StarUML 5.0 Developer Guide

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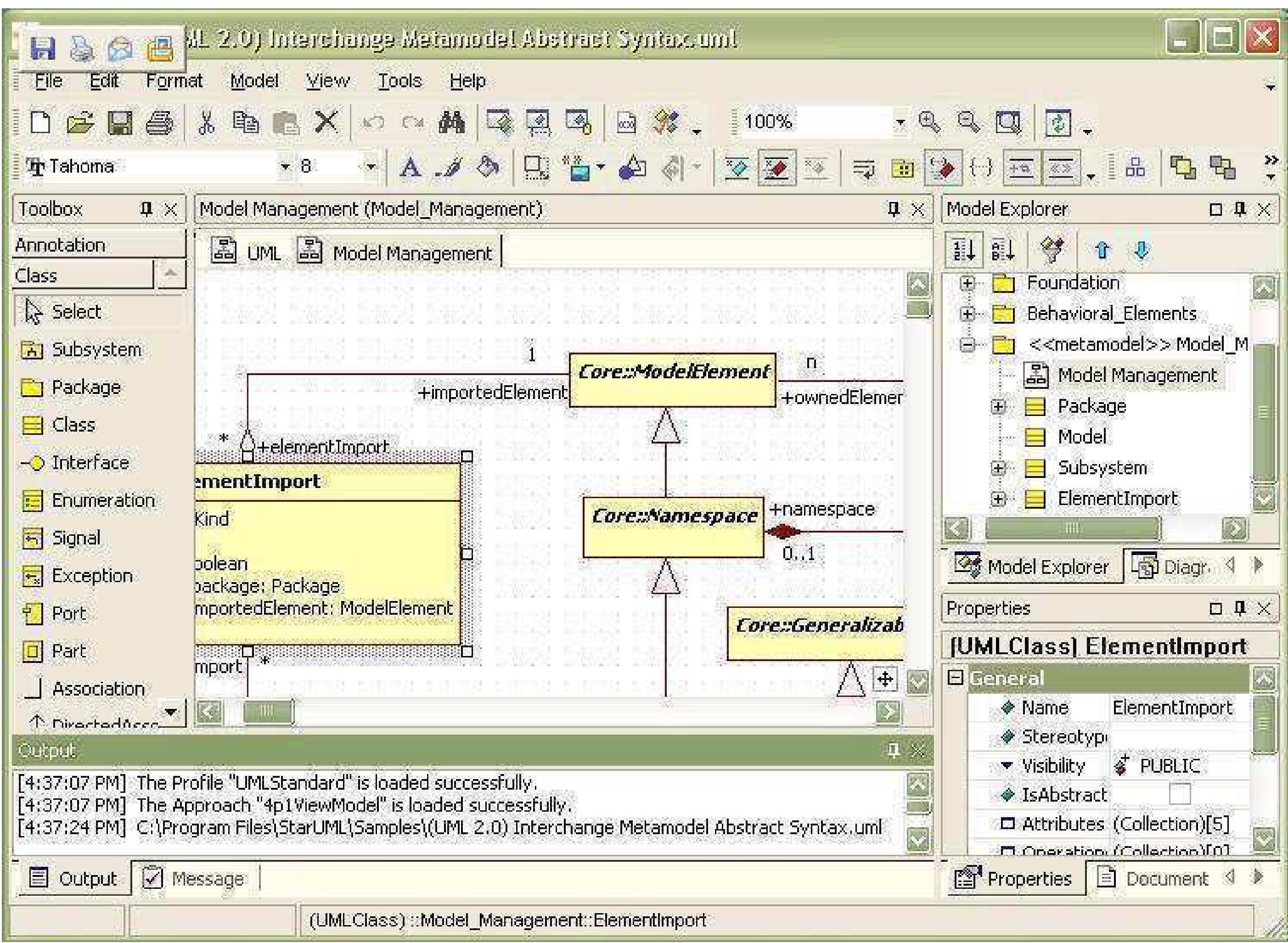
Chapter 1. Introduction

The StarUML™ Developer Guide
provides essential information for developers to use the extension mechanism of StarUML™, a UML-based software modeling platform, to develop StarUML™ Add-Ins.

StarUML OverView

StarUML™ is a software modeling platform which supports UML (Unified Modeling Language). It is based on UML version 1.4 and provides UML version 2.0 notations and eleven different types of diagram. It actively supports the MDA (Model Driven Architecture) approach by supporting the UML profile concept. StarUML™ is excellent in customizability to the user's environment and has a high extensibility in its functionality.



UML Tool which Adjusts to the User

StarUML™ provides maximum customization to the user's environment by offering customizing variables that can be applied in the user's software development methodology, project platform, and language.

True MDA Support

Software architecture is a critical process that can reach 10 years or more into the future. The intention of the OMG (Object Management Group) is to use MDA (Model Driven Architecture) technology to create platform independent models and allow automatic acquisition of platform dependent models or codes from platform independent models. StarUML™ complies truly with UML 1.4 standards and supports UML 2.0 notations. It provides the UML Profile concept, allowing creation of platform independent models. Users can easily obtain their end products with simple scripting through external COM interfaces or writing document template.

Excellent Extensibility and Flexibility

StarUML™ provides excellent extensibility and flexibility. It provides Add-In frameworks for extending the functionality of the tool. It is designed to allow access to all functions of the model/meta-model and tool through COM Automation, and it provides extension of menu and option items. Also, users can create their own approaches and frameworks according to their methodologies. The tool can also be integrated with any external tools.

Why UML/MDA Platform

StarUML™ is a Software Modeling Platform. Why do we need a modeling platform rather than just a UML tool?

- End users want customizable tools. Providing a variety of customizing variables to meet the requirements of the user environment can ensure high productivity and quality.
- No modeling tool provides a complete set of all possible functionalities. A good tool must allow future addition of functions to protect the user's investment costs in purchasing the tool.
- MDA (Model Driven Architecture) technology requires not only independent platforms but multi-platform functionality. Modeling tools confined to specific development environments are not suitable for MDA. The tool itself should become a modeling platform to provide functionality for various platform technologies and tools.
- Integration with other tools is vital for maximization of the tool's efficiency. The tool must provide a high level of extensibility, and allow integration with existing tools or user's legacy tools.

Chapter 2. StarUML Architecture

This chapter discusses the basic architecture of StarUML™. It mainly describes the structures of the platform architecture, Add-Ins, and external API.

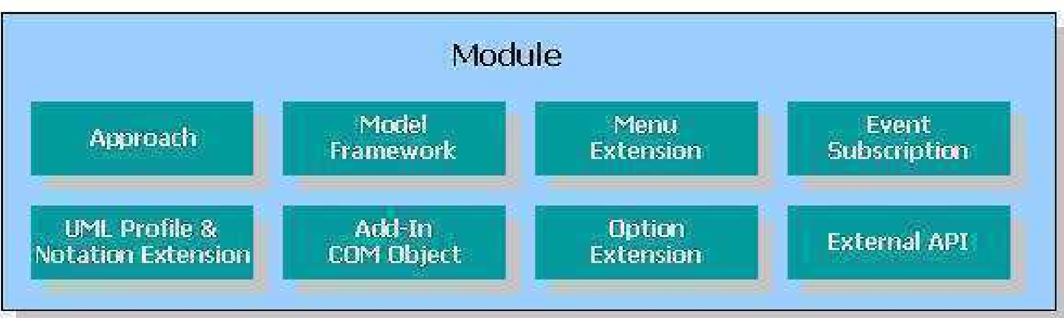
Platform Architecture

StarUML™ is an extensible software modeling platform; it does not just provide pre-defined functions but allows addition of new functions. The diagram below illustrates the architecture of StarUML™. Blue indicates the platform and green the extensible parts. The extensible parts can be developed by the user or a third party and then added to the platform for integration.

- **Approach**: Approach defines the model of the project and basic organization of the diagrams. For details on approach, see **"Chapter 5. Writing Approaches"**.
- **UML Profile & Notation Extension**
  : UML Profile allows extension of expression for the software model through the extension mechanism of UML. For details on UML profile, see **"Chapter 7. Writing UML Profiles" and "Chapter 10. Extending Notation"**
- **Model Framework**: Model Framework makes software models reusable and allows them to be used when defining other software models. For details on model framework, see **"Chapter 6. Writing Frameworks"**.
- **Add-In COM Object**: Add-In COM allows addition of new functionality to StarUML™. For details on Add-In COM objects, see **"Chapter 9. Writing Add-In COM Object"**.
- **Menu Extension**: The StarUML™ application menu (main menu and pop-up menu) can be added by the user. For details on menu extension, see **"Chapter 8. Extending Menu"**.
- **Option Extension**: The StarUML™ option items can be added by the user. For details on option extension, see **"Chapter 9. Writing Add-in COM Object"**.
- **Event Subscription**: Various events occurring in StarUML™ can be subscribed to. For details on subscribing to events, see **"Chapter 9. Writing Add-in COM Object"**.
- **External API**: The external API from StarUML™ allows access to various functionalities and information. Details on API are discussed throughout this developer guide, and the example included in StarUML™ installation **'StarUML Application Model.uml'** provides a good illustration. See **"Appendix A. Plastic Application Model."**

Organizing a Module

Module is a software package which allows addition of new functionalities and features by extending StarUML™. Module consists of various extension mechanisms of StarUML™. As illustrated in the diagram below, an Add-In package can consist of various approaches, various model frameworks, various UML profiles, various scripts, menu extensions, option extensions, help, and Add-In COM Objects.



Application of Modules

Modules can contain various elements, it can be developed for different purposes. Modules can be used for supporting specific processes, languages or platforms, integrating with other tools, or extending functions.

- **Support for Specific Processes**: UML Components, RUP, Catalysis, XP, ...
- **Support for Specific Programming Languages**: C/C++, Python, C#, Visual Basic, Java, Perl, Object Pascal, ...
- **Integration with Specific Tools**: Visual SourceSafe, CVS, MS Word, Eclipse, Visual Studio.NET, ...
- **Extension of Other Functionalities**: Traceability Manager, Design Patterns Support, Rule Checking, ...
- **Building Individual (or Enterprise) Specific Environment**

Elements of Module

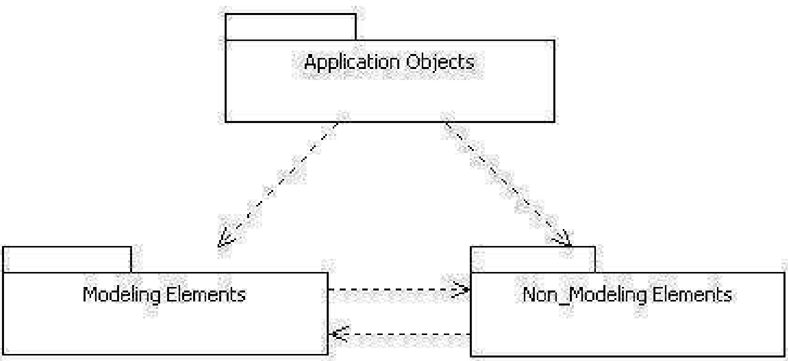
- **Approach**: Approach is applied in the beginning of the project to determine the initial model structure. For example, when making an Add-In for a specific process, approach can be used to pre-define the structure which manages the models produced at each stage of the process.
- **Model Framework**: When developing a module related to specific languages or platfoms, model framework can produce Class Library or Application Framework. Other basic services (e.g. Event, Transaction, Security, Directory, ...) can also be developed and added as models.
- **UML Profile**: UML Profile can be defined to extend expression of UML for specific processes, languages or frameworks, or to use additional properties. This has a global effect in the module.
- **Menu Extension**: Menu Extension is used to add most of the new functionality in Add-In, and to extend the main menu or pop-up menu to allow the user to select and run the functions. This is a critical element in Add-In development.
- **Option Extension**: Add-In itself can have various selection items. Utilizing them allows use of option dialogs in StarUML™ as option items.
- **Add-In COM Object**: Extensible functionalities can be created using languages and tools like Visual Basic, Delphi, Visual C++, and C#. In general, COM objects are used for additional GUI or complex functionalities, and Scripts are used for simple functionalities. This is usually programmed through external API.
- **Script**: Simple functionality extension can be done by using Scripting Languages (JScript, VBScript, Python, ...). This is usually programmed through external API.
- **Help**: Help for Add-In can be created as HTML and registered with local or remote path.

Open API Overview

StarUML™ provides a wide array of API (Application Programming Interface). The external API of StarUML™ is a standardized programming interface that allows use of the internal program functionalities from outside.

As illustrated in the diagram below, the external API of StarUML™ can be divided into three main parts: **Modeling Elements**, **Non_Modeling Elements** and **Application Objects**. The **Modeling Elements** part provides an interface for access to modeling elements, and the **Non_Modeling Elements** part provides an interface for MOF (Meta-Object Facility) and various elements other than modeling elements. The **Application Objects** part provides

(Meta-Object Facility) and various elements other than modeling elements. The **Application Objects** part provides various interfaces which manage the application itself.

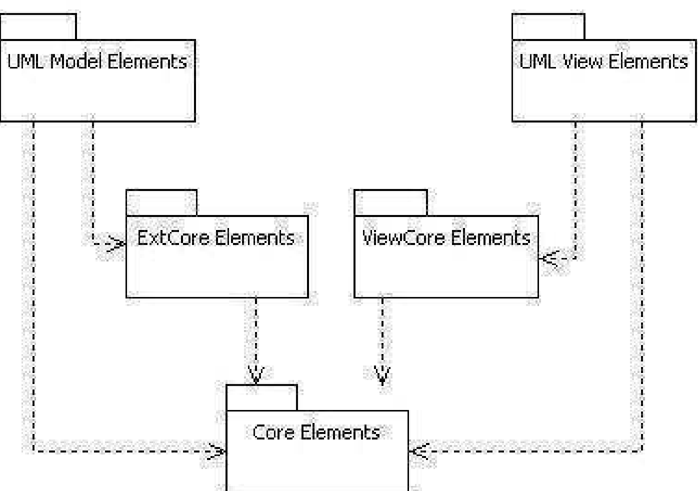


The Application Objects Part

The **Application Objects**
part includes interfaces which manage the application itself. The interfaces included in this part are **IStarUMLApplication** as the basic interface, **ISelectionManager** for managing element selection, **IUMLFactory** for creating elements, **IProjectManager** for managing projects, and interfaces related to events and GUI.

The Modeling Elements Part

The **Modeling Elements**
part includes interfaces for managing modeling elements. This part can be further divided into many parts. The **Core Elements** part defines the top interface of model, view, and diagram elements. The **ExtCore Elements** part includes interfaces for extensible model elements, and the **UML Model Elements** part defines the UML modeling elements based on the ExtCore Elements. The **ViewCore Elements** part includes interfaces for basic components of view elements, and the **UML View Elements**
part also defines the UML view elements based on the ViewCore Elements.



The Non_Modeling Elements Part

The **Non_Modeling Elements**
part includes interfaces for elements other than modeling elements. This part can be further divided into many parts: the **Extension Elements**
part which includes interfaces for elements related to the UML extension mechanism, the Document Elements part which manages StarUML™'s saved files, and the **Metamodeling Elements** part which manages meta-level elements.

Extension Elements

Document Elements

Metamodeling Elements

Chapter 3. HelloWord Example

This chapter briefly describes methods and processes of developing Add-In, using the "Hello, world" example.

"Hello, world" Example

The "Hello, world" example is the first and easiest example for learning any technique. In this chapter, we will use this example to learn about Add-Ins. The "Hello, world" example does not use all Add-In elements, but only the basic ones. It comprises the following elements.

- **One Menu Extension**
- **One Script**

This "Hello, world" example adds **[Hello, world!]**
to the menu, and adds a function to change the project title to "Helloworld" when the user selects the menu item.

Creating Script

First, use Jscript to create a script that changes the project title to "Helloworld." Use a text editor to enter the script source code as below and save it as **helloworld.js**.

```
var app = new ActiveXObject("StarUML.StarUMLApplication");

var prj = app.GetProject();

prj.Title = "Helloworld";
```

The first line of the script creates an object called StarUMLApplication. This object must be created as it provides the initial point for handling StarUML™. The second line acquires an object for the project, and the third line assigns the title of the project object acquired as "Helloworld."

Creating Menu Extension File

A menu extension file (.mnu) must be created in order to extend the StarUML™ menu. In this example, we will add **[Hello, world!]** under the menu item **[Tools]**.

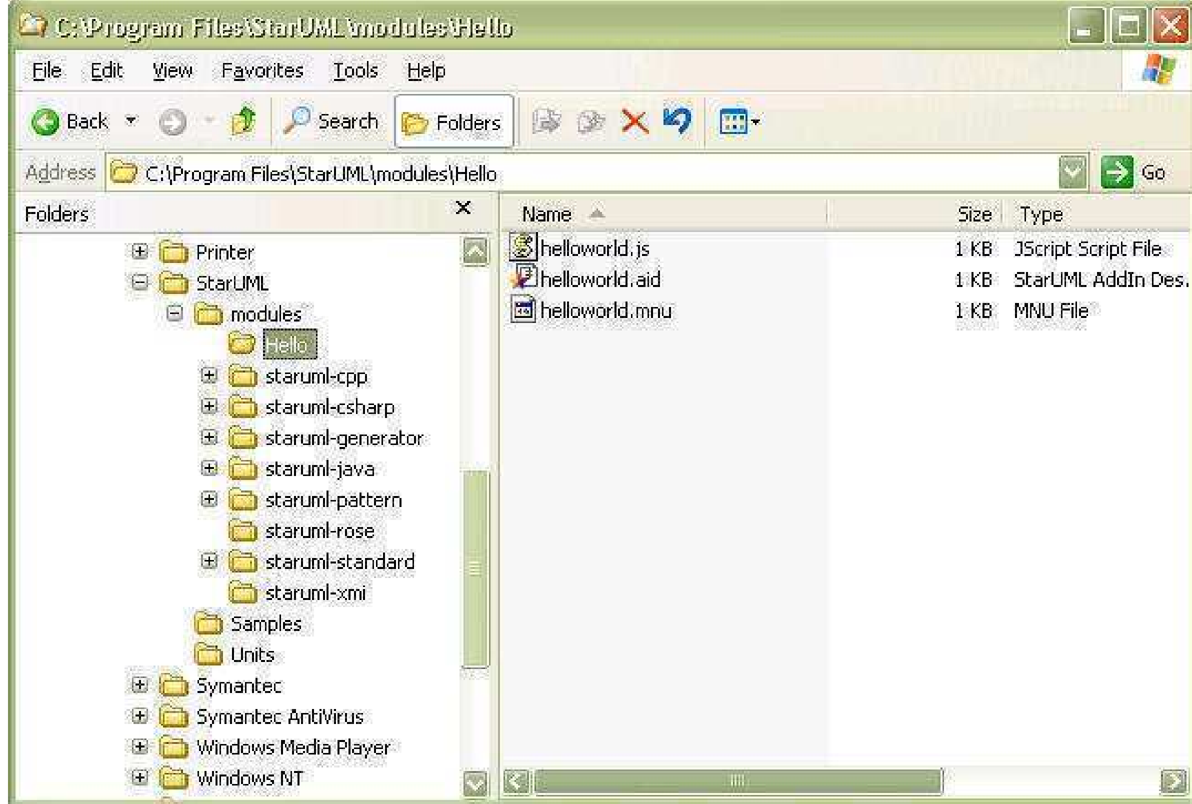
```
<?xml version="1.0"?>
<ADDINMENU addInID="StarUML.HelloworldAddIn">
    <BODY>
        <MAINMENU>
            <MAINITEM base="TOOLS" caption="Hello, world!" availableWhen="PROJECT_OPENED"
                script="helloworld.js"/>
        </MAINMENU>
    </BODY>
</ADDINMENU>
```

A menu extension file starts with the <ADDINMENU> tag and consists of <HEADER> and <BODY>. The <HEADER> section may be omitted, and the <BODY> section contains the information for menu extension. In this example, the <MAINITEM> element is added under the <MAINMENU> item for extending the main menu. For the <MAINITEM> element, the 'base' attribute is the location of the menu item to be added, 'caption' is the menu item name, 'availableWhen' is the condition for activating the menu, and 'script' is the script to execute when the menu item is selected.

Note: For details on menu extension, see "**Chapter 8. Extending Menu**".

