 / SUPPRESS	Prevents indenting when inserting into this Package.
-----------------	--

## CLASS/INTERFACE Node

The CLASS (or INTERFACE) node is the most important in code generation. It is brought in as Class (or Interface) Objects.

See *Class DECLARATION* and *Class BODY*.

Contained in Nodes: FILE, PACKAGE, Class BODY

## CLASS Declaration

Contained in Nodes: CLASS/INTERFACE

Multiplicity / Nodes	Description
1 / NAME	See <i>NAME Node</i> .
0..* / PARENT	See <i>PARENT Node</i> .
0..* / TAG	See <i>TAG Node</i> .
0..1 / DESCRIPTION	See <i>DESCRIPTION Node</i> .
1 / NAME	The name of the Class. If there is a node NAME, that will overwrite this attribute.
0..1 / SCOPE	The UML Scope of the Class - Public, Private, Protected or Package.
0..1 / ABSTRACT	If present, indicates that this is an abstract Class.
0..1 / VERSION	The version of the Class.
0..1 / STEREOTYPE	The stereotype that Enterprise Architect should assign to the Class. This does not support multiple stereotypes.
0..1 / ISLEAF	
0..1 / MULTIPLICITY	
0..1 / LANGUAGE	Generally, you do not need to set this.
0..1 / NOTE	Generally not used as it is covered by the comments above the Class.
0..1 / ALIAS	
0..* / MACRO	Adds a numbered <b>Tagged Value</b> that Enterprise Architect can use to round trip macros.

## Class BODY Node

Contained in Nodes: CLASS/INTERFACE

Multiplicity / Nodes	Description
0..* / METHOD	See <i>METHOD Node</i> .
0..* / ATTRIBUTE	See <i>ATTRIBUTE Node</i> .
0..* / FIELD	See <i>FIELD Node</i> .
0..* / CLASS	See <i>CLASS Node</i> .
0..* / SCOPE	See <i>SCOPE Node</i> .
0..* / PROPERTY	
0..* / TAG	See <i>TAG Node</i> .
0..* / PARENT	See <i>PARENT Node</i> .
0..1 / OPEN_POSITION	Gives the position where the Class body opens. This can also be used as an insert position.
0..1 / INSERT_POSITION	Gives the position where new Class members can be inserted into the file. If it is not found, the code generator will automatically insert new items immediately after the last one is found in code.

## SCOPE Node

This is an optional feature for languages resembling C++ that have blocks that specify the scope of elements. The language needs to have a name specified that is used for the scope of all elements in the block. In all other respects it behaves identically to the Class BODY node.

Contained in Nodes: Class BODY

Multiplicity / Nodes	Description
1 / NAME	Used as the scope for all methods and attributes contained within the scope.

## METHOD Node

Contained in Nodes: Class BODY, SCOPE

Multiplicity / Nodes	Description

1 / Method DECLARATION	See <i>Method DECLARATION Node</i> .
---------------------------	--------------------------------------

## Method DECLARATION Node

Contained in Nodes: METHOD

Multiplicity / Nodes	Description
0..1 / TYPE	See <i>TYPE Node</i> .
0..* / PARAMETER	See <i>PARAMETER Node</i> .
0..* / TAG	See <i>TAG NODE</i> .
0..1 / DESCRIPTION	See <i>DESCRIPTION Node</i> .
0..1 / MULTI PARAMETER	Supports Delphi's parameter list style of declaration. This is the equivalent of FIELD.
1 / NAME	
0..1 / TYPE	
0..1 / SCOPE	
0..1 / ABSTRACT	
0..1 / STEREOTYPE	
0..1 / STATIC	
0..1 / CONST or CONSTANT	
0..1 / PURE	
0..1 / ISQUERY	
0..1 / ARRAY	
0..1 / SYNCHRONIZED	
0..* / MACRO	
0..1 / CSHARPIMPLEMENTS	Specifies special behavior for C#.
0..1 / BEHAVIOR	Provides support for Aspect J, using behavior.

0..1 / SHOWBEHAVIOR	Provides support for Aspect J, using behavior, and shows the reverse-engineered behavior on the diagram.
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## ATTRIBUTE Node

Contained in Nodes: Class BODY, SCOPE

Multiplicity / Nodes	Description
1 / TYPE	See <i>TYPE Node</i> .
0..* / TAG	See <i>TAG Node</i> .
0..1 / DESCRIPTION	See <i>DESCRIPTION Node</i> .
1 / NAME	
0..1 / TYPE	
0..1 / SCOPE	
0..1 / DEFAULT	
0..1 / CONTAINER or ARRAY	
0..1 / CONTAINMENT	Reference or value.
0..1 / STEREOTYPE	
0..1 / STATIC	
0..1 / CONST or CONSTANT	
0..1 / ORDERED	
0..1 / LOWBOUND	
0..1 / HIGHBOUND	
0..1 / TRANSIENT or VOLATILE	

## FIELD Node

A field corresponds to multiple attribute declarations in one. Anything not defined in the Declarators but defined in the field itself will be set for each declarator. Everything supported in an attribute is supported in the field. If no declarators



are found then this works in the same way as an attribute.

Contained in Nodes: Class BODY, SCOPE

Multiplicity / Nodes	Description
0..* / DECLARATOR	See <i>ATTRIBUTE Node</i> .

## PARAMETER Node

Contained in Nodes: Method DECLARATION, TEMPLATE

Multiplicity / Nodes	Description
1 / TYPE	See <i>TYPE Node</i> .
0..* / TAG	See <i>TAG Node</i> .
0..1 / DESCRIPTION	See <i>DESCRIPTION Node</i> .
0..1 / NAME	
0..1 / TYPE	
0..1 / KIND	Expected to be in, inout, out or return.
0..1 / DEFAULT	
0..1 / FIXED	
0..1 / ARRAY	

## NAME Node

Contained in Nodes: PACKAGE, Class DECLARATION

Multiplicity / Nodes	Description
1 / NAME	
0..* / QUALIFIER	
0..* / NAMEPART	An alternative to using NAME and QUALIFIER. A string of values, all except the last one taken as qualifiers. The last one is taken as the Name.

## TYPE Node

Contained in Nodes: Method DECLARATION, ATTRIBUTE, PARAMETER

Multiplicity / Nodes	Description
0..1 / TEMPLATE	The entire text of the template is the name of the type. Only used if NAME is undefined. See <i>TEMPLATE Node</i> .
1 / NAME	
0..* / QUALIFIER	
0..* / NAMEPART	An alternative to using NAME and QUALIFIER. A string of values, all except the last one taken as qualifiers. The last one is taken as the Name.

## TEMPLATE Node

Contained in Nodes: TYPE

Multiplicity / Nodes	Description
0..* / PARAMETER	See <i>PARAMETER Node</i> .
1 / NAME	

## PARENT Node

Contained in Nodes: Class DECLARATION

Multiplicity / Nodes	Description
0..1 / TYPE	Has the value Parent, Implements or VirtualP.
1 / NAME	
0..* / QUALIFIER	
0..* / NAMEPART	An alternative to using NAME and QUALIFIER. A string of values, all except the last one taken as qualifiers. The last one is taken as the Name.
0..1 / INSTANTIATION	

## TAG Node

Contained in Nodes: Class DECLARATION, Method DECLARATION, ATTRIBUTE, PARAMETER

Multiplicity / Nodes	Description
1 / NAME	
0..* / VALUE	
0..1 / MEMO	
0..1 / NOMEMO	
0..1 / GROUP	

## DESCRIPTION Node

Contained in Nodes: Class DECLARATION, Method DECLARATION, ATTRIBUTE, PARAMETER

Multiplicity / Nodes	Description
0..* / VALUE	

## Editing Grammars

If you need to write and edit a grammar for code imported in a new programming language, you can do so using the in-built Grammar Editor.