Add-In Deployment

The script file (helloworld.js) and menu extension file (helloworld.mnu) must be placed in the same directory. Under the installation directory of StarUML™, there is a directory called "modules." Make a subdirectory called "HelloworldAddIn" under this directory and place the two files in it.



Add-In Registration

If you deployed the Add-In files properly, you must write Add-In description file so as to recognize the Add-In to StarUML. Add-In Description file is a XML document file which extension file name is '.aid'. It contains overall information about the Add-In that is a name of Add-In, COM object name, file name of executable module, menu extension file name, help url, and so on. For details on Add-In Description file, see **"Chapter 9. Writing Add-in COM Object"**.

The following is Add-In Description file of HelloWord example.

```
<?xml version="1.0" encoding="UTF-8"?>
    <ADDIN>
    <NAME>Helloworld AddIn</NAME>
    <DISPLAYNAME>Helloworld Sample</DISPLAYNAME>
    <COMPANY>Plastic Software, Inc.</COMPANY>
    <COPYRIGHT>Copyright 2005 Plastic Software, Inc. All rights reserved.</COPYRIGHT>
    <HELPFILE>http://www.staruml.com</HELPFILE>
    <ICONFILE>Helloworld.ico</ICONFILE>
    <ISACTIVE>True</ISACTIVE>
    <MENUFILE>helloworld.mnu</MENUFILE>
    <VERSION>1.0.1.35</VERSION>
</ADDIN>
```

Save the Add-In description file in the directory that Add-In is deployed.

Verification and Excution of Added Add-In

If the steps above have been performed properly, the "Hello, world" Add-In should have been added to StarUML™. Start StarUML™ and select **[Tools]** → **[Add-In Manager]** to check whether the Add-In has been added correctly.

If the installation was successful, it can be verified that **[Hello, world!]** has been added under the **[Tools]** menu. When this menu is selected, the file **helloworld.js** will be executed to change the project title to "Helloworld."

Chapter 4. Using Open API

StarUML™ supports COM automation and exposes API to outside to access most programs that is uml meta model, application object and so on.
This chapter discuss that using the external API of StarUML™.

Using APIs for Projects

This section describes methods of managing projects, units and model fragments in StarUML™.

Basic Concepts of Project Management

In order to manage projects, it is important to understand the concepts related to projects (projects, units, and model fragments).

Project

A project is the most basic unit of management in StarUML™. A project manages one or more software models, and it can be understood as a top-level package that does not change. One project is usually saved as one file. A project contains and manages the following modeling elements.

Element	Description
Model	Element for managing one software model.
Subsystem	Element for managing the elements that express one subsystem.
Package	Most basic element for managing elements.

Project files are saved in the XML format, and the extension name is ".UML". While all models, views, and diagrams created in StarUML™ are saved in one project file, a project may be divided and saved in multiple files by using units that are described in the next section. The following information is saved in project files.

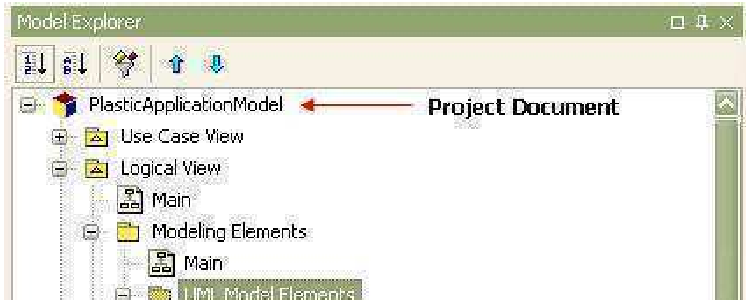
- UML profiles referenced by the project
- Unit files referenced by the project
- All model information contained in the project
- All diagram and view information contained in the project

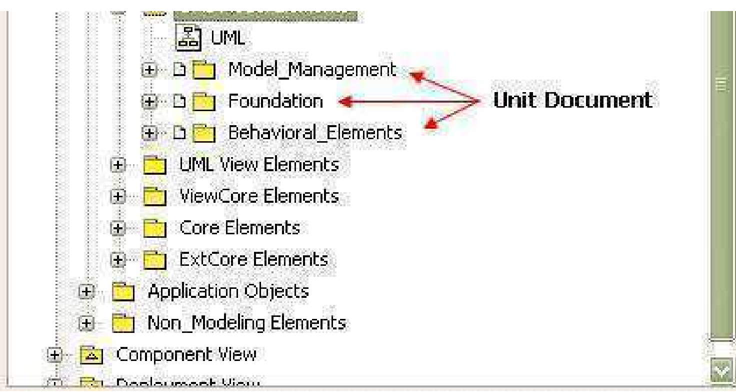
Unit

While a project is usually saved in one file, there may be cases where a project has to be divided and saved in multiple files because many people have to work on it concurrently and so on. In cases such as this, a project can be managed in multiple units. Units can be organized hierarchically, and one unit can have many sub-units. A unit is saved in a ".UNT" file, and it is referenced by project files (.UML) and other unit files (.UNT).

Only a package, subsystem, or model element can be one unit. Any element belonging to these groups is saved as a respective unit file (.UNT).

Just as a project can manage multiple units under it, a unit can manage many sub-units. Upper units have references to sub-units, and units form a hierarchical structure.





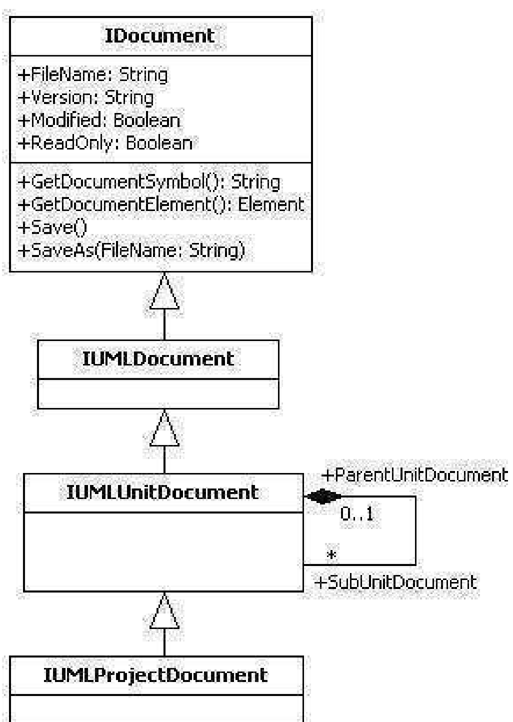
Model Fragment

A model fragment is a part of a project saved in a separate file. Only a model, subsystem, or package element can be a model fragment, and it is saved as a ".MFG" file. A model fragment file can easily be added to any project at any time. Model fragments are essentially different from units because they can completely be merged.

Document Object Management

Concept of Document

A document is an abstracted object of a part saved as a file in StarUML™. In other words, it provides various properties and methods to access a .UML or .UNT part as one object. While a model fragment (.MFG) is also one file, it does not have a document object as it is used for importing/exporting and is not internally managed by the StarUML™ application. The following diagram illustrates hierarchical structure of document interfaces.



- **IDocument**: The top interface for documents.
- **IUMLDocument**: Upper interface for documents related to UML models.
- **IUMLUnitDocument**: Interface for documents managed as units (.UNT) in StarUML™.
- **IUMLProjectDocument**: Interface for documents managed as projects (.UML) in StarUML™. Since a project document is regarded as a unit document, it inherits its properties from the unit document interface.

Accessing Document Objects

In order to access a project or unit document object, the **IProjectManager** object reference must be acquired. This allows direct access to the project or unit document object.

```
var app = new ActiveXObject("StarUML.StarUMLApplication");


var prjmgr = app.ProjectManager;

// Get project document object.
var prj_doc = prjmgr.ProjectDocument;

// Get unit document objects.
for (var i = 0; i < prjmgr.GetUnitDocumentCount(); i++) {
    var unit_doc = prjmgr.GetUnitDocumentAt(i);
}
```

While **IProjectManager**
allows direct access to documents, document objects can also be acquired through the respective modeling elements that contain them. The following example illustrates acquiring reference for a project document object from an element and saving it.

```
var elem = ...  // Assign specific element(i.e. Class, Package, etc)
var elem_doc = elem.GetContainingDocument();
elem_doc.Save();
```

Document Properties and Methods

The **IDocument** interface provides the following properties and methods.

Property	**Description**
FileName: String	Acquires file name of the document. File name includes the full path and extension.
Version: String	Acquires version of the document.
Modified: Boolean	Determines if the document has been modified by the user.
ReadOnly: Boolean	Determines if the document file is read-only.
Method	**Description**
GetDocumentSymbol(): String	Acquires document symbol. Returns 'PROJECT' string for project documents and 'UNIT' string for unit documents.
GetDocumentElement(): IElement	Returns the top element for the document.
Save()	Saves the document with the current file name.
SaveAs(FileName: String)	Saves the document with a different file name and changes the current file name.

Project Object Management

Accessing Project Object

In order to directly manage a project, reference for the project object must be acquired. The following is the Jscript code for acquiring reference for a project object.

```
var app = new ActiveXObject("StarUML.StarUMLApplication");
```

```
var prj = app.GetProject();
...
```

While reference for project objects can be acquired directly from the application object (app), project objects can also be accessed using the following method.

```
var app = new ActiveXObject("StarUML.StarUMLApplication");


var prjmgr = app.ProjectManager;
var prj = prjmgr.Project;
...
```

Modifying Project Title and Properties

Once reference for a project object has been acquired, the title, properties and various methods of the project become accessible. In order to change the title of the project, the "Title" property must be modified. Other properties like "Copyright", "Author", and "Company can also be modified in the same way.

```
...
prj.Title = "MyProject";
...
```

Caution:
Although generic modeling elements use the "Name" property, project objects must not use the "Name" property. A project is a top package and it cannot have a name. This is because pathnames are commonly used for reference between elements and all pathnames can become invalid if the project title is modified.

Adding Packages under Project

Only model, subsystem, and package elements can be added under a project. The **IUMLFactory** object must be used to create and add new elements. See the following example for adding packages under a project.

```
var app = new ActiveXObject("StarUML.StarUMLApplication");


var factory = app.UMLFactory;
var prj = app.GetProject();
var newPackage = factory.CreatePackage(prj);
newPackage.Name = "NewPackage";
```

Creating New Project

To make a new project, acquire reference for the **IProjectManager** object and call up the **NewProject** method.

```
var app = new ActiveXObject("StarUML.StarUMLApplication");


var prjmgr = app.ProjectManager;
prjmgr.NewProject();
```

To create a new project with a specific approach rather than creating an empty project, use the
NewProjectByApproach
method. The following example illustrates creating a new project using the "UMLComponents" approach.

```
var app = new ActiveXObject("StarUML.StarUMLApplication");
```

```
var prjmgr = app.ProjectManager;
prjmgr.NewProjectByApproach("UMLComponents");
```

Opening Project

To open a project file (.UML), acquire reference for the **IProjectManager** object and then use the **OpenProject** method.

```
var app = new ActiveXObject("StarUML.StarUMLApplication");


var prjmgr = app.ProjectManager;
prjmgr.OpenProject("C:\\MyProject.uml");
```

Saving Project

To save the project currently open in StarUML™, acquire reference for the **IProjectManager** object and then use the **SaveProject** method. Use the **SaveProjectAs** method to save with a different name, and use the **SaveAllUnits** method to save all units under the project.

```
var app = new ActiveXObject("StarUML.StarUMLApplication");


var prjmgr = app.ProjectManager;
prjmgr.SaveProject();
prjmgr.SaveProjectAs("MyProject2.uml");
prjmgr.SaveAllUnits();
```

Closing Project

To close a project, acquire reference for the **IProjectManager** object and then use the **CloseProject** method.

```
var app = new ActiveXObject("StarUML.StarUMLApplication");


var prjmgr = app.ProjectManager;
prjmgr.CloseProject();
```

Unit Managment

Separating New Unit

To separate a new unit for managing a package, model, or subsystem as a separate file, acquire reference for the **IProjectManager** object and then use the **SeparateUnit** method.

```
var app = new ActiveXObject("StarUML.StarUMLApplication");


var prjmgr = app.ProjectManager;

var pkg = ...  // Assign reference for the package to separate as a new unit.
var new_unit = prjmgr.SeparateUnit(pkg, "NewUnit.unt");
```

Merging Unit

If a separated package, model, or subsystem unit does not need to be managed as a separate file and needs to be merged, acquire reference for the **IProjectManager** object and then use the **MergeUnit** method.

```
var app = new ActiveXObject("StarUML.StarUMLApplication");


var prjmgr = app.ProjectManager;

var pkg = ...  // Assigns reference for the package that will no longer be managed as a unit.
prjmgr.MergeUnit(pkg);
```

Accessing Sub-Unit

Units can be organized hierarchically. A project can have many units under it, and each unit can have many sub-units. The following example illustrates accessing the sub-units within a unit.

```
var unit = ...  // Assigns reference for the unit that contains sub-units to access.
for (var i = 0; i < unit.GetSubUnitDocumentCount(); i++) {
    var sub_unit = unit.GetSubUnitDocumentAt(i);
    ...
}
```

Model Fragment Management

Making Model Fragment from Package

Package, model, or subsystem can be saved as a separate model fragment file. Acquire reference for the **IProjectManager** object and then use the **ExportModelFragment** method.

```
var app = new ActiveXObject("StarUML.StarUMLApplication");
var prjmgr = app.ProjectManager;
var pkg = ...  // Assigns package to make as a model.
prjmgr.ExportModelFragment(pkg, "MyFragment.mfg");
```

Importing Model Fragment

A model fragment file can be added to a package, model, or subsystem. Acquire reference for the **IProjectManager** object and then use the **ImportModelFragment** method.

```
var app = new ActiveXObject("StarUML.StarUMLApplication");
var prjmgr = app.ProjectManager;
var pkg = ...  // Assigns package to add a model fragment.
prjmgr.ImportModelFragment(pkg, "MyFragment.mfg");
```

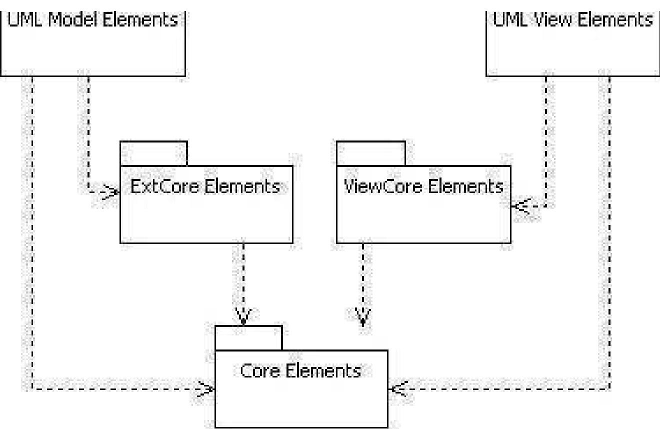
Using APIs for Elements

This section introduces interface types that are modeling elements of StarUML™ external API, and describes their usage. Modeling elements refer to the UML model, view, and diagram elements that are used when modeling software. Model elements such as package, class, and actor, view elements that correspond to each model element, and diagram elements such as class diagram and use case diagram are examples of modeling elements. Model, view, and diagram elements can be created, deleted or modified using external API for modeling elements.

Note: Please refer to **"Appendix B. List of UML Modeling Elements"** for a complete listing of UML modeling elements.

Modeling Element Structure

Modeling elements are organized in the following logical groups.



- **Core Elements**: The Core Elements group defines the top interface for model, view, and diagram elements.
- **ExtCore Elements**: The ExtCore Elements group defines the common top interface for extensible model elements.
- **ViewCore Elements**: The ViewCore Elements group defines the core types for view elements.
- **UML Model Elements**: Defines the UML model elements. The UML standard modeling elements fall into this category.
- **UML View Elements**: The UML View Elements group defines the UML view elements.

Modeling elements are largely divided into **model**, **view**, and **diagram** types. However, the diagram type is actually a part of the model or view types, and thus it is more accurate for the division to be made into **model** type and **view**
type. Model is the element that contains actual information for the software model, and view is a visual expression of information contained in a specific model. One model can have multiple views and a view generally has reference to one model.

Simple Example of Using Modeling Elements

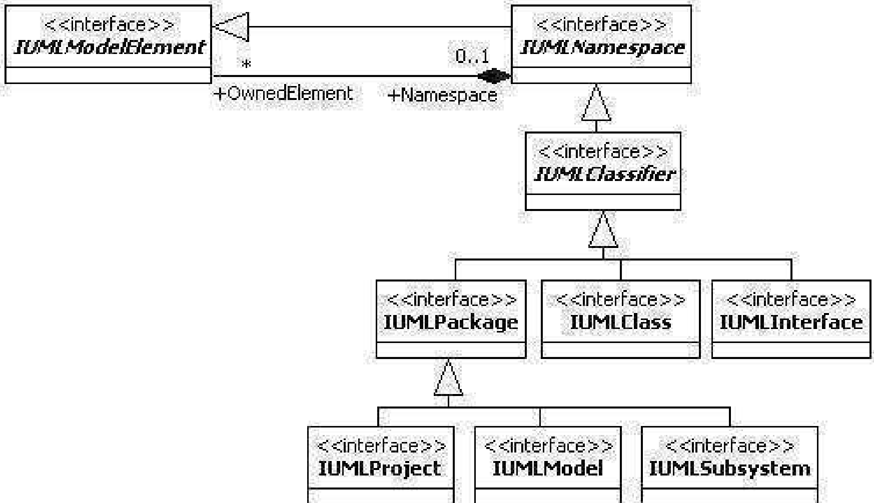
Before introducing the external API interfaces for modeling elements, let us look at a simple example of using modeling elements. Suppose we want to track StarUML™ application's top-level project element through namespace type elements like package, class, and interface, all the way down to the sub-elements of each namespace type element. In this case, the modeling element structure must be utilized. The following is the Jscript code for utilizing the modeling element structure.

```
var app, prj;

app = new ActiveXObject("StarUML.StarUMLApplication");
prj = app.GetProject();
VisitOwnedElement(prj);

function VisitOwnedElement(owner){
    var elem;

    for (var i = 0; i < owner.GetOwnedElementCount(); i++){
        elem = owner.GetOwnedElementAt(i);
        ...

        if (elem.IsKindOf("UMLNamespace")) VisitOwnedElement(elem);
    }
}
```

In this example, all sub-elements that are in "OwnedElement" relationships with the top project element are recursively obtained. The most crucial part of this code is the user-defined function called **VisitOwnedElement**. This function takes an **IUMLNamespace** type element (which is a modeling element) as an argument and uses **GetOwnedElementCount** and **GetOwnedElementAt,** which are **IUMLNamespace** interface methods.

Information required for structuring the **VisitOwnedElement** function can be obtained from the relationships of the

modeling elements. The following diagram illustrates the relationships between StarUML™ external API interface types that are related to the **IMULNamespace** interface example above.



The **IUMLNamespace** interface is inherited from **IUMLModelElement**, which is a shared upper type for **IUMLPackage**, **IUMLClass**, and **IUMLInterface** types. **IUMLNamespce** also has an association called **Namespace-OwnedElement**. The diagram illustrates that the **IUMLNamespace** type modeling elements like **IUMLPackage**, **IUMLClass**, etc. have **IUMLModelElement** type elements below them known as **OwnedElements.**
As such, external API modeling elements interfaces are defined according to the relationships between the modeling elements.

Note: Modeling element names that fall into the category of standard UML elements start with an "**UML**" prefix before the standard UML element names. For example, the name of a UML element called **Actor** is **UMLActor**. And for external API, the prefix "**I**" is used according to coding procedures, as in **IUMLActor**. Please refer to **"Appendix B. List of UML Modeling Elements"** for a complete listing of UML modeling elements and their names.

Convention for Expressing Association for External API

The diagram above illustrates that **IUMLModelElement** and **IUMLNamespace** interface types have an OwnedElement-Namespace association. Such associations are expressed as references in StarUML™'s external API interface. For example, Namespace association in the **IUMLModelElement** interface is expressed as below.