### Access

Ribbon	Code > Source Code > Configure > Language Grammar Editor
Menu	Tools   <b>Language Grammars</b>

### Create and Edit Grammar

Field/Button	Action
Open Grammar	Display a browser through which you can locate and open the file containing the grammar you want to edit.
Save	Save the current file.
Validate Grammar	The grammar validation will run a series of tests on the current grammar to ensure its validity. Errors and warnings will be displayed informing you of both errors that will make the grammar unusable, and conditions where you may get unexpected results.
Help	Display this Help topic.

### Context Menu Options

Field/Button	Action
Open File	Display a browser through which you can locate and open the file containing the grammar you want to edit.
Validate	The grammar validation will run a series of tests on the current grammar to ensure its validity. Errors and warnings will be displayed informing you of both errors that will make the grammar unusable, and conditions where you may get unexpected results.
Language	The Grammar Editor defaults to normal Backus–Naur Form (nBNF). The mBNF option is also available.
Line Numbers	Turn line numbers on or off in the grammar editor.



## Parsing AST Results

The Abstract Syntax Tree (AST) is the code that Enterprise Architect sees as it processes a grammar.

You parse the text in the bottom half of the **Grammar Editor window** and review what is displayed as a result. You can either open a file or paste text in. If you have pasted text that corresponds to something that cannot appear at the file level (such as Operation Parameters) you can select an alternative rule to use as a starting point. The parse will then commence from that rule.

### Access

Ribbon	Code > Source Code > Configure > Language Grammar Editor > Grammar <b>Debugger</b> > AST Results
Menu	Tools   <b>Language Grammars</b>   Grammar <b>Debugger</b>   AST Results

### Toolbar Options

Option	Action
Open File	Open a sample input file to test against.
Parse	Perform the parse operation. If the parse is successful, the 'AST Results' tab will contain the resulting AST.
Select Rule	This drop down allows you to select an alternative root rule for processing your sample source.
Help	Display this Help topic.

## Profiling Grammar Parsing

When you parse a grammar that you have created, it might show errors that you cannot immediately diagnose. To help you resolve such errors, you can review the process that the parser followed to generate the AST you can see, using the Grammar **Profiler**.

You again parse the text in the bottom half of the **Grammar Editor window**, but this time the tree shows each rule that the parser attempted, where it got to and if it passed or not. Rules for opening a file, pasting a file and setting the starting rule remain the same.

### Access

Ribbon	Code > Source Code > Configure > Language Grammar Editor > Grammar <b>Debugger</b> > <b>Profiler</b> Results
Menu	Tools   <b>Language Grammars</b>   Grammar <b>Debugger</b>   <b>Profiler</b> Results

### Toolbar Options

Option	Action
Open File	Display a browser through which you can locate and open the file containing the grammar you want to edit.
Parse	Perform the parse operation. If the parse is successful, the 'AST Results' tab will contain the resulting AST, and the 'Profile Results' tab will contain debug information regarding the path that the parser took through your grammar. The profile data is extremely useful when debugging a new grammar.
Select Rule	If you want to use a different root rule for processing your sample source, click on the drop-down arrow and select the alternative rule.
Help	Display this Help topic.

### Notes

- Because profiling can take a very long time for large files, the 'Profile Results' tab is not filled if you are not displaying that tab when you begin parsing

## Example Grammars

The Code Samples directory set up by the Enterprise Architect installer contains an example Grammar that you can load into the Grammar editor to review, and into the Grammar **Debugger** to parse and profile.

The Grammar example consists of two files:

- test.ssl - a simple sample language source file, in the style of C, and
- ssl.nbnf - a grammar for the simple sample language

The example illustrates:

- Tokenization (using the Lexer)
- Creation of a Package
- Creation of a Class or Interface
- Creation of an attribute
- Creation of an operation (with parameters)
- Importing comments

The Code Samples directory also contains two other Grammar files that you can examine:

- Expressions Sample.nBNF - this illustrates how expression parsing is set up and processed, with detailed comment text providing explanations
- CSV Sample.nBNF - an example grammar for processing CSV files