IUMLModelElement
Namespace: IUMLNamespace

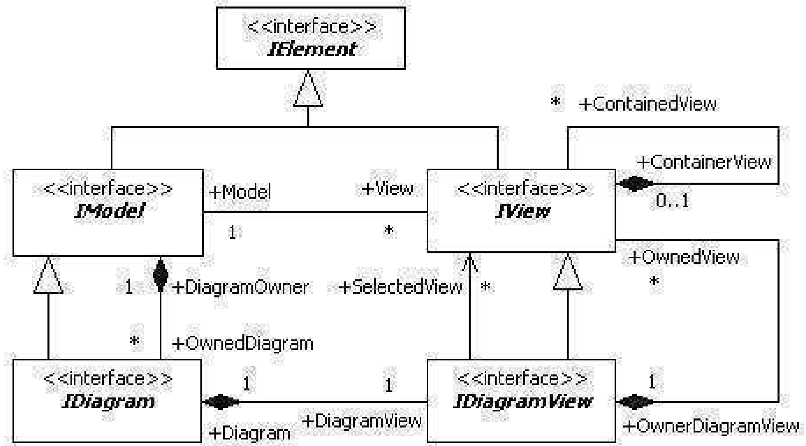
Further, **OwnedElement** association in the **IUMLNamespace** interface is expressed as below. This is because the Multiplicity attribute of the metamodel is * and groups or list structures are used in the internal implementation of the program. As all associations in external API interface definition are expressed using the same convention, this applies to all other interfaces as well as **IUMLModelElement**-**IUMLNamespace**.

IUMLNamespace
function GetOwnedElementCount(): Integer;
function GetOwnedElementAt(Index: Integer): IUMLModelElement;

Core Elements

Core Elements are top parent interfaces for modeling elements. **IElement**, **IModel**, **IView**, **IDiagram**, and **IDiagramView**
interfaces fall into this category, and they are organized as illustrated in the diagram below. The organization below should be given special attention as core group interface types are quite frequently used and they play critical roles. Associations between the interfaces should be given special emphasis here.

Associations between the interfaces should be given special emphasis here.



Interface name	Description
IElement	Interface type that defines the top shared element for all modeling elements.
IModel	Interface type that defines the shared parent element for model elements.
IView	Interface type that defines the shared parent element for view elements.
IDiagram	Interface type that defines the shared parent element for diagram model elements.
IDiagramView	Interface type that defines the shared parent element for diagram view elements.

IElement

IElement
interface defines the top shared type for all modeling elements, and provides the following main methods.

Main method	Description
GetGUID(): String	Function that returns the GUID (Global Unique Identifier) of modeling elements. GUID is encoded as Base64.
GetClassName(): String	Function that returns class names of modeling elements. Return value example: "UMLClass"
IsKindOf(ClassName: String): Boolean	Function that verifies whether the modeling element is the same type of element received as an argument. Argument value example: "UMLClass"
IsReadOnly(): Boolean	Function that verifies whether the modeling element is read-only. Attributes of read-only modeling elements cannot be modified.
MOF_GetAttribute(Name: String): String	Returns in strings the default type attribute values of modeling elements as defined by arguments.
MOF_GetReference(Name: String): IElement	Returns the reference type attribute (object reference) values of modeling elements as defined by arguments.
MOF_GetCollectionCount(Name: String): Integer	Returns the count number of items in reference collection as defined by arguments.
MOF_GetCollectionItem(Name: String; Index: Integer): IElement	Returns the attribute value (object reference) of the 'index' order item in the reference collection of modeling elements as defined by arguments.

Among the methods of **IElement** interface, the **MOF_***XXX* methods provide consistent ways to access the attribute values of each modeling element by string names. For instance, **IUMLModelElement**, a sub-type of **IElement**, has an attibribute called "Visibility". In general, the expression **IUMLModelElement.Visibilty** is used to get the value of this attribute. But the **IElement.MOF_GetAttribute** method can be used as illustrated below to get the

value of this attribute. But the **IElement.MOF_GetAttribute** method can be used as illustrated below to get the value of the attribute by a string name called "Visibility". As such, **MOF_*XXX*** methods allow access to the attributes of basic type / reference type / reference collection type of each modeling element by string names, and this is very useful in many cases.

Note: String names of attributes, which are used as arguments in **MOF_*XXX*** methods, are the same as the respective attribute names.

The following example reads the value of the attribute "Visibility" of an **IUMLModelElement** type element using the **IElement.MOF_GetAttribute** method. It should be noted that the **MOF_GetAttribute** method uses strings as return values. In this example, return values can be "vkPrivate", "vkPublic", etc.

```
...
var elem = ... // Get reference to IUMLModelElement type element object.
var val = elem.MOF_GetAttribute("Visibility");
...
```

The **IElement.MOF_GetReference**
method is used when reading reference type attribute values of modeling elements. The **MOF_GetReference** method returns reference to the **IElement**
type objects. The following example reads the "Namespace" reference attribute value of **IUMLModelElement** type elements.

```
...
var elem = ... // Get reference to IUMLModelElement type element object.
var refElem = elem.MOF_GetReference("Namespace");
...
```

The **IElement.MOF_GetCollectionItem**
method is used when reading reference collection type attribute values of modeling elements. The
MOF_GetCollectionItem
method receives the name of the reference collection type attribute and the item index as arguments. Collection item count number can be obtained using the **MOF_GetCollectionCount** method. Also, the
MOF_GetCollectionItem method, like the **MOF_GetReference** method, returns reference to the **IElement** type objects. The following example reads the "Attributes" reference collection attribute values of **IUMLClassifier** type elements.

```
...
var elem = ... // Get reference to IUMLClassifier type element object.

var colCount = elem.MOF_GetCollectionCount("Attributes");
for (var i = 0; i < colCount; i++){
    var colItem = elem.MOF_GetCollectionItem("Attributes", i);
    ...
}
```

Note: An error occurs if argument values for **MOF_*XXX*** methods are not defined with names of existing attributes.

IModel

IModel
interface defines the shared parent type of model elements, and provides the following main properties and methods.

Main Property	Description
Name: String	Name attribute.
Documentation: String	Documentation attribute.
Pathname: String	Path name of model element. Path name format includes the "::" indicator for all upper level elements except the top project element. Path name

	example: "::Application Model::Modeling Elements::UML Model Elements". * Read-only.
Main Method	**Description**
AddAttachment(Attach: String);	Adds values to attachment file attributes (file path, URL).
FindByName(AName: String): IModel	Returns names of lower level model elements that are identical to the names received as arguments.
FindByRelativePathname(RelPath: String): IModel	Returns relative path names of overlapped lower level model elements that are identical to the relative path names received as arguments. The Name of the model itself is excluded in the argument. Argument value example: "Model_Management::UMLPackage"
ContainsName(AName: String): Boolean	Verifies whether there exists a lower level model element with the same name as defined by the argument.
CanDelete(): Boolean	Verifies whether the current model element is read-only.
GetViewCount: Integer	Returns count of view elements of the current model.
GetViewAt(Index: Integer): IView	Returns the (index)th view element of the current model.
GetOwnedDiagramCount: Integer	Returns count of diagram elements contained in the current model.
GetOwnedDiagramAt(Index: Integer): IDiagram	Returns the (index)th diagram element contained in the current model.

The following example shows reading basic attribute values of a model element and resetting them.

```
function DoingSomething(elem){
    if (elem.GetClassName() == "UMLClass"){
        if (elem.IsReadOnly() != true){
            elem.Name = "class_" + elem.Name;
            elem.Documentation = "I am a class";
            elem.AddAttachment("http://www.staruml.com");
        }
    }
}
```

The **FindByName** method and **FindByRelativePathname** method can be used to find lower level elements of a model element. The **FindByName**
method returns the name of the first lower level element that is identical to the string value received as argument. The **FindByName**
method performs a search only for the lower levels of the model element. To search for all lower level elements when the lower level elements are in an overlapped structure, the **FindByRelativePathname** method can be used. The following example shows how to use the **FindByName** and **FindByRelativePathname** methods.

```
var app = new ActiveXObject("StarUML.StarUMLApplication");
var rootElem = app.FindByPathname("::Application Model::Modeling Elements::UML Model Elements");

var elem = rootElem.FindByName("Model_Management");
var elem2 = rootElem.FindByRelativePathname("Model_Management::UMLPackage");
```

As shown in the diagram above, **IModel** interface and **IView** interface are in a Model-View association. An **IModel** type element can have many **IView** type elements, and each **IView** type element must have one **IModel** type element. The following example shows how to get reference to all **IView** type elements for each **IUMLClass** type element.

```
var elem = ... // Get reference to IModel type element.

if (elem.GetClassName() == "UMLClass"){
    for (var i = 0; i < elem.GetViewCount(); i++){
        var view = elem.GetViewAt(i);
        ...
```

```
    }
}
```

As illustrated in the diagram above, the **IModel** interface and **IDiagram** interface are in a DiagramOwner-OwnedDiagram association. Since the **IDiagram** interface is a parent type for all diagram model types, reference to diagram elements contained in the model element can be obtained using the method shown in the following example.

```
var elem = ... // IModel type element
for (int i = 0; i < elem.GetOwnedDiagramCount(); i++){
    var dgm = elem.GetOwnedDiagramAt(i);
    ...
}
```

IView

IView interface defines the shared parent type of view elements, and provides the following main properties.

Main property	Description
LineColor: String	Defines line color. Uses BGR format. Examples: "0xff0000" (blue); "0x00ff00" (green); "0x0000ff" (red); "0x000000" (black); "0xffffff" (white)
FillColor: String	Defines fill color. Uses BGR format.
FontFace: String	Defines font. Example: "Times New Roman"
FontColor: String	Defines font color. Uses BGR format.
FontSize: String	Defines font size.
FontStyle: Integer	Defines font style. Integers 1 (bold), 2 (italic), 3 (underline), and 4 (strikeout) can be used separately or in combination. Example: 1 + 2 (bold & italic) * Does not apply to view elements with pre-defined default styles.
Selected: Boolean	Defines whether the current view element is selected. * Read-only.
Model: IModel	Defines reference to model element corresponding to the current view element. * Read-only.
OwnerDiagramView: IDiagramView	Defines diagram view element containing the current view element. * Read-only.

The following example shows setting basic attribute values for an **IVew** type element.

```
var view = ... // IView type element
view.LineColor = "0x0000ff";
view.FillColor = "0x00ffff";
view.FontFace = "Times New Roman";
view.FontColor = "0x0000ff";
view.FontSize = "12";
view.FontStyle = 1;
```

View elements other than **IUMLNoteView**, **IUMLNoteLinkView**, and **IUMLTextView** type view elements have references to the model element. The following code can be used to obtain information on an **IModel** type element referenced by an **IView** type element.

```
var view = ... // IView type element
var mdl = view.Model;
...
```

The following code can be used to obtain information on diagrams that contain an **IView** type element.

The following code can be used to obtain information on diagrams that contain an **IView** type element.

```
var view = ... // IView type element
var dgmView = view.OwnerDiagramView;
...
```

IDiagram

IDiagram interface is inherited from **IModel**
interface, and is the shared parent type of all diagram type model elements. **IDiagram** interfaces have the following main properties.

Main property	Description
DefaultDiagram: Boolean	Defines whether the current diagram is the Default Diagram. Default Diagram is the diagram that automatically opens when a project is opened. Only class / use case / component / deployment diagrams can be set as the Default Diagram.
DiagramOwner: IModel	Defines an upper level model element that contains the current diagram. * Read-only.
DiagramView: IDiagramView	Defines the diagram view element that corresponds to the current diagram model. * Read-only.

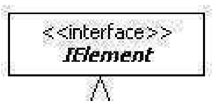
IDiagramView

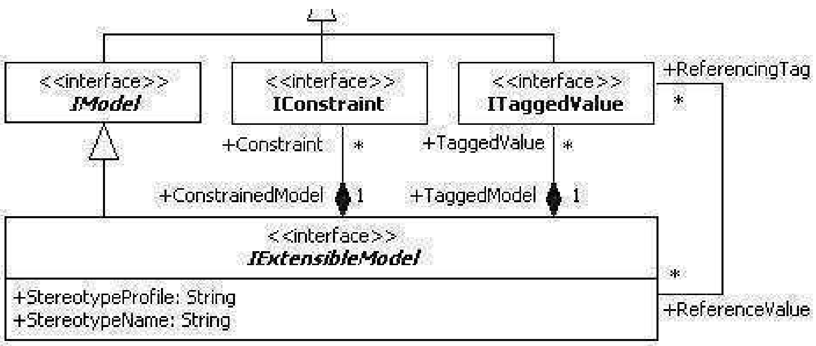
IDiagramView interface is inherited from **IView**
interface, and is the shared parent type of all diagram view elements.

Main property	Description
Diagram: IDiagram	Defines diagram model elements that correspond to the current diagram view element.* Read-only.
Main method	**Description**
GetSelectedViewCount: Integer	Returns count of view elements currently selected in the diagram.
GetSelectedViewAt(Index: Integer): IView	Returns the (index)th view element that is currently selected in the diagram.
GetOwnedViewCount: Integer	Returns count of view elements contained in the diagram.
GetOwnedViewAt(Index: Integer): IView	Returns the (index)th view element contained in the diagram.
LayoutDiagram()	Automatically reorganizes the diagram layout.
ExportDiagramAsBitmap(FileName: String)	Converts the diagram into a bitmap image and saves it as a file using the path name and file name defined.
ExportDiagramAsMetafile(FileName: String)	Converts the diagram into a Windows Metafile and saves it as a file using the path name and file name defined.
ExportDiagramAsJPEG(FileName: String)	Converts the diagram into a JPEG image and saves it as a file using the path name and file name defined.

ExtCore Elements

ExtCore elements provide a platform structure for model elements where UML extension functions can be applied. All model elements, which are applied with UML extension functions, are inherited from the **IExtensibleModel** interface. **IExtensibleModel** interface can have many **constraints** and **tagged values** as illustrated in the diagram below.





Interface name	Description
IExtensibleModel	Shared upper level type of model elements that can be applied with UML extension functions.
IConstraint	Constraint element.
ITaggedValue	Tagged value element.

IExtensibleModel

IExtensibleModel interface defines the following main properties and methods.

Main property	Description
StereotypeProfile: String	Defines name of the UML profile that defines the stereotype applied in the current model element. * Read-only.
StereotypeName: String	Defines name of the stereotype applied in the current model element. * Read-only.
Main method	**Description**
GetConstraintCount: Integer	Returns count of constraint elements contained in the current model element.
GetConstraintAt(Index: Integer): IConstraint	Returns (index)th constraint element contained in the current model element.
AddConstraint(Name: String; Body: String): IConstraint	Creates a constraint element with name and value defined by arguments.
IndexOfConstraint(AConstraint: IConstraint): Integer	Returns index of the constraint element defined by arguments.
DeleteConstraint(Index: Integer)	Deletes (index)th constraint element contained in the current model element.
GetTaggedValueCount: Integer	Returns count of tagged value elements contained in the current model element.
GetTaggedValueAt(Index: Integer): ITaggedValue	Returns (index)th tagged value element contained in the current model element.
GetStereotype: IStereotype	Returns stereotype element applied in the current model element.
SetStereotype(const Name: WideString)	Defines stereotype value with string instead of using IStereotype element.
SetStereotype2(Profile: String; Name: String)	Defines UML profile with stereo definition and stereotype values.

By convention, stereotype and tagged values should be defined through the UML profile. However, StarUML™ allows definition of stereotypes by string values for those unfamiliar with UML profiles. The following example shows reading the stereotype value from a certain **IExtensibleModel** type element and resetting it.

```
var elem = ... // Get reference to model element.
if (elem.IsKindOf("ExtensibleModel")){
    var stereotypeStr = elem.StereotypeName;
    if (stereotypeStr == ""){
        elem.SetStereotype("Stereotype1");
    }
}
```

Unlike stereotype, tagged values must be defined through the UML profile only. Please refer to **"Chapter 7. Writing UML Profiles"** for a detailed description of UML profile, stereotypes, and tagged values.

IConstraint

Constraints can be added or edited at the constraints editor in the StarUML™ application as illustrated above. In external API, constraints can be added or edited using the **IConstraint** interface. The **IConstraint** interface provides the following properties.

Main property	Description
Name: String	Name of constraint.
Body: String	Contents of constraint.
ConstrainedModel: IExtensibleModel	IExtensibleModel type element applied with the constraint.

Constraint elements can be created through the method provided by an **IExtensibleModel** type element. The following example shows adding, editing, and deleting a constraint for a certain **IExtensibleModel** type element.

```
var elem = ... // Get reference to IExtensibleModel type element.

var AConstraint = elem.AddConstraint("Constraint1", "Constraint Value1");
var constrName = AConstraint.Name;
var constrValue = AConstraint.Body;
var idx = elem.IndexOfConstraint(AConstraint);
elem.DeleteConstraint(idx);
```

ITaggedValue

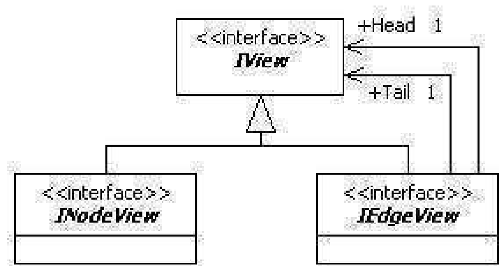
ITaggedValue
interface defines tagged value elements, and provides the following properties and methods. Please refer to **"Chapter 7. Writing UML Profiles"** for a detailed description of tagged value elements.

Main property	Description
ProfileName: String	Defines the name of the UML profile that defines the current tagged value

ProfileName: String	Defines the name of the UML profile that defines the current tagged value. * Read-only.
TagDefinitionSetName: String	Defines the tag definition set that contains the current tagged value. * Read-only.
Name: String	Defines the name of the tagged value defined in the UML profile. * Read-only.
DataValue: String	Defines tagged value. * Read-only.
TaggedModel: IExtensibleModel	Defines reference to the IExtensibleModel type element applied with the current tagged value. * Read-only.
Main method	**Description**
GetTagDefinition: ITagDefinition	Returns tag definition element for the current tagged value.
GetTagDefinitionSet: ITagDefinitionSet	Returns tag definition set element for the current tagged value.
GetProfile: IProfile	Returns the UML profile element that defines the current tagged value.

ViewCore Elements

ViewCore group interface types are inherited from **IView**
interface and provide a platform structure for all view type elements. ViewCore group contains many interface types. This section describes **INodeView** and **IEdgeView** interfaces, which are the most important interfaces.



Interface name	Description
INodeView	The top level interface type for node type views.
IEdgeView	The top level interface type for edge type views.

INodeView

INodeView
interface is a platform type for node type view elements. A node type view is a view element that has an area like class views. **INodeView** interface provides the following main properties.

Main property	Description
Left: Integer	Location information of the view (Left).
Top: Integer	Location information of the view (Top).
Width: Integer	Size information of the view (Width).
Height: Integer	Size information of the view (Height).
MinWidth: Integer	Defines the minimum size of the current view element (Width). * Read-only.
MinHeight: Integer	Defines the minimum size of the current view element (Height). * Read-only.

AutoResize: Boolean	Defines the autoresize property of the current view element.

The following example shows changing the location and size of an **INodeView** type view.

```
var nodeView = ... // Get reference to INodeView type element.
var l = nodeView.Left;
var t = nodeView.Top;
var w = nodeView.Width;
var h = nodeView.Height;
nodeView.Left = l * 2;
nodeView.Top = t * 2;
nodeView.Width = w * 2;
nodeView.Height = h * 2;
```

IEdgeView

IEdgeView
interface is a platform type for edge type view elements. An edge type view is a line-based view element like dependency views. **IEdgeView** interface provides the following main properties.

Main property	Description
LineStyle: LineStyleKind	Defines line style.
Points: IPoints	Defines line coordinates.
Tail: IView	Defines view element at the starting point of the line.
Head: IView	Defines view element at the ending point of the line.

The following values defined in **LineStyleKind** enumeration can be used for the line style of edge type views.

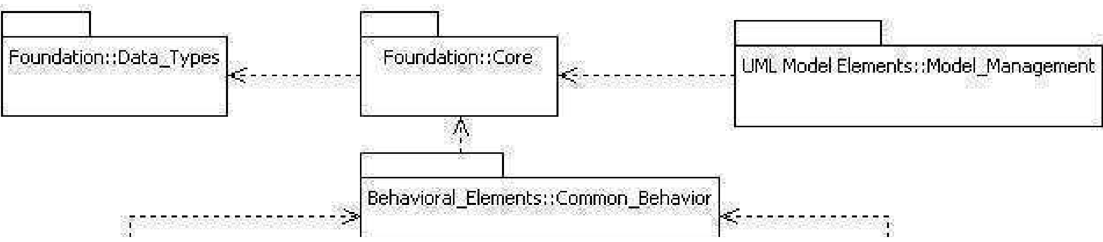
Value	Description
lsRectilinear	Rectilinear shape line style.
lsOblique	Oblique shape line style.

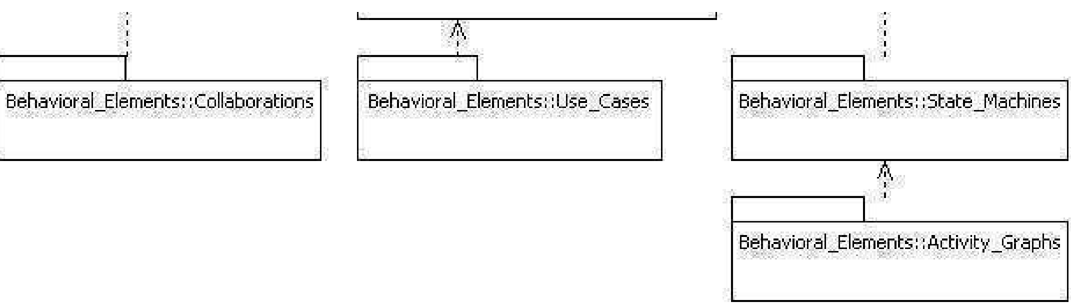
The following example shows changing the line style for an edge type view.

```
lsRectilinear = 0;
lsOblique = 1;

var view = ... // Get reference to view element.
if (view.IsKindOf("EdgeView")){
    view.LineStyle = lsRectilinear;
}
```

Accessing UML Model Elements

UML Model Elements group is further grouped into various packages as illustrated below. It should be noted that the UML model elements defined in the UML Model Elements group are StarUML™'s implementation of standard UML elements as defined in the UML standard specifications; they are almost identical to the standard UML elements. We will skip the detailed description of UML model elements in the UML Model Elements group here.





Creating UML Model Elements

When creating a UML model element, **IUMLFactory** interface must be used. **IUMLFactory** interface provides creation methods not only for UML model elements but also UML diagram elements, UML view elements and all other UML modeling elements. An **IUMLFactory** type object can be obtained through an **IStarUMLApplication** type object as illustrated below.

```
var app = new ActiveXObject("StarUML.StarUMLApplication");
var facto = app.UMLFactory;
...
```

IUMLFactory provides the following UML model element creation methods.

UML model element	Creation method
UMLModel	CreateModel(AOwner: UMLNamespace): IUMLModel
UMLSubsystem	CreateSubsystem(AOwner: UMLNamespace): IUMLSubsystem
UMLPackage	CreatePackage(AOwner: UMLNamespace): IUMLPackage
UMLClass	CreateClass(AOwner: UMLNamespace): IUMLClass
UMLInterface	CreateInterface(AOwner: UMLNamespace): IUMLInterface
UMLEnumeration	CreateEnumeration(AOwner: UMLNamespace): IUMLEnumeration
UMLSignal	CreateSignal(AOwner: UMLNamespace): IUMLSignal
UMLException	CreateException(AOwner: UMLNamespace): IUMLException
UMLComponent	CreateComponent(AOwner: UMLNamespace): IUMLComponent
UMLComponentInstance	CreateComponentInstance(AOwner: UMLNamespace): IUMLComponentInstance
UMLNode	CreateNode(AOwner: UMLNamespace): IUMLNode
UMLNodeInstance	CreateNodeInstance(AOwner: UMLNamespace): IUMLNodeInstance
UMLUseCase	CreateUseCase(AOwner: UMLNamespace): IUMLUseCase
UMLActor	CreateActor(AOwner: UMLNamespace): IUMLActor
UMLActivityGraph	CreateActivityGraph(AContext: UMLModelElement): IUMLActivityGraph
UMLStateMachine	CreateStateMachine(AContext: UMLModelElement): IUMLStateMachine
UMLCompositeState	CreateCompositeState(AOwnerState: UMLCompositeState): IUMLCompositeState
UMLCollaboration	CreateCollaboration(AOwner: UMLClassifier): IUMLCollaboration
UMLCollaboration	CreateCollaboration2(AOwner: UMLOperation): IUMLCollaboration
UMLCollaborationInstanceSet	CreateCollaborationInstanceSet(AOwner: UMLClassifier): IUMLCollaborationInstanceSet
UMLCollaborationInstanceSet	CreateCollaborationInstanceSet2(AOwner: UMLOperation): IUMLCollaborationInstanceSet
UMLInteraction	CreateInteraction(ACollaboration: UMLCollaboration): IUMLInteraction

UMLInteractionInstanceSet	CreateInteractionInstanceSet(ACollaborationInstanceSet: UMLCollaborationInstanceSet): IUMLInteractionInstanceSet
UMLActionState	CreateActionState(AOwnerState: UMLCompositeState): IUMLActionState
UMLSubactivityState	CreateSubactivityState(AOwnerState: UMLCompositeState): IUMLSubactivityState
UMLPseudostate	CreatePseudostate(AOwnerState: UMLCompositeState): IUMLPseudostate
UMLFinalState	CreateFinalState(AOwnerState: UMLCompositeState): IUMLFinalState
UMLPartition	CreatePartition(AActivityGraph: UMLActivityGraph): IUMLPartition
UMLSubmachineState	CreateSubmachineState(AOwnerState: UMLCompositeState): IUMLSubmachineState
UMLAttribute	CreateAttribute(AClassifier: UMLClassifier): IUMLAttribute
UMLAttribute	CreateQualifier(AAssociationEnd: UMLAssociationEnd): IUMLAttribute
UMLOperation	CreateOperation(AClassifier: UMLClassifier): IUMLOperation
UMLParameter	CreateParameter(ABehavioralFeature: UMLBehavioralFeature): IUMLParameter
UMLTemplateParameter	CreateTemplateParameter(AClass: UMLClass): IUMLTemplateParameter
UMLTemplateParameter	CreateTemplateParameter2(ACollaboration: UMLCollaboration): IUMLTemplateParameter
UMLEnumerationLiteral	CreateEnumerationLiteral(AEnumeration: UMLEnumeration): IUMLEnumerationLiteral
UMLUninterpretedAction	CreateEntryAction(AState: UMLState): IUMLUninterpretedAction
UMLUninterpretedAction	CreateDoAction(AState: UMLState): IUMLUninterpretedAction
UMLUninterpretedAction	CreateExitAction(AState: UMLState): IUMLUninterpretedAction
UMLUninterpretedAction	CreateEffect(ATransition: UMLTransition): IUMLUninterpretedAction
UMLSignalEvent	CreateSignalEvent(ATransition: UMLTransition): IUMLSignalEvent
UMLCallEvent	CreateCallEvent(ATransition: UMLTransition): IUMLCallEvent
UMLTimeEvent	CreateTimeEvent(ATransition: UMLTransition): IUMLTimeEvent
UMLChangeEvent	CreateChangeEvent(ATransition: UMLTransition): IUMLChangeEvent
UMLClassifierRole	CreateClassifierRole(ACollaboration: UMLCollaboration): IUMLClassifierRole
UMLObject	CreateObject(ACollaborationInstanceSet: UMLCollaborationInstanceSet): IUMLObject
UMLObject	CreateObject2(AOwner: UMLNamespace): IUMLObject
UMLTransition	CreateTransition(AStateMachine: UMLStateMachine; Source: UMLStateVertex; Target: UMLStateVertex): IUMLTransition
UMLDependency	CreateDependency(AOwner: UMLNamespace; Client: UMLModelElement; Supplier: UMLModelElement): IUMLDependency
UMLAssociation	CreateAssociation(AOwner: UMLNamespace; End1: UMLClassifier; End2: UMLClassifier): IUMLAssociation
UMLAssociationClass	CreateAssociationClass(AOwner: UMLNamespace; AAssociation: UMLAssociation; AClass: UMLClass): IUMLAssociationClass
UMLGeneralization	CreateGeneralization(AOwner: UMLNamespace; Parent: UMLGeneralizableElement; Child: UMLGeneralizableElement): IUMLGeneralization
UMLLink	CreateLink(ACollaborationInstanceSet: UMLCollaborationInstanceSet; End1: UMLInstance; End2: UMLInstance): IUMLLink
UMLAssociationRole	CreateAssociationRole(ACollaboration: UMLCollaboration; End1: UMLClassifierRole; End2: UMLClassifierRole): IUMLAssociationRole
UMLStimulus	CreateStimulus(AInteractionInstanceSet: UMLInteractionInstanceSet; Sender:

	UMLInstance; Receiver: UMLInstance; Kind: UMLFactoryMessageKind): IUMLStimulus
UMLStimulus	CreateStimulus2(AInteractionInstanceSet: UMLInteractionInstanceSet; Sender: UMLInstance; Receiver: UMLInstance; CommunicationLink: UMLLink; Kind: UMLFactoryMessageKind): IUMLStimulus
UMLMessage	CreateMessage(AInteraction: UMLInteraction; Sender: UMLClassifierRole; Receiver: UMLClassifierRole; Kind: UMLFactoryMessageKind): IUMLMessage
UMLMessage	CreateMessage2(AInteraction: UMLInteraction; Sender: UMLClassifierRole; Receiver: UMLClassifierRole; CommunicationConnection: UMLAssociationRole; Kind: UMLFactoryMessageKind): IUMLMessage
UMLInclude	CreateInclude(AOwner: UMLNamespace; Includer: UMLUseCase; Includee: UMLUseCase): IUMLInclude
UMLExtend	CreateExtend(AOwner: UMLNamespace; Extender: UMLUseCase; Extendee: UMLUseCase): IUMLExtend
UMLRealization	CreateRealization(AOwner: UMLNamespace; Client: UMLModelElement; Supplier: UMLModelElement): IUMLRealization

The following example shows creating UML model elements using **IUMLFactory**.

```
var app = new ActiveXObject("StarUML.StarUMLApplication");
var facto = app.UMLFactory;

var pjt = app.GetProject();
var mdlElem = facto.CreateModel(pjt);           // Create UMLModel element.
var pkgElem = facto.CreatePackage(mdlElem);     // Create UMLPackage element.
var clsElem1 = facto.CreateClass(pkgElem);      // Create UMLClass element.
var clsElem2 = facto.CreateClass(pkgElem);      // Create UMLClass element.
var attrElem = facto.CreateAttribute(clsElem1); // Create UMLAttribute element.
var opElem = facto.CreateOperation(clsElem1);   // Create UMLOperation element.
var paramElem1 = facto.CreateParameter(opElem); // Create UMLParameter element.
var paramElem2 = facto.CreateParameter(opElem); // Create UMLParameter element.
paramElem1.TypeExpression = "String";
paramElem2.Type_ = clsElem2;
...
```

Deleting UML Model Element

The **DeleteModel** method of **IStarUMLApplication** interface can be used to delete UML model elements. The **CanDelete** method of **IModel**
interface can be used to check whether the current model element can be deleted. If the current model element is read-only, the **CanDelete**
method returns "false". Additional caution should be taken because when a model element is deleted, all its lower level model elements, and all the view elements related to the current model element are automatically deleted altogether. The following example is a continuation of the example above, showing deleting a class element.

```
...
if (clsElem1.CanDelete() == true){
    app.DeleteModel(clsElem1);
}
...
```

Managing UML Diagram

Creating UML Diagram Elements

IUMLFactory can be used to create UML diagram elements like creating UML model elements. **IUMLFactory** provides the following diagram-related creation methods.

UML diagram element	Creation method
UMLClassDiagram	CreateClassDiagram(AOwner: Model): IUMLClassDiagram
UMLUseCaseDiagram	CreateUseCaseDiagram(AOwner: Model): IUMLUseCaseDiagram
UMLSequenceDiagram	CreateSequenceDiagram(AOwner: UMLInteractionInstanceSet): IUMLSequenceDiagram
UMLSequenceRoleDiagram	CreateSequenceRoleDiagram(AOwner: UMLInteraction): IUMLSequenceRoleDiagram
UMLCollaborationDiagram	CreateCollaborationDiagram(AOwner: UMLInteractionInstanceSet): IUMLCollaborationDiagram
UMLCollaborationRoleDiagram	CreateCollaborationRoleDiagram(AOwner: UMLInteraction): IUMLCollaborationRoleDiagram
UMLStatechartDiagram	CreateStatechartDiagram(AOwner: UMLStateMachine): IUMLStatechartDiagram
UMLActivityDiagram	CreateActivityDiagram(AOwner: UMLActivityGraph): IUMLActivityDiagram
UMLComponentDiagram	CreateComponentDiagram(AOwner: Model): IUMLComponentDiagram
UMLDeploymentDiagram	CreateDeploymentDiagram(AOwner: Model): IUMLDeploymentDiagram

The method for creating UML diagram elements is almost identical to the method for creating UML model elements. One difference for UML diagram elements is that view type elements are automatically created when creating model type elements. The following example shows creating a UML diagram element and accessing the automatically created UML diagram view element.

```
var app = new ActiveXObject("StarUML.StarUMLApplication");
var pkgElem = ...                               // Upper level model element to contain UML dia

var dgmElem = facto.CreateClassDiagram(pkgElem);  // Create UMLClassDiagram.
var dgmViewElem = dgmElem.DiagramView;            // Automatically created diagram view element.
app.OpenDiagram(dgmElem);
...
```

Deleting UML Diagram Element

Since UML diagram elements are regarded as UML model elements, they can be deleted using the **DeleteModel** method of **IStarUMLApplication** interface, like deleting UML model elements. The **CanDelete** method of **IModel** interface can be used to check whether the diagram element can be deleted.

Handling View Elements

Creating View Elements

IUMLFactory can also be used when creating view elements. **IUMLFactory** methods related to view element creation are as follows.

UML view element	Creation method
UMLNoteView	CreateNoteView(ADiagramView: DiagramView): IUMLNoteView
UMLNoteLinkView	CreateNoteLinkView(ADiagramView: DiagramView; ANote: UMLNoteView; LinkTo: View): IUMLNoteLinkView
UMLTextView	CreateTextView(ADiagramView: DiagramView): IUMLTextView
UMLModelView	CreateModelView(ADiagramView: DiagramView; AModel: UMLModel): IUMLModelView
UMLSubsystemView	CreateSubsystemView(ADiagramView: DiagramView; AModel: UMLSubsystem): IUMLSubsystemView
UMLPackageView	CreatePackageView(ADiagramView: DiagramView; AModel: UMLPackage): IUMLPackageView

UMLClassView	CreateClassView(ADiagramView: DiagramView; AModel: UMLClass): IUMLClassView
UMLInterfaceView	CreateInterfaceView(ADiagramView: DiagramView; AModel: UMLInterface): IUMLInterfaceView
UMLEnumerationView	CreateEnumerationView(ADiagramView: DiagramView; AModel: UMLEnumeration): IUMLEnumerationView
UMLSignalView	CreateSignalView(ADiagramView: DiagramView; AModel: UMLSignal): IUMLSignalView
UMLExceptionView	CreateExceptionView(ADiagramView: DiagramView; AModel: UMLException): IUMLExceptionView
UMLComponentView	CreateComponentView(ADiagramView: DiagramView; AModel: UMLComponent): IUMLComponentView
UMLComponentInstanceView	CreateComponentInstanceView(ADiagramView: DiagramView; AModel: UMLComponentInstance): IUMLComponentInstanceView
UMLNodeView	CreateNodeView(ADiagramView: DiagramView; AModel: UMLNode): IUMLNodeView
UMLNodeInstanceView	CreateNodeInstanceView(ADiagramView: DiagramView; AModel: UMLNodeInstance): IUMLNodeInstanceView
UMLActorView	CreateActorView(ADiagramView: DiagramView; AModel: UMLActor): IUMLActorView
UMLUseCaseView	CreateUseCaseView(ADiagramView: DiagramView; AModel: UMLUseCase): IUMLUseCaseView
UMLCollaborationView	CreateCollaborationView(ADiagramView: DiagramView; AModel: UMLCollaboration): IUMLCollaborationView
UMLCollaborationInstanceSetView	CreateCollaborationInstanceSetView(ADiagramView: DiagramView; AModel: UMLCollaborationInstanceSet): IUMLCollaborationInstanceSetView
UMLGeneralizationView	CreateGeneralizationView(ADiagramView: DiagramView; AModel: UMLGeneralization; Parent: View; Child: View): IUMLGeneralizationView
UMLAssociationView	CreateAssociationView(ADiagramView: DiagramView; AModel: UMLAssociation; End1: View; End2: View): IUMLAssociationView
UMLAssociationClassView	CreateAssociationClassView(ADiagramView: DiagramView; AModel: UMLAssociationClass; AssociationView: View; ClassView: View): IUMLAssociationClassView
UMLDependencyView	CreateDependencyView(ADiagramView: DiagramView; AModel: UMLDependency; Client: View; Supplier: View): IUMLDependencyView
UMLRealizationView	CreateRealizationView(ADiagramView: DiagramView; AModel: UMLRealization; Client: View; Supplier: View): IUMLRealizationView
UMLIncludeView	CreateIncludeView(ADiagramView: DiagramView; AModel: UMLInclude; Base: View; Addition: View): IUMLIncludeView
UMLExtendView	CreateExtendView(ADiagramView: DiagramView; AModel: UMLExtend; Base: View; Extension: View): IUMLExtendView
UMLColObjectView	CreateObjectView(ADiagramView: DiagramView; AModel: UMLObject): IUMLColObjectView
UMLSeqObjectView	CreateSeqObjectView(ADiagramView: UMLSequenceDiagramView; AModel: UMLObject): IUMLSeqObjectView
UMLColClassifierRoleView	CreateClassifierRoleView(ADiagramView: DiagramView; AModel: UMLClassifierRole): IUMLColClassifierRoleView
UMLSeqClassifierRoleView	CreateSeqClassifierRoleView(ADiagramView: UMLSequenceRoleDiagramView; AModel: UMLClassifierRole): IUMLSeqClassifierRoleView

UMLLinkView	CreateLinkView(ADiagramView: DiagramView; AModel: UMLLink; End1: View; End2: View): IUMLLinkView
UMLAssociationRoleView	CreateAssociationRoleView(ADiagramView: DiagramView; AModel: UMLAssociationRole; End1: View; End2: View): IUMLAssociationRoleView
UMLColStimulusView	CreateStimulusView(ADiagramView: UMLCollaborationDiagramView; AModel: UMLStimulus; LinkView: View): IUMLColStimulusView
UMLSeqStimulusView	CreateSeqStimulusView(ADiagramView: UMLSequenceDiagramView; AModel: UMLStimulus; Sender: View; Receiver: View): IUMLSeqStimulusView
UMLColMessageView	CreateMessageView(ADiagramView: UMLCollaborationRoleDiagramView; AModel: UMLMessage; AssociationRoleView: View): IUMLColMessageView
UMLSeqMessageView	CreateSeqMessageView(ADiagramView: UMLSequenceRoleDiagramView; AModel: UMLMessage; Sender: View; Receiver: View): IUMLSeqMessageView
UMLStateView	CreateStateView(ADiagramView: UMLStatechartDiagramView; AModel: UMLCompositeState): IUMLStateView
UMLSubmachineStateView	CreateSubmachineStateView(ADiagramView: UMLStatechartDiagramView; AModel: UMLSubmachineState): IUMLSubmachineStateView
UMLPseudostateView	CreatePseudostateView(ADiagramView: DiagramView; AModel: UMLPseudostate): IUMLPseudostateView
UMLFinalStateView	CreateFinalStateView(ADiagramView: DiagramView; AModel: UMLFinalState): IUMLFinalStateView
UMLActionStateView	CreateActionStateView(ADiagramView: UMLActivityDiagramView; AModel: UMLActionState): IUMLActionStateView
UMLSubactivityStateView	CreateSubactivityStateView(ADiagramView: UMLActivityDiagramView; AModel: UMLSubactivityState): IUMLSubactivityStateView
UMLSwimlaneView	CreateSwimlaneView(ADiagramView: UMLActivityDiagramView; AModel: UMLPartition): IUMLSwimlaneView
UMLTransitionView	CreateTransitionView(ADiagramView: DiagramView; AModel: UMLTransition; Source: View; Target: View): IUMLTransitionView

The following example creates **IUMLClassView** type elements in the class diagram view, and creates the **IUMLDependencyView** and **IUMLAssociationView**
that link the two elements. As model elements are required for creating view elements, model elements are created first.

```
var app = new ActiveXObject("StarUML.StarUMLApplication");
var factory = app.UMLFactory;

// Get reference to existing model elements.
var rootElem = app.FindByPathname("::Logical View");
if (rootElem != null){

    app.BeginUpdate();
    try{
        // Create model elements.
        var class1 = factory.CreateClass(rootElem);
        var class2 = factory.CreateClass(rootElem);
        var dependency = factory.CreateDependency(rootElem, class1, class2);
        var association = factory.CreateAssociation(rootElem, class1, class2);
        var diagram = factory.CreateClassDiagram(rootElem);
        var diagramView = diagram.DiagramView;

        // Create view elements.
        var classView1 = factory.CreateClassView(diagramView, class1);
        var classView2 = factory.CreateClassView(diagramView, class2);
        var dependencyView = factory.CreateDependencyView(diagramView, dependency,
                             classView1, classView2);
        var associationView = factory.CreateAssociationView(diagramView, association,
```

```
                                  classView1, classView2);

            // Adjust view element attributes.
            classView1.Left = 100;
            classView1.Top = 100;
            classView2.Left = 300;
            classView2.Top = 100;
            app.OpenDiagram(diagram);
        }
        finally{
            app.EndUpdate();
        }
}
```

Deleting UML View Elements

The **DeleteView** method of **IStarUMLApplication** interface can be used to delete UML view elements. Caution should be taken in that when a model element is deleted, its view elements are automatically deleted together, but when a view element is deleted its model element is not deleted.

The following example shows deleting view elements that were created in the example above.

```
...
app.DeleteView(dependencyView);
app.DeleteView(associationView);
```

Using APIs for Application Objects

Application Object Management

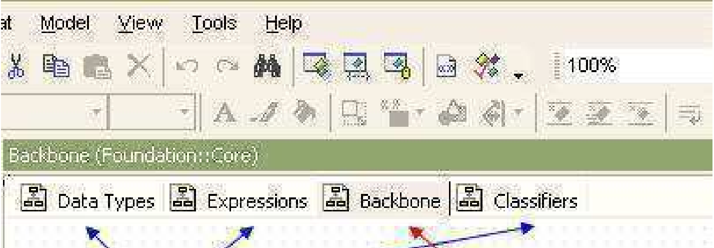
StarUMLApplication Object

The first thing to acquire in order to use StarUML™'s external API is reference to a **StarUMLApplication** object. All other objects can be access through this. The **IStarUMLApplication** interface is an abstraction of the StarUML™ application itself and contains the following methods.

- User action related methods (Undo, Redo, ClearHistory, BeginUpdate, EndUpdate, BeginGroupAction, EndGroupAction, ...)
- Element editing related methods (Copy, Cut, Paste, ...)
- Model, view, and diagram deletion related methods (DeleteModel, DeleteView, ...)
- Reading values of option items (GetOptionValue)
- Log, message, and web browsing related methods (Log, AddMessageItem, NavigateWeb, ...)
- Opened diagram management (OpenDiagram, CloseDiagram, ...)
- Others (FindByPathname, SelectInModelExplorer, ...)

Managing Opened Diagrams

In the StarUML™'s diagram area, **opened diagrams** are managed under tabs as illustrated below. The currently activated diagram is called **active diagram**.



To open a diagram, use the following code. If the diagram is not currently open, the diagram will open and automatically become active. If the diagram is already opened, it will be set as the active diagram.

```
var app = new ActiveXObject("StarUML.StarUMLApplication");
var dgm = ...  // Assign a diagram to open.
app.OpenDiagram(dgm);
```

To obtain reference to opened diagrams, use the **GetOpenedDiagramCount** and **GetOpenedDiagramAt** methods.

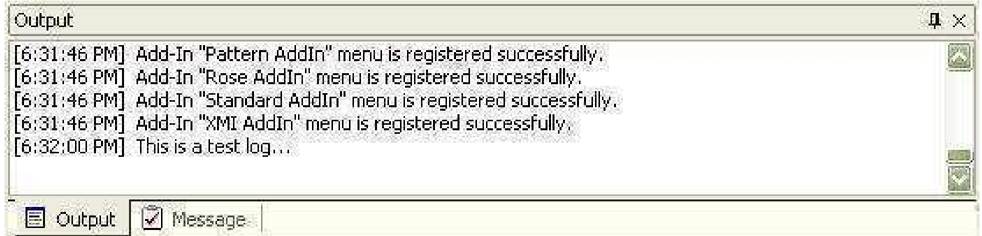
```
var app = new ActiveXObject("StarUML.StarUMLApplication");
...
for (i=0; i<app.GetOpenedDiagramCount(); i++) {
    var dgm = app.GetOpenedDiagramAt(i);
    ...
}
```

Opened diagrams can also be closed. In this case, the **CloseDiagram** method can be used. Use the **CloseAllDiagram** method to close all diagrams, or use the **CloseActiveDiagram** method to close the active diagram.

```
var app = new ActiveXObject("StarUML.StarUMLApplication");
var dgm = ...  // Assign a diagram to close.
app.CloseDiagram(dgm);
```

Recording Log

The **[Output]**
tab in StarUML™'s information area provides the interface for recoding and showing the application execution log to the user.



To record log in the **[Output]** section, use the **Log** method as shown in the following example.

```
var app = new ActiveXObject("StarUML.StarUMLApplication");
app.Log("This is a test log...");
```

Managing Message Items

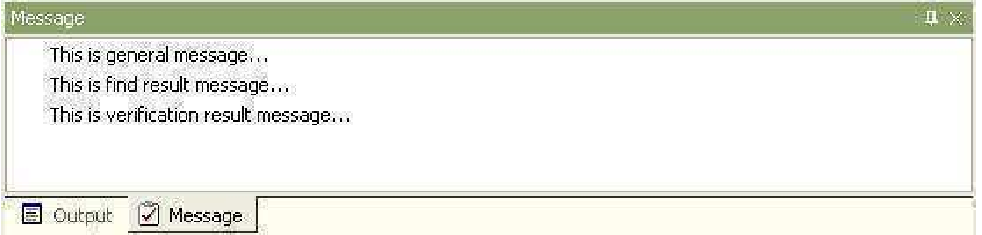
StarUML™ uses message items to display specific messages to the user. Message items are used to notify details or elements that were not found in element find or did not pass model verification. There are three types of message item: general items, element find result items, and model verification result items.

Value	literal	Description
0	mkGeneral	General message items.

1	mkFindResult	Message items for element find results.
2	mkVerificationResult	Message items for model verification results.

When adding a message item, the message item's type, content and related element must be referenced. The following example shows adding three types of message with different message contents to reference a project element. The result is shown in the following illustration.

```
var app = new ActiveXObject("StarUML.StarUMLApplication");
app.AddMessageItem(0, "This is general message...", app.GetProject());
app.AddMessageItem(1, "This is find result message...", app.GetProject());
app.AddMessageItem(2, "This is verification result message...", app.GetProject());
```



Double-clicking a message automatically selects the related element in the model explorer, and if the element is expressed in a diagram, the diagram becomes active.

Finding Element by Pathname

Elements can be searched by pathnames. For example, the pathname for element Class1 located under Package2 and under Package1 is "**::Package1::Package2::Class1"**. A pathname is a series of element names linked by the "::" delimiter. The search always starts from the top level project. Since the name of the top level project is always a null string, any pathname starts with "::". However, it is possible to omit the initial "::". In other words, an expression such as "**Package1::Package2::Class2**" is regarded as the same pathname as the one above. The following example shows obtaining reference to a model element by pathname.

```
var app = new ActiveXObject("StarUML.StarUMLApplication");
var elem = app.FindByPathname("::Logical View::Class1");
...
```

Controlling Application Updates

When the user makes a specific modification or performs a specific command through API, the modification is immediately updated and shown in StarUML™. However, when performing complex tasks through API, many commands have to be executed in one go, and if each task is applied each time, the display will clog up and processing speed will decrease. In such a case, it is better to stop the modification update, perform the various complex tasks, and then apply the changes all together at the same time. **StarUMLApplication** object provides such functions through the **BeginUpdate** and **EndUpdate** methods.

The user can call the **BeginUpdate** method before performing complex and long process tasks, and call the **EndUpdate**
method immediately after the tasks to apply the changes. Care must be taken in that no changes will be applied at all if **EndUpdate** cannot be called, due to errors or other problems while processing tasks after calling **BeginUpdate**. To prevent such problems, exception process techniques (especially, try … finally) should be used as shown in the following example.

```
var app = new ActiveXObject("StarUML.StarUMLApplication");
...
app.BeginUpdate();
try {
  ... // Place tasks to process here.
}
finally {
  app.EndUpdate();  // The finally block will be executed even if an exception occurs in the try b
```

```
  app.EndUpdate(); // The finally block will be executed even if an exception occurs in the try
}
...
```

For indicating the end of modifications and triggering application of the changes, the **EndUpdate2** method can also be used instead of the **EndUpdate** method. Both methods have the same effect, but **EndUpdate2** allows more detailed control. This method performs more detailed control through the following two arguments.

Argument	Type	Description
CompletelyRebuild	Boolean	Rebuilds all tree structures displayed in the model explorer from the beginning. Setting the value of this argument to 'True' may allow faster application of changes if the changes include creation or modification of large quantities of model elements. The **EndUpdate()** method is the same as having this value set as 'False'.
UseUpdateLock	Boolean	Applies the insert/delete/modify results of the tree items in the model explorer in one go. In other words, changes in the tree items are not visually displayed in the GUI but are processed at at the same time. Setting the value of this argument to 'True' when the model is very large will cause the process to take a relatively longer time, even if the model elements modified are few. When this value is 'True', the process time is proportional to the total number of model elements rather than the number of model elements modified. The **EndUpdate()** method is the same as having this value set as 'True'.

Using Group Actions

It is possible to undo or redo any user-performed actions. The same applies for any commands performed through API. If a command is executed twice and the user wishes to undo the tasks, undo must be performed twice. However, there are many cases where the user wants a combination of different commands to be processed as a single action. For instance, when performing undo after writing code to automatically add Get function and Set function for a specific attribute, the undo should be able to revert the code to the time before Get function and Set function were added. However, to add Get/Set functions, many commands must be used together in combinations. In such a case, multiple commands can be handled as a single group and processed as one action.

StarUMLApplication object allows the execution of many commands as a single action by using the **BeginGroupAction** and **EndGroupAction** methods. When calling the **BeginGroupAction** method, a new virtual group action is created. All other tasks performed after this are added to the group action, and when the **EndGroupAction** method is called, the action grouping is complete. After executing **BeginGroupAction**, even if an error occurs in the tasks included in the group, **EndGroupAction** must be called, and therefore exception processes (especially try … finally) must be handled properly. This group action can be managed as a single action through undo or redo.

```
var app = new ActiveXObject("StarUML.StarUMLApplication");
...
app.BeginGroupAction();
try {
  ...
}
finally {
  app.EndGroupAction();
}
...
```

When calling the **BeginGroupAction** method, the result is the same as calling **BeginUpdate**. In the same way, when calling the **EndGroupAction** method, the result is the same as calling **EndUpdate**. In other words, changes are not applied until the group is properly completed. Therefore the **BeginUpdate** or **EndUpdate** methods must not be used between **BeginGroupAction** and **EndGroupAction**.

Element Selection Management

StarUML™ allows ways to acquire information on the model elements or view elements selected by the user, and to select certain elements by force. All of these functions are defined in **ISelectionManager** interface.

Acquiring Selected Elements

In order to acquire the list of model elements or view elements currently selected, reference to **SelectionManager** must be acquired first. And then codes like the following example can be used to acquire reference to the selected model elements or view elements.

```
var app = new ActiveXObject("StarUML.StarUMLApplication");
var selmgr = app.SelectionManager;

// List selected model elements.
for (i=0; i<selmgr.GetSelectedModelCount(); i++) {
    var m = selmgr.GetSelectedModelAt(i);
    ...
}

// List selected view elements.
for (i=0; i<selmgr.GetSelectedViewCount(); i++) {
    var v = selmgr.GetSelectedViewAt(i);
    ...
}
```

Acquiring Currently Active Diagram

Reference can be made to the currently active diagram (the diagram currently displayed on the StarUML™ screen). A diagram is always managed by two separate objects: **Diagram** and **DiagramView**. References to both **Diagram** object and **DiagramView** object can be acquired directly.

```
var app = new ActiveXObject("StarUML.StarUMLApplication");
var selmgr = app.SelectionManager;
var dgm = selmgr.ActiveDiagram  // Diagram object of the currently active diagram
var dgmview = selmgr.ActiveDiagram  // DiagramView object of the currently active diagram
```

Selecting Model Elements

To select specific model elements (e.g. Class, Interface, Component, ...), use the **SelectModel** method. Calling this method deselects all of the currently selected elements and selects just one of the elements. To maintain the current selection and add model elements to the selection, the **SelectAdditionalModel** method must be used.

```
var app = new ActiveXObject("StarUML.StarUMLApplication");
var selmgr = app.SelectionManager;
var m = ...  // Assign reference to model element to select.
...
selmgr.SelectModel(m);  // Select only the model element 'm'.
...
selmgr.SelectAdditionalModel(m); // Add model element 'm' to selection.
...
```

To cancel the selection of model elements, use the **DeselectModel** method as shown in the example below.

```
var app = new ActiveXObject("StarUML.StarUMLApplication");
var selmgr = app.SelectionManager;
var m = ...  // Assign reference to model element to deselect.
...
selmgr.DeselectModel(m);  // Deselect model element 'm'.
...
selmgr.DelselectAllModels(); // Deselect all model elements.
...
```

Selecting View Elements

To select view elements illustrated in a diagram, use the **SelectView** method. Calling this method deselects all of the currently selected view elements and selects just one of them. To maintain the current selection and add model view elements to the selection, the **SelectAdditionalView** method must be used.

```
var app = new ActiveXObject("StarUML.StarUMLApplication");
var selmgr = app.SelectionManager;
var v = ...
...
selmgr.SelectView(v);
...
selmgr.SelectAdditionalView(v);
...
```

To cancel the selection of view elements, use the **DeselectView** method as shown in the example below.

```
var app = new ActiveXObject("StarUML.StarUMLApplication");
var selmgr = app.SelectionManager;
var v = ...  // Assign reference to view element to add.
...
selmgr.DeselectView(v);  // Select only the view element 'v'.
...
selmgr.DelselectAllViews(); // Add view element 'v' to the selection.
...
```

Selecting Diagram Areas

View elements in certain areas can be selected by entering coordinates for the area in the currently active diagram. Use the **SelectArea** method to do this, or use the **SelectAdditionalArea** method to add elements to the selection. The following example selects all view elements located within the area of the coordinates (100, 100, 500, 300) in the currently active diagram.

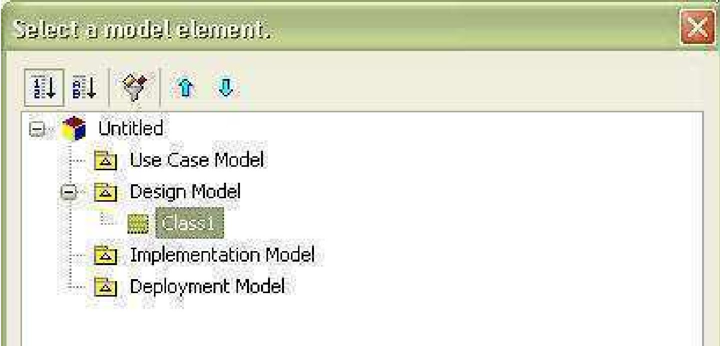
```
var app = new ActiveXObject("StarUML.StarUMLApplication");
var selmgr = app.SelectionManager;
selmgr.SelectArea(100, 100, 500, 300);
```

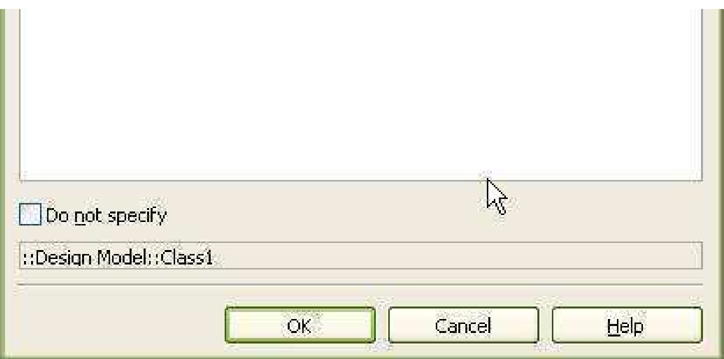
Element Selection Dialog Management

StarUML™ provides two types of dialog for selecting specific elements: a tree view type, **ElementSelector,** and a list view type, **ElementListSelector**. **ElementSelector** is the most commonly used method as it allows selection of elements in a tree view structure just as in the model explorer. **ElementListSelector** is used to list and select elements of the same types.

Managing ElementSelector Object

ElementSelector
is a dialog that displays a tree view structure and allows the user to select an element just like the model explorer as shown in the illustration below. The user can select an element or set it to select nothing at all (set a null value).





Reference to an **ElementSelector** dialog object can be acquired through a **StarUMLApplication** object as shown in the example below.

```
var app = new ActiveXObject("StarUML.StarUMLApplication");
var sel_dlg = app.ElementSelector;
```

ElementSelector dialog provides the following property and methods.

Main property	**Description**
AllowNull: Boolean	Defines whether to allow no selection (setting a null value).
Main method	**Description**
Filter(Filtering: ElementFilteringKind)	Defines what type of modeling elements to display. Value can be any one of the following. fkAll (0): Shows all modeling elements. fkPackages (1): Shows UMLPackage type elements (UMLPackage, UMLModel, UMLSubsystem) only. fkClassifiers (2): Shows UMLClassifier type elements only.
ClearSelectableModels	Clears selectable element type list.
AddSelectableModel(ClassName: String)	Adds the selected type to the selectable element type list. Argument value example: "UMLClass"
RemoveSelectableModel(ClassName: String)	Removes the selected type from the selectable element type list. Argument value example: "UMLClass"
Execute(Title: String): Boolean	Executes the dialog. Sets the dialog title with the argument string.
GetSelectedModel: IModel	Returns reference to the user-selected elements.

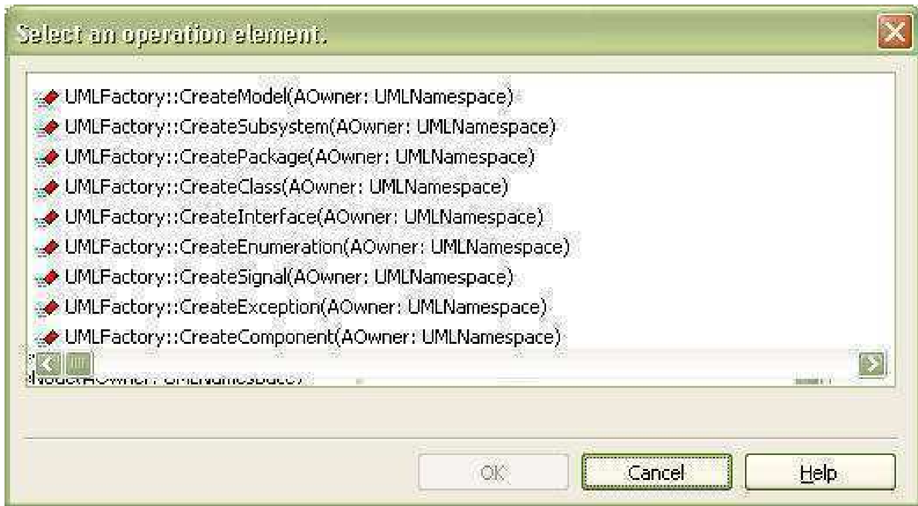
The following example shows the whole process of executing **ElementSelector** dialog and acquiring the selected elements.

```
fkClassifiers = 2;

var app = new ActiveXObject("StarUML.StarUMLApplication");
var sel_dlg = app.ElementSelector;

sel_dlg.AllowNull = false;
sel_dlg.Filter(fkClassifiers)
sel_dlg.ClearSelectableModels();
sel_dlg.AddSelectableModel("UMLModel");
sel_dlg.AddSelectableModel("UMLSubsystem");
sel_dlg.AddSelectableModel("UMLPackage");

if (sel_dlg.Execute("Select a classifier type element.")){
    var elem = sel_dlg.GetSelectedModel;
    ...
}
else{
    // If canceled, ...
```

```
}
```

Managing ElementListSelector Object

ElementListSelector
is a dialog that displays a list of selectable elements in a list view and allows the user to select an element.



Reference to an **ElementListSelector** dialog object can be acquired through a **StarApplication** object as shown in the example below.

```
var app = new ActiveXObject("StarUML.StarUMLApplication");
var sel_dlg = app.ElementListSelector;
```

ElementListSelector dialog provides the following property and methods.

Main property	**Description**
AllowNull: Boolean	Defines whether to allow no selection (setting a null value).
Main method	**Description**
ClearListElements	Clears the list.
AddListElement(AModel: IModel)	Adds the model element defined by argument to the list.
AddListElementsByCollection(AModel: IModel; CollectionName: String; ShowInherited: Boolean)	Adds the collection elements of the model element defined by argument to the list. 'ShowInherited' argument defines whether to trace the inheritance structure of the selected model element and add collection items of upper level elements to the list.
AddListElementsByClass(MetaClassName: String; IncludeChildInstances: Boolean)	Adds the elements of the types defined by argument to the list. If the 'IncludeChildInstances' argument is 'true', child elements of the selected type are also added to the list.
Execute(Title: String): Boolean	Executes the dialog. Sets the dialog title with the argument string.
GetSelectedModel: IModel	Returns reference to the user-selected elements.

The following example executes **ElementListSelector** dialog, and prompts the user to select an element from the operation collection of a specific class element. Since the "ShowInherited" argument is "true", if there are parent classes for the selected class element, the operation collection of this class element can also be selected.

```
var app = new ActiveXObject("StarUML.StarUMLApplication");
var sel_dlg = app.ElementListSelector;
```

```
sel_dlg.AllowNull = false;
sel_dlg.ClearListElements();

var class = ... // Get reference to class element.
sel_dlg.AddListElementsByCollection(class, "Operations", true);

if (sel_dlg.Execute("Select an operation element.")){
    var selElem = sel_dlg.GetSelectedModel;
    ...
}
else{
    // If canceled, ...
}
```

The example above used the **AddListElementsByCollection** method. The following example now uses the **AddListElementsByClass**
method. Since the "IncludeChildInstances" argument is "true", elements of the selected types and all their child elements are added to the list.

```
var app = new ActiveXObject("StarUML.StarUMLApplication");
var sel_dlg = app.ElementListSelector;

sel_dlg.AllowNull = false;
sel_dlg.ClearListElements();

sel_dlg.AddListElementsByClass("UMLClassifier", true);

if (sel_dlg.Execute("Select a classifier type element.")){
    var selElem = sel_dlg.GetSelectedModel;
    ...
}
else{
    // If canceled ...
}
```

Using APIs for Meta-Objects

This section describes the concept of StarUML™ meta-model elements and their usage. As introduced in **"Chapter 2. StarUML Architecture"** StarUML™ meta-model elements are elements that belong to the **Non_Modeling Elements::MetaModeling Elements** package.

Basic Concept of Meta-Model

StarUML™ meta-model elements provide methods for meta-level access to the StarUML™ modeling elements described in above section. In short, meta-model elements are the elements that define these modeling elements. Using meta-model elements allows listing of elements for each modeling element and accessing information on modeling elements in the currently open project. Although the concept of meta-model may seem difficult for novice users, it is highly recommended that you read the following descriptions, as meta-model comes in really handy when using StarUML™.

Simple Example of Using Meta-Model

Before explaining the meta-model concept, let us look at the following simple example for a brief overview of using StarUML™ meta-model elements. First, suppose we need to get a list of all **Class** elements in the currently running StarUML™ application through external API. Although a search can be conducted from the top-level project element through all of the lower level elements, using meta-model elements can simplify the process. Look at the following code.

```
var app = new ActiveXObject("StarUML.StarUMLApplication");
var meta = app.MetaModel;

var metaClass = meta.FindMetaClass("UMLClass");
for (var i = 0; i < metaClass.GetInstanceCount(); i++){
```

```
for (var i = 0; i < metaClass.GetInstanceCount(); i++){
    var AClassElem = metaClass.GetInstanceAt(i);
    ...
}
```

This example uses meta-model elements to get reference to all **Class** elements. The modeling element name **"UMLClass"** is given as the argument of the **IMetaModel.FindMetaClass** method to access the **Class** elements. The argument can be replaced by **"UMLAttribute"** if a list of all **Attribute** elements is required. In other words, this can be applied to all modeling elements in the same way.

Note: See **"Appendix B. List of UML Modeling Elements"** for element name conventions.

The second example shows how to access information for modeling elements. How do we find out what attributes **Class**
elements—which are UML modeling elements—have in the program implementation code? This question is not about what attributes are defined in a user-created Class element, but what attributes are defined in the Class element itself, which is a UML modeling element. For instance, Class modeling elements have attributes such as **"Name"**, **"Visibility"**, and **"IsAbstract".**

```
var app = new ActiveXObject("StarUML.StarUMLApplication");
var meta = app.MetaModel;

var metaClass = meta.FindMetaClass("UMLClass");
for (var i = 0; i < metaClass.GetMetaAttributeCount(); i++){
    var metaAttr = metaClass.GetMetaAttributeAt(i);
    var attrName = metaAttr.Name;
    ...
}
```

This example acquires the names of all the attributes owned by the Class modeling element. Just like the first example, the argument for the **IMetaModel.FindMetaClass** method can be changed to perform the same task on other modeling elements.

UML Metamodeling Architecture

This section briefly introduces the UML metamodeling architecture. This is helpful for understanding StarUML™ meta-model.

The OMG (Object Management Group) uses a method called metamodeling architecture for defining specifications for UML elements. This meta-modeling architecture consists of the following layers.

- Meta-metamodel
- Metamodel
- Model
- User Objects

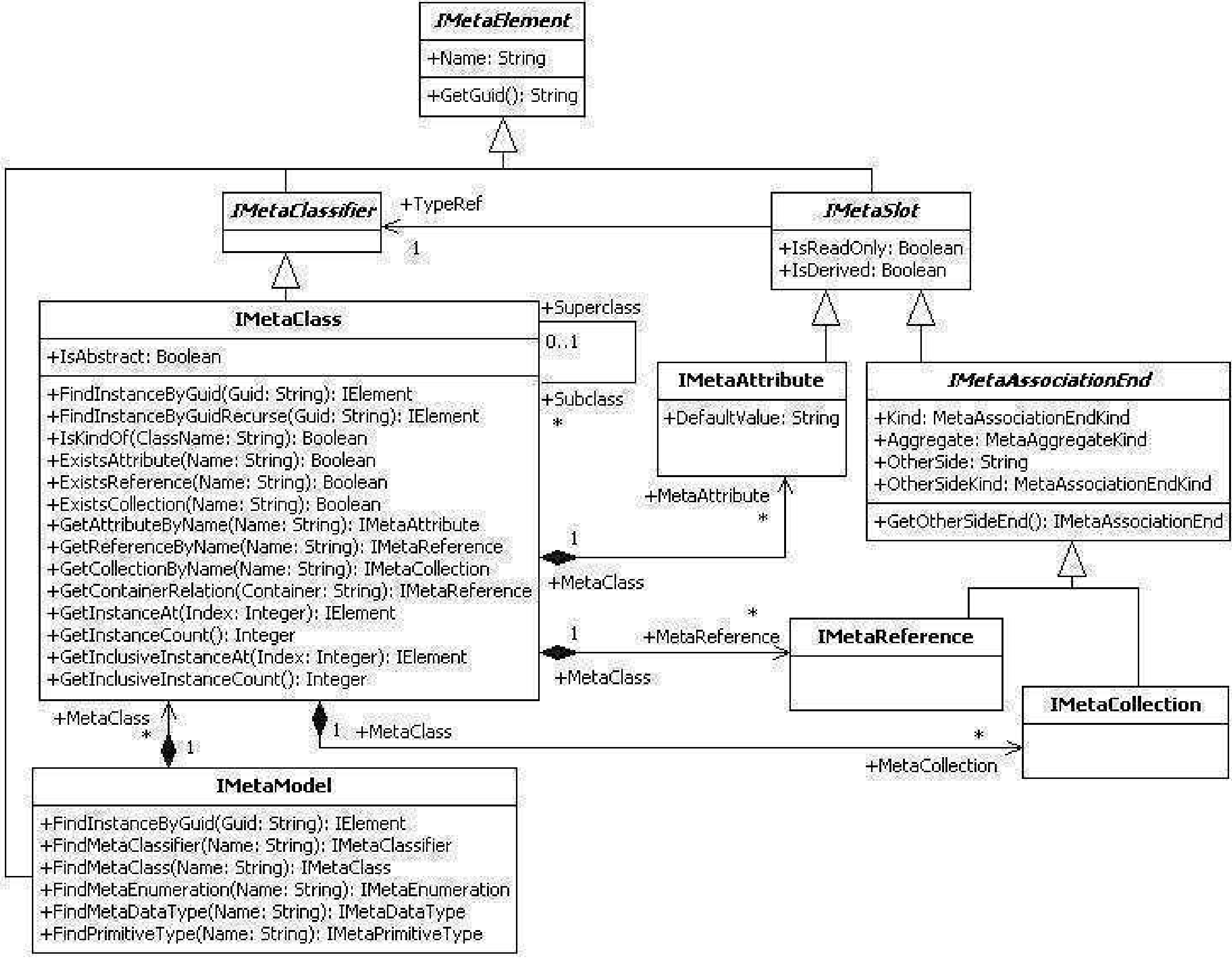
The definitions of UML modeling elements described in the UML Specification fall into the category of **metamodel**. In other words, the common elements in UML like Package, Class, Use Case, and Actor are **metamodel** elements. And the UML elements that are created during software modeling, i.e., the Class elements named as "Class1" or "Class2" are instances of **metamodels**, which fall into the category of **model**. More specifically put, "Class1" and "Class2" are instances of a **metamodel** element called **Class** (**UMLClass** in StarUML™).

The platform layer for defining **UML metamodels** like Package, Class, Use Case, and Actor is **meta-metamodel**; StarUML™ meta-models fall into this **meta-metamodel** layer. In other words, all modeling elements can be seen as instances of the MetaClass type explained below. However, StarUML™ meta-model plays the role of facilitating consistent access to modeling elements at the meta-level rather than defining modeling elements.

Meta-Model Organization

The following diagram illustrates the components and organization of StarUML™ meta-model elements. Some components are omitted due to space constraints. Please refer to the **::Application Model::Non_Modeling Elements::Metamodeling Elements** package of **StarUML Application Model** for the complete diagram.

Elements::Metamodeling Elements package of **StarUML Application Model** for the complete diagram.



StarUML™ meta-model comprises the relatively small number of meta-model elements as shown in the diagram. **IMetaElement** is the top-level element of meta-model elements and has attributes of **Name** and **GUID**. Since modeling elements are instances of a meta-model element (specifically, **IMetaClass**), the **Name** attribute value of **IMetaElement** should be one of the modeling elements' names described in **"Chapter 5. Modeling Element Management".** Examples are "Model", "View", "UMLClass", and "UMLAttribute".

The top-level IMetaElement has meta-model elements like IMetaClassifier and IMetaSlot. IMetaClassifier is a meta-element for the definition of modeling elements themselves, and IMetaSlot is for the definition of modeling element attributes and reference attributes. Also, concrete elements like IMetaClass, IMetaAttribute, IMetaReference, IMetaCollection, and IMetaModel are derived from IMetaClassifier and IMetaSlot; they play the most important roles in the StarUML™ meta-model architecture.

Meta-Model Element Management

IMetaModel

IMetaModel
element maintains and manages meta-model elements as a collection and provides use of other meta-model elements. Only one **IMetaModel**
exists in one StarUML™ application. Reference to the object can be obtained through the **IStarUMLApplication** interface.

```
var app = new ActiveXObject("StarUML.StarUMLApplication");
var meta = app.MetaModel;
```

It has been mentioned that **IMetaModel**

It has been mentioned that **IMetaModel**
element provides use of other meta-model elements. The following example shows obtaining reference to **IMetaClass** meta-elements by using **IMetaModel**. It will be explained again in the **IMetaClass** element section that the number of references to **IMetaClass**
types and the number of modeling elements are the same (check with the following example).

```
var app = new ActiveXObject("StarUML.StarUMLApplication");
var meta = app.MetaModel;

for (var i = 0; i < meta.GetMetaClassCount(); i++){
    var metaClass = meta.GetMetaClassAt(i);
    ...
}
```

Although omitted in the class diagram above, there are **IMetaEnumeration**, **IMetaDataType**, and **IMetaPrimitiveType** meta-model elements in similar relationships with IMetaClass, and the **IMetaModel** interface provides reference to these elements. The **IMetaEnumeration** element is a meta-element for defining enumeration type related to modeling elements. **UMLVisibilityKind** and **UMLAggregationKind** are examples of **IMetaEnumeration** element instances. **IMetaDataType** is a meta-element for defining data type other than enumeration and primitive type. **Points** type is the only instance of this. And **IMetaPrimitiveType** element is a meta-element for defining primitive types, which are **Integer**, **Real**, **Boolean**, and **String**.

The **IMetaModel**
interface provides a find method for meta-elements. The following example is a section of the first example in this chapter. It shows the obtaining of reference to **IMetaClass** elements for the **UMLClass** modeling element using the **IMetaModel.FindMetaClass**
method (the number of references to IMetaClass types is same as the number of the modeling elements).

```
var app = new ActiveXObject("StarUML.StarUMLApplication");
var meta = app.MetaModel;
var metaClass = meta.FindMetaClass("UMLClass");
...
```

Like the **IMetaClass**, the **IMetaModel** interface provides a find method to other meta-elements like **FindMetaClassifier**, **FindMetaEnumeration**, **FindMetaDataType**, and **FindPrimitiveType**.

The **IMetaModel** interface is a GUID for modeling elements and provides the **FindInstanceByGuid** method that acquires reference to respective modeling elements. The **FindInstanceByGuid** method returns the **IElement** type reference. The following code can be used as an extension of the example above.

```
...
var guid = ...
var elem = meta.FindInstanceByGuid(guid);
...
```

IMetaClass

The **IMetaClass**
element is a meta-element that provides definition for each modeling element, and maintains and manages instances of each modeling element as a collection. In the StarUML™ application, the number of **IMetaClass** elements is the same as the number of modeling elements. The following code shows obtaining **IMetaClass** type reference for each modeling element using the **IMetaModel.FindMetaClass** method.

```
var app = new ActiveXObject("StarUML.StarUMLApplication");
var meta = app.MetaModel;

var metaClassOfPackage = meta.FindMetaClass("UMLPackage");
var metaClassOfClass = meta.FindMetaClass("UMLClass");
var metaClassOfAttribute = meta.FindMetaClass("UMLAttribute");
...
```

Another way to obtain reference to the **IMetaClass**
type elements is to use the GetMetaClass method of the IElement interface, which is the top-level type of modeling element.

```
elem = ... // Get reference to modeling elements.
var metaClass = elem.GetMetaClass();
```

The **IMetaClass**
interface provides methods to obtain superclasses and subclasses in the inheritance structure of each modeling element. The superclass of the IElement type element—which is the top-level modeling element—is null.

```
var metaClass = ... // Get IMetaClass type reference.
var superCls = metaClass.Superclass;
...
for (var i = 0; i < metaClass.GetSubclassCount(); i++){
    var subCls = metaClass.GetSubclassAt(i);
    ...
}
```

The **IMetaClass** interface is a GUID for modeling elements and provides the **FindInstanceByGuid** method, which is similar to **IMetaModel.FindInstanceByGuid**, to obtain reference to respective modeling elements. **IMetaClass**'s
method is more efficient than IMetaModel's method since it searches for modeling elements of specific types only. If no matching result is found in the respective type, **FindInstanceByGuidRecurse** can be used to search all derivative modeling elements as well.

The first example in this section illustrated searching for instances of a specific modeling element using the **GetInstanceCount** and **GetInstanceAt** methods of the **IMetaClass** interface. Instances of modeling elements refer to user-created elements.

```
var metaClass = ... // Get IMetaClass type reference.
for (var i = 0; i < metaClass.GetInstanceCount(); i++){
    var AElem = metaClass.GetInstanceAt(i);
    ...
}
```

IMetaAttribute

The **IMetaAttribute**
interface can be used to read the specifications for attributes of each modeling element. Reference to **IMetaAttribute** can be obtained through the **IMetaClass** interface as shown below. The **IMetaClass** interface also provides the **ExistsAttribute** method that checks for the existence of an attribute with a specific name, and the **GetAttributeByName** method that returns **IMetaAttribute** type elements of a specific name.

```
var app = new ActiveXObject("StarUML.StarUMLApplication");
var metaClass = app.MetaModel.FindMetaClass("UMLClass");

for (var i = 0; i < metaClass.GetMetaAttributeCount(); i++){
    var metaAttr = metaClass.GetMetaAttributeAt(i);
    ...
}
```

The following example shows reading the specifications for attributes of modeling elements.

```
var metaAttr = ... // Get IMetaAttribute type reference.
var metaType = metaAttr.TypeRef;

var attrName = metaAttr.Name;
```

```
var attrType = metaType.Name;
...
```

Also, **IMetaSlot**, the upper-level interface for **IMetaAttribute**, provides the **IsReadOnly** and **IsDerived** properties. **IsReadOnly** indicates whether the respective attribute is read-only, and **IsDerived** indicates whether the respective attribute actually does not exist but is resembled by other attributes.

IMetaReference and IMetaCollection

The **IMetaReference** and **IMetaCollection**
elements define the reference attributes that specify references between different modeling elements. These references all express associations. While **IMetaReference** shows references with multiplicity of '1' or less, **IMetaCollection**
shows references that have to be expressed as collections. This is the only difference between the **IMetaReference** and **IMetaCollection** interfaces (**IMetaReference** and **IMetaCollection** are both derived from the **IMetaAssociationEnd** interface).

First, let us look at an example of obtaining reference to **IMetaReference** and **IMetaCollection** objects. Just like **IMetaAttribute**, the **IMetaClass** interface can be used.

```
var metaClass = ... // Get IMetaClass type reference for a specific modeling element.

// Get references to IMetaReference type objects.
for (var i = 0; i < metaClass.GetMetaReferenceCount(); i++){
    var metaAttr = metaClass.GetMetaReferenceAt(i);
    ...
}

// Get references to IMetaCollection type objects.
for (var i = 0; i < metaClass.GetMetaCollectionCount(); i++){
    var metaAttr = metaClass.GetMetaCollectionAt(i);
    ...
}
```

The **IMetaAssociationEnd** interface, the shared upper-level type for **IMetaReference** and **IMetaCollection**, provides properties and methods for defining specifications of reference attributes (associations) for the respective modeling element.

The **Kind**
property simply determines whether the respective association is a simple reference type or a collection reference type. The **IMetaReference** type is a simple reference type and the **IMetaCollection** type is a collection reference type. The **Aggregate** property shows the **AggregationKind** attribute of the respective association. This value is an enumerative type and can be one of the following values:

- makNone (0): None
- makAggregate (1): Aggregation association, or
- makComposite (2): Composition association.

The **OtherSide** property shows the name of the **AssociationEnd** on the other side of the association, and the **OtherSideKind** property shows whether the **AssociationEnd** on the other side is a simple reference type or a collection reference type.

The **GetOtherSideEnd** method returns the **IMetaAssociationEnd** type reference at the **AssociationEnd** on the other side of the association. The following example shows how to use the properties and methods provided by the **IMetaAssociationEnd** interface that is the shared upper-level type of **IMetaReference** and **IMetaCollection**.

```
var metaSlot = ... // Get IMetaReference or IMetaCollection type reference.
var kind = metaSlot.Kind;
var aggregate = metaSlot.Aggregate;
var otherSide = metaSlot.OtherSide;
var otherSideKind = metaSlot.OtherSideKind;
var otherSideEnd = metaSlot.GetOtherSideEnd();
```

```
...
```

The **TypeRef** reference attribute of the **IMetaSlot** interface can be used to find out the **IMetaClass** element for an **IMetaReference** or **IMetaCollection**
type object. The following example shows how to read the element on the opposite side of the association for a modeling element.

```
var metaSlot = ... // Get IMetaReference or IMetaCollection type reference.
var otherSideEnd = metaSlot.GetOtherSideEnd();
var otherSideMetaClass = otherSideEnd.TypeRef;
...
```

Chapter 5. Writing Approaches

Basic Concept of Approach

There are countless methodologies for software development, and each company or organization has its own, or uses an existing one that is modified to meet the requirements of its development team or projects. Application domains, programming languages, and platforms are also different for each piece of software developed. Consequently, many items have to be configured in the initial phase of software modeling. Approaches to facilitate this initial configuration of the environment for a project depend on the software development methodology or platform requirements. Users can specify appropriate approaches in order to create projects in certain forms.

Approaches perform the following tasks in creating projects.

- Approaches configure profiles for use in projects. The profiles defined in approaches are automatically included in projects when the projects are being created.
- Approaches determine the package structures. The package structures are usually dependent on the software development process models. For example, using the 4+1 View Model Approach selects the five packages "Logical View", "Physical View", "Process View", "Development View" and "Use Case View".
- Approaches configure frameworks to reference. For projects that are dependent on specific programming languages or platforms, the respective frameworks can be specified in the approaches to be loaded when creating projects. For example, if the current project is developed in Java, the JFC (Java Foundation Classes) framework can be specified in the approach, so that it is included in the project as a package for direct reference.
- Approaches import model fragments to include basically.

Follow the steps below to create a new approach.

1. Create an approach document file (.apr) to define the new approach.
2. Copy the approach document file (.apr) to subdirectory of module directory.

Creating New Approach

Basic Structure of Approach Document File

Approach document files are created according to XML document conventions, and the extension name is .apr (approach file). The approach contents are contained within the **APPROACH** element, and there must not be any errors in syntax or contents.

```
<?xml version=”1.0” encoding=”...” ?>
<APPROACH version="...">
    <HEADER>
        ...
    </HEADER>
    <BODY>
        ...
    </BODY>
</APPROACH>
```

- encoding property: Specifies the encoding property value for the XML document (e.g. UTF-8, EUC-KR). For details on this property value, see XML-related resources.
- version property (APPROACH element): Version information for the approach document format (e.g. 1.0).
- HEADER element: See the **Header Contents** section.
- BODY element: See the **Body Contents** section.

Header Contents

The HEADER section of an approach document contains general information for the approach such as the approach

The HEADER section of an approach document contains general information for the approach such as the approach name and description.

```
<HEADER>
    <NAME>...</NAME>
    <DISPLAYNAME>...</DISPLAYNAME>
    <DESCRIPTION>...</DESCRIPTION>
</HEADER>
```

- NAME element: Contains the name of the approach. It is a unique name to identify the approach from the others.
- DISPLAYNAME element: Contains the name of the approach that is shown to users in New Project dialog.
- DESCRIPTION element: Contains detailed description of the approach.

Body Contents

The BODY section of an approach document largely consists of the **IMPORTPROFILES** element and the **MODELSTRUCTURE**
element. The IMPORTPROFILES element specifies the name of the profile to load when creating projects, and the MODELSTRUCTURE element contains information for the initial project model structure and the framework to load.

```
<BODY>
    <IMPORTPROFILES>
        <PROFILE>...</PROFILE>
        ...
    </IMPORTPROFILES>
    <MODELSTRUCTURE>
        ...
    </MODELSTRUCTURE>
</BODY>
```

- IMPORTPROFILES element: Lists the profiles to include in projects using multiple PROFILE elements.
- PROFILE element: Contains the name of a profile to include in projects.
- MODELSTRUCTURE element: See the **Model Structure** section.

Model Structure

The MODELSTRUCTURE element expresses the initial package structure for projects. Model, SubSystem, Package and Frameworks are hierarchically organized. For instance, model, subsystem, package or framework elements can further be defined under the SUBSYSTEM element. While a framework is a package element by itself, it cannot contain other package elements.

The following shows the syntax structure for a MODELSTRUCTURE element.

```
<MODELSTRUCTURE>
    model_expression*
</MODELSTRUCTURE>
```

```
model_expression ::= model_element
    | package_element
    | subsystem_element
    | import_framework
    | import_model_fragment.
model_element ::= <MODEL name="..." stereotypeProfile="..." stereotypeName="...">model_expression<
package_element ::= <PACKAGE name="..." stereotypeProfile="..." stereotypeName="...">model_express
subsystem_element ::= <SUBSYSTEM name="..." stereotypeProfile="..." stereotypeName="...">model_exp
import_framework ::= <IMPORTFRAMEWORK name="..."/>.
import_model_fragment ::= <IMPORTMODELFRAGMENT fileName="..."/>.
```

- name property (MODEL, PACKAGE, SUBSYSTEM elements): The name of each UML model element.
- stereotypeProfile property (MODEL, PACKAGE, SUBSYSTEM elements): The name of profile that defines the stereotype applying to the model element.
- stereotypeName property (MODEL, PACKAGE, SUBSYSTEM elements): The name of stereotype that apply to the model element.
- name property (IMPORTFRAMEWORK element): The name of the registered framework to include.
- fileName property (IMPORTMODELFRAGMENT element): The file name of model fragment to import to parent model element.

Approach Document Example

The following is an example of an approach for a 4+1 View Model.

```
<?xml version="1.0" encoding="UTF-8" ?>
<APPROACH version="1">
    <HEADER>
        <TITLE>4+1 View Model</TITLE>
        <DESCRIPTION>This is an approach to support 4+1 View Model in .NET platform.</DESCRIPTION>
    </HEADER>
    <BODY>
        <IMPORTPROFILES>
            <PROFILE>4+1Profile</PROFILE>
            <PROFILE>CSharpProfile</PROFILE>
        </IMPORTPROFILES>
        <MODELSTRUCTURE>
            <MODEL name="UseCase View"/>
            <MODEL name="Logical View">
                <IMPORTFRAMEWORK name="dot_net_framework"/>
           </MODEL>
            <MODEL name="Development View"/>
            <MODEL name="Process View"/>
            <MODEL name="Deployment View"/>
        </MODELSTRUCTURE>
    </BODY>
</APPROACH>
```

Registering New Approach

To make an approach to be recognized automatically by StarUML, must place it in the subdirectory of StarUML module directory(<install-dir>\modules). StarUML searches and reads all approaches in the module directory and registers them at the program automatically when StarUML is initializing. If approach file is invalid or it's extension file name is not .apr, StarUML will not read the approach and ignore it. It is recommended that make a subdirectory in the StarUML module directory and place the approach in there to avoid modules being out of order .

Note:
To register approach icon, Make icon file for the approach and place it in the directory of the approach. Icon of the approach is displayed with the name at approaches list in the New Project dialog. If there is no icon file which name is same of the approach's, default icon is registered as icon of the approach.

Note: Delete files of the approach from the StarUML module directory(<install-dir>\modules) not to use the approach any more.

Using Approach-Related Methods

Reading Information for Approaches Installed in the System

Since approaches are for initial project configurations, they usually do not need to be accessed by programs directly. Therefore, StarUML™ does not support COM automation objects for managing approaches. Nevertheless, the **GetAvailableApproachCount()** and **GetAvailableApporachAt()** of **IProjectManager** can be used to obtain the count and names of the approaches installed in the system.

```
IProjectManager.GetAvailableApproachAt(Index: Integer): String
IProjectManager.GetAvailableApproachCount(): Integer
```

Creating Project with Approach

A new project can be created with a given approach by calling **IProjectManager.NewProjectByApproach()**. The ApproachName entered as a parameter must be the name of one of the approaches installed in the system. Otherwise, this will result in an empty project. The expression for **NewProjectByApproach()** in **IProjectManager** is as follows.

```
IProjectManager.NewProjectByApproach(ApproachName: String)
```

The following is a Jscript example for creating a new project with the "UMLComponents" approach.

```
var app = new ActiveXObject("StarUML.StarUMLApplication");
var prjMgr = app.ProjectManager;
prjMgr.NewProjectByApproach("UMLComponents");
```

Chapter 6. Writing Frameworks

Basic Concepts of Model Framework

A model framework enables use of application frameworks or class libraries in StarUML™. For instance, JFC (Java Foundation Classes), MFC (Microsoft Foundation Classes), and VCL (Visual Component Library) can be the objects for a model framework. As will be described later in this chapter, the user can define his or her own model framework as well. The biggest advantage of using model frameworks is that it facilitates shared use and reuse of the common and basic modeling elements and structures.

The "Import Model Framework" dialog (illustration below), accessible through the
[File]-[Import]-[Framework...]
menu in the StarUML™ application, displays a list of the model frameworks installed in the system. Selecting an item from the list and running it results in automatic inclusion of the modeling structure defined by the model framework in the path specified. A model framework consists of many unit files, and the model frameworks included in StarUML™ are treated in the same way as the units.

The list of the model frameworks installed in the system can be obtained, or specific model frameworks can be included in projects, by using StarUML™'s external API as illustrated above. Details on this will be discussed later.

Creating New Model Framework

A model framework consists of many unit files (.unt) and one model framework definition document file (.frw), and it may have an optional icon file (.ico). Follow the steps below to define a new model framework.

1. Create unit files that contain model information for the model framework (see**"Chapter 4. Using Open API"**).
2. Create a model framework document file (.frw) that defines the model framework.
3. Copy unit files, model framework document file and icon file to subdirectory of module directory.

Basic Structure of Model Framework Document File

Model framework document files are created according to XML document conventions, and the extension name is.frw (Framework File). Information for a model framework is contained within the **FRAMEWORK** tag, and there must not be any errors in syntax or contents.

```
<?xml version="1.0" encoding="..." ?>
<FRAMEWORK version="...">
    <HEADER>
```

```
        ...
    </HEADER>
    <BODY>
        ...
    </BODY>
</FRAMEWORK>
```

- encoding property: Specifies the encoding property value for the XML document (e.g. UTF-8, EUC-KR). For details on this property value, see XML-related resources.
- version property (FRAMEWORK element): Version information for the framework document format (e.g. 1.0).
- HEADER element: See the **Header Contents** section.
- BODY element: See the **Body Contents** section.

Header Contents

The HEADER section contains general information for the model framework such as the model framework name and description.

```
<HEADER>
    <NAME>...</NAME>
    <DISPLAYNAME>...</DISPLAYNAME>
    <DESCRIPTION>...</DESCRIPTION>
</HEADER>
```

- Name element: Contains the name of the model framework. This acts as the unique ID for the model framework and must be identical with the name of the registry registration key.
- DISPLAYNAME element: Contains the display name used in the "Import Model Framework" dialog, etc.
- DESCRIPTION element: Contains description for the model framework.

Body Contents

The BODY section contains actual information for the model framework and largely consists of the **IMPORTPROFILES** section and the **FRAMEWORKMODELS** section.

```
<BODY>
    <IMPORTPROFILES>
        <PROFILE>...</PROFILE>
        ...
    </IMPORTPROFILES>
    <FRAMEWORKMODELS>
        <UNIT>...</UNIT>
        ...
    </FRAMEWORKMODELS>
</BODY>
```

- IMPORTPROFILES element: Lists the UML profiles to load when the model framework is included.
- PROFILE element: Specifies the name of each UML profile to load.
- FRAMEWORKMODELS element: Lists the unit files that constitute the model framework.
- UNIT element: Specifies the name of each unit file. Only file names are specified, without the path names. The unit files that constitute a model framework must be located under the same path as the model framework document file.

Note:
The "UNIT element" specifies only those unit files that belong to the top-level units. As discussed in "Chapter 4. Using Open API", when a unit contains lower-level units, all the lower-level units are loaded together when the upper-level unit is loaded.

Model Framework Document Example

The following is an example of a model framework document that defines the Java 2 Standard Edition (J2SE) 1.3 model framework.

```
<?xml version="1.0" encoding="UTF-8" ?>
<FRAMEWORK version="1.0">
    <HEADER>
        <NAME>J2SE1.3</NAME>
        <DISPLAYNAME>Java 2 Standard 1.3</DISPLAYNAME>
        <DESCRIPTION>Java 2 Standard Edition (J2SE) 1.3 Framework.</DESCRIPTION>
    </HEADER>
    <BODY>
        <FRAMEWORKMODELS>
            <UNIT>J2SE13 (java).pux</UNIT>
            <UNIT>J2SE13 (javax).pux</UNIT>
            <UNIT>J2SE13 (org).pux</UNIT>
        </FRAMEWORKMODELS>
    </BODY>
</FRAMEWORK>
```

Registering New Model Framework

To make a framework to be recognized automatically by StarUML, must place it in the subdirectory of StarUML module directory(<install-dir>\modules). StarUML searches and reads all frameworks in the module directory and registers them at the program automatically when StarUML is initializing. If framework file is invalid or it's extension file name is not .frw, StarUML will not read the framework and ignore it. It is recommended that make a subdirectory in the StarUML module directory and place the framework in there to avoid modules being out of order.

Note:
To register frameworddk icon, Make icon file for the framework and place it in the directory of the framework. Icon of the framework is displayed with the name at frameworks list in the **[Import Framework]** dialog. If there is no icon file which name is same of the framework's, default icon is registered as icon of the framework.

Note: Delete files of the framework from the StarUML module directory(<install-dir>\modules) not to use the framework any more.

Using Model Framework-Related Methods

Reading Information for Model Frameworks Installed in the System

The list of the model frameworks installed in the system can be viewed through external API. The external APIs for this are the **GetAvailableFrameworkCount** method and the **GetAvailableFrameworkAt** method of the **IProjectManager** interface. The following are the expressions of these two methods.

```
IProjectManager.GetAvailableFrameworkAt(Index: Integer): String
IProjectManager.GetAvailableFrameworkCount(): Integer
```

Importing Model Framework

The **IProjectManager.ImportFramework**
method can be used to include a registered model framework in the current project. The method expression is as follows. The **OwnerPackage**
argument specifies the upper-level model element where the model framework will be included. This must be an **IUMLPackage** type model element. And the **FrameworkName** argument is the name of the model framework to load. This is a string value for the accurate name (ID) of the model framework.

```
IProjectManager.ImportFramework(OwnerPackage: IUMLPackage; FrameworkName: String)
```

The following example shows importing the "J2SE1.3" model framework using the IProjectManager.ImportFramework method.

```
var app = new ActiveXObject("StarUML.StarUMLApplication");
var prjMgr = app.ProjectManager;

var owner = ... // Get reference to IUMLPackage type element.
prjMgr.ImportFramework(owner, "J2SE1.3");
```

Chapter 7. Writing UML Profiles

Basic Concept of UML Profile

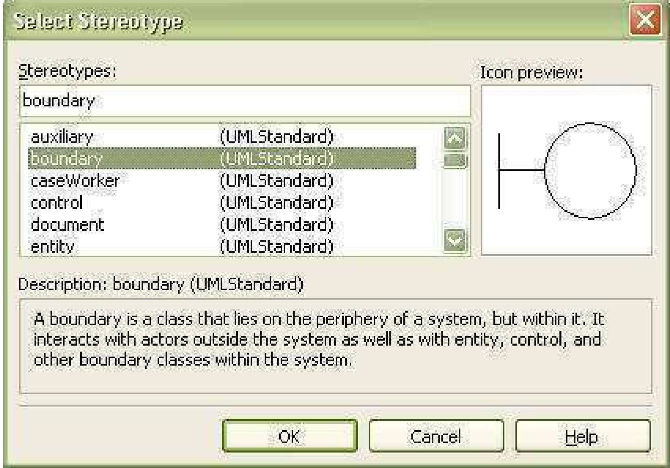
UML Extension Mechanisms

UML is a universal software modeling language that provides an abundance of well-defined modeling concepts and notations to meet all the requirements of general software modeling. Nevertheless, the software modeling/development environment today can take many different forms, and there may be requirements for elements or semantics that do not exist in the UML standard. By default, UML provides concepts for supporting such requirements, and they are called the UML Extension Mechanisms.

UML Extension Mechanisms use **Stereotypes**, **Constraints**, **Tag Definitions**, and **Tagged Values** to extend the semantics of UML modeling elements or define the UML modeling elements with new semantics.

Stereotype

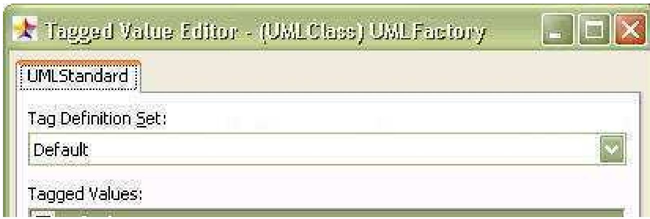
A stereotype is a modeling element that has definitions for adding new properties and constraints to the standard UML modeling elements. A stereotype can also have definitions to provide new notations for modeling elements. The illustration below is the stereotype selection dialog that appears when clicking on the stereotype selection button in the StarUML™ application. The stereotype selection dialog displays a list of the selectable stereotypes defined in the UML profile that is included in the current project. Stereotypes can also be configured or modified through external API. Details on this will be described later.



Note:
Although the UML standard allows each extensible modeling element to have multiple stereotypes, StarUML™ limits each modeling element to only one stereotype.

Tag Definitions

Tag definition is an element that defines new properties that can be added to certain modeling elements. And definitions of the values of the properties added to elements by tag definitions are called Tagged Values. A tagged value can be a basic datatype value, a reference to other modeling elements, or a collection. The following illustration is the extension property editor screen in the StarUML™ application. The extension property editor displays a list of the tag definition items that belong to the selected modeling element as defined by the UML profile. Tagged values of modeling elements can also be configured or modified through external API. Details on this will be described later.



Constraints

A constraint adds a specific constraint to a certain modeling element to allow redefinition of the semantics for the selected modeling element. For descriptions of constraints, please refer to the section **"ExtCore Elements"** in **"Chapter 4. Using Open API".**

Note: StarUML™ UML profile excludes definitions of constraints.

UML Profile

UML profile is a package of UML extension mechanisms. In other words, it is a collection of stereotypes, constraints, tag definitions, and data types that are required for a certain software domain or development platform.

A UML profile consists of **Stereotype**, **Constraint**, **Tag Definition**, and **Data Type** elements. Although the UML standard requires a profile to be defined as a package element with the **"<<profile>>"** stereotype, StarUML™ allows it to be defined as an XML formatted file for easier use.

Additional Extension Mechanism in the StarUML

StarUML profile supports a few of additional extension mechanism with predefined in UML. They are the **Diagram Type**, **Element Prototype**, **Model Prototype**, **Palette Extension**. These extension mechanism extend semantics of the existing elements or provide regular methods for creating the element and apply it to user interface.

Diagram Type

Diagram Type is extension element to define new diagram that has additional semantics based on UML standard diagram. It is useful to define specialized diagram in each phase of design that is data model diagram, robustness analysis diagram, and so on or to apply many kind of diagrams used in various domains to StarUML. Diagram type name is assigned as the "DiagramType" property of the diagram. "DiagramType" property can't be changed as opposed to stereotype. When profile is included in project, it is added in the **[Add Diagram]** menu and let user be able to create a diagram as the diagram type.

Element Prototype

Element prototype defines a sample for element creating which properties are preset. User can create an element with copy of sample by registering element prototype in the palette or using external API.

Model Prototype

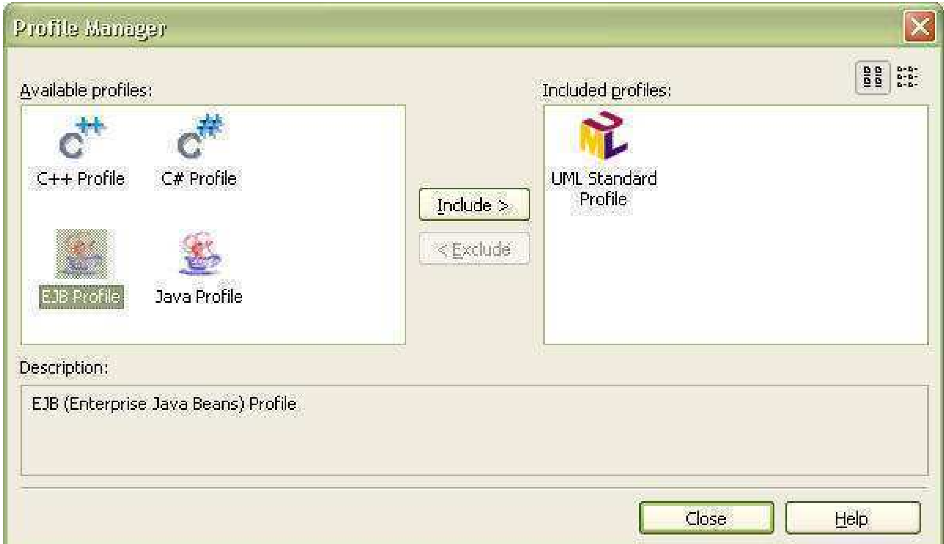
Model prototype only can be applied to model even if it is similar to element prototype. It is inserted in the **[Add Model]**
as submenu on element prototype in palette. A model element that is copy of the sample can be created by the menu.

Palette Extension

Palette extension allows to insert additional palette that appears in the left of main form. Added palette can designate element prototypes or UML standard elements defined in the profile as palette items.

Profile Includes and Excludes

If a UML profile is required for the current project in the StarUML™ application, the profile must be added to the project. This is because no profiles other than **"UML Standard Profile"** are added automatically. To add profiles in the StarUML™ application, use the profile dialog (illustrated below) that can be executed by clicking the **[Model] -> [Profiles...]** menu. The **"Available Profiles"** list on the left shows the list of the profiles currently registered in the user system, and the **"Included Profiles"**
list on the right shows the list of the profiles included in the current project. Adding a profile can be done simply by selecting a profile from the "Available Profiles" list, and clicking the "Include" button in the center. Once a profile is added, the stereotypes and tag definitions defined in the new profile are added to the stereotype selection dialog and extension property editor as shown above. If a profile is no longer required in the current project, simply click the "Exclude" button to remove it from the project. Care should be taken, since excluding a profile results in the removal of all information referenced by the profile in the project. Profiles can also be included or excluded through external API. Details on this will be described later.



Creating UML Profile

Basic Structure of Profile Document File

A profile document file is defined in the XML format, and the extension name is .prf (PLASTIC Profile File). The contents of the profile are enclosed by the **PROFILE** tag. There must not be any errors in syntax or contents.

The basic profile document structure is as follows.

```
<?xml version="1.0" encoding="..." ?>
<PROFILE version="...">
    <HEADER>
        ...
    </HEADER>
    <BODY>
        ...
    </BODY>
</PROFILE>
```

- encoding property: Defines value for encoding the property of the XML document (e.g. UTF-8, EUC-KR). For details on this value, see XML reference resources.
- version property (PROFILE element): This is the version of the PRF document (e.g. 1.0).
- HEADER element: See the **Header Contents** section.
- BODY element: See the **Body Contents** section.

Header Contents

The HEADER section of a profile document contains general information for the profile, such as the profile name and description.

```
<HEADER>
    <NAME>...</NAME>
    <DISPLAYNAME>...</DISPLAYNAME>
    <DESCRIPTION>...</DESCRIPTION>
    <AUTOINCLUDE>...</AUTOINCLUDE>
</HEADER>
```

- NAME element: Contains the profile name. This acts as the profile ID.
- DISPLAYNAME element: This is the caption name used in the profile dialog and other user interfaces.
- DESCRIPTION element: Contains the description of the profile.
- AUTOINCLUDE element: Specifies whether includes the profile automatically when creates new project.

Body Contents

The BODY section of a profile document contains the actual contents of the profile. This section can contain information for Stereotypes, Datatypes, TagDefinitionSets, and addtional extension elements.

```
<BODY>
    <STEREOTYPELIST>
        ...
    </STEREOTYPELIST>
    <TAGDEFINITIONSETLIST>
        ...
    </TAGDEFINITIONSETLIST>
    <DATATYPELIST>
        ...
    </DATATYPELIST>
    <ELEMENTPROTOTYPELIST>
        ...
    </ELEMENTPROTOTYPELIST>
    <MODELPROTOTYPELIST>
        ...
    </MODELPROTOTYPELIST>
    <PALETTELIST>
        ...
    </PALETTELIST>
    <DIAGRAMTYPELIST>
        ...
    </DIAGRAMTYPELIST>
</BODY>
```

- STEREOTYPELIST element: Defines multiple stereotypes (STEREOTYPE elements). For definition of stereotypes, see the **Stereotype** section.
- TAGDEFINITIONSETLIST element: Defines multiple tag definition sets (TAGDEFINITIONSET elements). For definition of tag definition sets, see the **TagDefinitionSet** section.
- DATATYPELIST element: Defines multiple data types (DATATYPE elements). For definition of data types, see the **DataType** section.
- ELEMENTPROTOTYPELIST element: Defines multiple element prototypes (ELEMENTPROTOTYPE elements). For definition of element prototypes, see the **ElementPrototype** section.
- MODELPROTOTYPELIST element: Defines multiple model prototypes (MODELPROTOTYPE elements). For definition of model prototypes, see the **ModelPrototype** section.
- PALETTELIST element: Defines multiple palette extensions (PALETTE elements). For definition of palette extension, see **Palette** section.
- DIAGRAMTYPELIST element: Defines multiple diagram types (DIAGRAMTYPE elements). For definition of diagram type, see **DiagramType** section.

Stereotype

The STEREOTYPE element defines information for stereotype and the inheritance structure.

```
<STEREOTYPE>
    <NAME>...</NAME>
    <DESCRIPTION>...</DESCRIPTION>
    <BASECLASSES>
        <BASECLASS>...</BASECLASS>
        ...
    </BASECLASSES>
    <PARENT>...</PARENT>
    <RELATEDTAGDEFINITIONSET>...</RELATEDTAGDEFINITIONSET>
    <ICON minWidth="..." minHeight="...">...</ICON>
    <NOTATION>...</NOTATION>
</STEREOTYPE>
```

- NAME element: Contains the name of the stereotype. This has to be a unique value within the profile.
- DESCRIPTION element: Contains the description for the stereotype.
- BASECLASSES element: May contain names of multiple UML modeling elements that can be applied with the stereotype. The names of the elements used here are the names of the UML elements (e.g., UMLClass, UMLClassifier, UMLAttribute, UMLPackage, ...).
  Note: If the name of an abstract class like UMLClassifier is used, all the elements inherited from it are applied. If the upper-level stereotype (PARENT element) is defined, this section is not defined; any definition in this section is ignored and the BASECLASSES value of the upper-level stereotype is applied.
- PARENT element: Stereotypes can have inheritance relationships. The PARENT element contains the name of the upper-level stereotype. Stereotypes in an inheritance relationship must be defined within the same profile. This can be left undefined or omitted if there is no upper-level stereotype.
- RELATEDTAGDEFINITIONSET element: Contains the name of the TagDefinitionSet related to the stereotype. This can be interpreted as a set of additional properties provided by the stereotype to the elements, may be omitted if there is none. The tag definition set defined here must also be defined within the same profile.
- ICON element: A stereotype can also be indicated by an icon, depending on user selection. This element contains the name of the icon file for the stereotype. Stereotype icon files can be .WMF, .EMF or .BMP files. Icon files must be located in the same directory as the profile document. The profile document contains the icon file names without the path names.
- minWidth property (ICON element): Defines the minimum width of the stereotype icon.
- minHeight property (ICON element): Defines the minimum height of the stereotype icon.
- NOTATION element: Stereotype can not be displayed by iconic style but also redefine drawing method by using notation description language. This element contains the name of the notation extension file(.nxt) to define the notation. The element with notation extension will draw as described by notation extension file not to draw as UML standard. Notation extension file must be placed in the directory of profile document. It must be specified only the file name except directory path in this element.

TagDefinitionSet

TAGDEFINITIONSET 요소에는 태그요소집합의 기본 정보를 기술하고, TADDEFINITIONLIST 요소 밑에 여러 개의 TAGDEFINITION 요소를 두어 태그정의집합에 포함된 태그정의들을 나열한다.

The TAGDEFINITIONSET element contains basic information on tag definition set, and includes multiple TAGDEFINITION elements under the TADDEFINITIONLIST element to list tag definitions included in the tag definition set.

```
<TAGDEFINITIONSET>
    <NAME>...</NAME>
    <BASECLASSES>
        <BASECLASS>...</BASECLASS>
        ...
    </BASECLASSES>
```

```
    <TAGDEFINITIONLIST>
        ...
    </TAGDEFINITIONLIST>
</TAGDEFINITIONSET>
```

- NAME element: Contains the name of the tag definition set. If the tag definitions concern a specific stereotype, using the name of the stereotype is recommended (in this case, if a tag definition set of the same name as a stereotype exists, it will be displayed first in the user interface).
- BASECLASSES element: Contains the names of the UML elements to apply the tag definition set (applied in the same way as the BASECLASSES element of the STEREOTYPE). If the tag definition set is defined as related to a specific stereotype, this element is not defined; any definition in this element is ignored and is recognized as BASECLASSES of the respective stereotype.
- TAGDEFINITIONLIST element: Contains multiple TagDefinitions included in the set. See the **TagDefinition** section.

TagDefinition

TAGDEFINITIONLIST element: Contains multiple TagDefinitions included in the set. See the **TagDefinition** section.

```
<TAGDEFINITION lock=”...”>
    <NAME>...</NAME>
    <TAGTYPE referenceType=”...”>...</TAGTYPE>
    <DEFAULTDATAVALUE>...</DEFAULTDATAVALUE>
    <LITERALS>
        <LITERAL>...</LITERAL>
        ....
    </LITERALS>
</TAGDEFINITION>
```

- lock property (TAGDEFINITION element): Configures whether to allow editing of tagged values from the UI. If set as "True", tagged values can be edited only through an external COM interface and the extension property editor cannot be used. This property may be omitted, in which case the default value is "False".
- NAME element: This is the name of the tag. This must be unique within the TagDefinitionSet.
- TAGTYPE element: This is the type of the tag. This can be any of the 5 types: Integer, Boolean, Real, String, Enumeration, Reference, or Collection.
- referenceType property (TAGTYPE element): Defines what types of object references are allowed when the tag type is Reference or Collection. For example, defining this as "UMLClass" permits connection of Class types only. If omitted, the default value is "UMLModelElement". This property is ignored if the tag type is Integer, Boolean, Real, String, or Enumeration.
- DEFAULTVALUE element: Contains the default value of the tag. This element is ignored and the default value is set as null for Reference Type or Collection Type.
- LITERALS element: Defines the literals to enumerate if the tag type is Enumeration. This is ignored for other types.

DataType

DATATYPE element defines one data type. This element has a sub-element called NAME.

```
<DATATYPE>
    <NAME>...</NAME>
</DATATYPE>
```

- NAME element: Contains the name of the data type.

ElementPrototype

ELEMENTPROTOTYPE element describes information of element prototype that defines the pattern of element creating.

```
<ELEMENTPROTOTYPE>
    <NAME>....</NAME>
    <DISPLAYNAME>....</DISPLAYNAME>
    <ICON>....</ICON>
    <DRAGTYPE>....</DRAGTYPE>
    <BASEELEMENT argument=”...”>....</BASEELEMENT>
    <STEREOTYPENAME>....</STEREOTYPENAME>
    <STEREOTYPEDISPLAY>....</STEREOTYPEDISPLAY>
    <SHOWEXTENDEDNOTATION>....</SHOWEXTENDEDNOTATION>
    <MODELPROPERTYLIST>
        <MODELPROPERTY name=”...”>....</MODELPROPERTY>
        ....
    </MODELPROPERTYLIST>
    <VIEWPROPERTYLIST>
        <VIEWPROPERTY name=”...”>....</VIEWPROPERTY>
        ....
    </VIEWPROPERTYLIST>
    <TAGGEDVALUELIST>
        <TAGGEDVALUE profile=”...” tagDefinitionSet=”...” tagDefinition=”...”> </TAGGEDVALUE>
        ....
    </TAGGEDVALUELIST>
</ELEMENTPROTOTYPE>
```

- NAME element: This is the name of the element prototype. This must be unique within the profile.
- DISPLAYNAME element: Contains the display name used in the user interface like a palette.
- ICON element: This element contains the name of the icon file for the element prototype using in the user interface like a palette. The icon file of the element prototype must be .BMP formatted image file 16 X 16 sized. The icon file must be placed in the directory of profile document. It must be specified only the file name except directory path in this element.
- DRAGTYPE element: In order to create the relative element for the element prototype, the user specifies how to show when specifying location and size as the user dragging mouse on diagram. It's value must be one of: Rect or Line.
- BASEELEMENT element: Specifies the name of UML standard element based to create copy of element prototype. This element can not be omitted. If this element is not specified, the element prototype can't be recognized.
  The names of available UML standard elements are as follows.

Element names			
Text	CollaborationInstanceSet	CallEvent	SignalAcceptState
Note	Interaction	TimeEvent	SignalSendState
NoteLink	InteractionInstanceSet	ChangeEvent	Artifact
Model	CompositeState	ClassifierRole	AttributeLink
Subsystem	State	Object	Port
Package	ActionState	Transition	Part
Class	Activity	Dependency	Connector
Interface	SubactivityState	Association	CombinedFragment
Enumeration	Pseudostate	AssociationClass	InteractionOperand
Signal	FinalState	Generalization	Frame
Exception	Partition	Link	ExtensionPoint
Component	Swimlane	AssociationRole	Rectangle
ComponentInstance	SubmachineState	Stimulus	Ellipse
Node	Attribute	Message	RoundRect
NodeInstance	Operation	Include	Line
Actor	Parameter	Extend	Image
UseCase	TemplateParameter	Realization	
StateMachine	EnumerationLiteral	ObjectFlowState	
ActivityGraph	UninterpretedAction	FlowFinalState	
Collaboration	SignalEvent	SystemBoundary	

- argument property: For some kind of elements which base element is one of Association, Pseudostate, and so on, it needs an argument to create. Specific property values of these elements are preset as argument of

them. Default value of this property is 0. In most of case, it doesn't need to specify.
Argument values used in StarUML are as follows.

Element name	Meaning and Value
Pseudostate	Decision = 0, InitialState = 1, Synchronization = 2, Junction Point = 3, Choice Point = 4, Deep History = 5, Shallow History = 6
UninterpretedAction	Entry Action = 0, Do Activity = 1, Exit Action = 2
Stimulus	Stimulus with Call Action = 0, Stimulus with Send Action = 1, Stimulus with Return Action = 2, Stimulus with Create Action = 3, Stimulus with Destroy Action = 4, Reverse Stimulus with Call Action = 5, Reverse Stimulus with Send Action = 6, Reverse Stimulus with Return Action = 7, Reverse Stimulus with Create Action = 8, Reverse Stimulus with Destroy Action = 9
Message	Message with Call Action = 0, Message with Send Action = 1, Message with Return Action = 2, Message with Create Action = 3, Message with Destroy Action = 4, Reverse Message with Call Action = 5, Reverse Message with Send Action = 6, Reverse Message with Return Action = 7, Reverse Message with Create Action = 8, Reverse Message with Destroy Action = 9
Association	Assocation = 0, Directed Association = 1, Aggregation = 2, Composition = 3;
Swimlane	Vertical Swimlane = 0, Horizontal Swimlane = 1;

- STEREOTYPENAME element: Specifies the Stereotype name of the element prototype. If specifies the value of this element, it is inputted as value of "Stereotype" property when create the model element. This element may be omitted.
- STEREOTYPEDISPLAY element: Specifies how to display the stereotype when create element the model element. Value of this element must be one of: sdkText(display as text), sdkIcon(display as icon), sdkNone(does not display), sdkDecoration(display as decoration). This element may be omitted. Default value is sdkText.
- SHOWEXTENDEDNOTATION element: Specifies whether to draw the element as notation extension in case of existing notation extension file(.nxt) specified in the STEREOTYPENAME element. If value is True, StarUML draws view of the element that created by element prototype as described in notation extension file. This element may be omitted. Default value is False.
- MODELPROPERTYLIST element: Contains list of MODELPROPERTY elements.
- MODELPROPERTY element: Specifies the value of model property in creating element. The name property that defines name of model property must be specified certainly. If value of name is not property name of base element or is invalid, the element would not be created properly.
  See "**Chapter 4. Using Open API**" for available property names and range of the each property value.

- VIEWPROPERTYLIST element: Contains list of VIEWPROPERTY elements.
- VIEWPROPERTY element: Specifies the value of view property in creating element. The name property that defines name of view property must be specified certainly. If value of name is not property name of base element or is invalid, the element would not be created properly.
  See "**Chapter 4. Using Open API**" for available property names and range of the each property value.
- TAGGEDVALUELIST element: Contains list of TAGGEDVALUE elements.
- TAGGEDVALUE element: Specifies the tagged value of model element in creating element. To assign tagged value, you must specify the tagDefinition defining it.
- profile property (TAGGEDVALUE element)
  : Specifies the profile name that contains the tag definition. This element may be omitted. If omitted, the profile that ELEMENENTPROTOTYPE element belongs to is applied.
- tagDefinitionSet property (TAGGEDVALUE element): Specifies the tagDefinitionSet name containing the tagDefinition.
- tagDefinition property (TAGGEDVALUE element): Specifies the name of the tagDefinition.

ModelPrototype

MODELPROTOTYPE element describes information of model prototype that defines the pattern of model creating.

```
<MODELPROTOTYPE>
    <NAME>....</NAME>
    <DISPLAYNAME>....</DISPLAYNAME>
    <ICON>....</ICON>
    <BASEMODEL argument=”...”>....</BASEMODEL>
    <STEREOTYPENAME>....</STEREOTYPENAME>
    <PROPERTYLIST>
        <PROPERTY name=”...”>....</PROPERTY>
        ....
    </PROPERTYLIST>
    <TAGGEDVALUELIST>
        <TAGGEDVALUE profile=”...” tagDefinitionSet=”...” tagDefinition=”...”> </TAGGEDVALUE>
        ....
    </TAGGEDVALUELIST>
    <CONTAINERMODELLIST>
        <CONTAINERMODEL type="...." stereotype="...."/>
        ....
    </CONTAINERMODELLIST>
</MODELPROTOTYPE>
```

- NAME element: This is the name of the model prototype. This must be unique within the profile.
- DISPLAYNAME element: Contains the display name used in the user interface like the **[Add Model]** menu.
- ICON element: This element contains the name of the icon file for the model prototype using in the user interface like the **[Add Model]**
  menu. The icon file of the model prototype must be .BMP formatted image file 16 X 16 sized. The icon file must be placed in the directory of profile document. It must be specified only the file name except directory path in this element.
- BASEMODEL element: Specifies the name of UML standard element based to create copy of model prototype. This element can not be omitted. If this element is not specified, the element prototype can't be recognized. Available names of UML standard elements are the same of what is enumerated in the BASEELEMENT part of the ElementPrototype section. Elements that own only view can't be used.
- argument property:
  For some kind of elements which base model element is one of Association, Pseudostate, and so on, it needs an argument to create. Specific property values of these model elements are preset as argument of them. Default value of this property is 0. In most of case, it doesn't need to specify.
  Available argument values are the same of what is enumerated in the argument part of the ElementPrototype section.
- STEREOTYPENAME element: Specifies the Stereotype name of the model prototype. If specifies the value of this element, it is inputted as value of "Stereotype" property when create the model element. This element

may be omitted.

- PROPERTYLIST element: Contains list of PROPERTY elements.
- PROPERTY element: Specifies the value of model property in creating model element. The name property that defines name of model property must be specified certainly. If value of name is not property name of base model or is invalid, the model element would not be created properly.
  See **"Chapter 4. Using Open API"** for available property names and range of the each property value.
- TAGGEDVALUELIST element: Contains list of TAGGEDVALUE elements.
- TAGGEDVALUE element: Specifies the tagged value of model element in creating element. To assign tagged value, you must specify the tagDefinition defining it.
- profile property (TAGGEDVALUE element)
  : Specifies the profile name that contains the tag definition. This element may be omitted. If omitted, the profile that MODELPROTOTYPE element belongs to is applied.
- tagDefinitionSet property (TAGGEDVALUE element): Specifies the tagDefinitionSet name containing the tagDefinition.
- tagDefinition property (TAGGEDVALUE element): Specifies the name of the tagDefinition.
- CONTAINERMODELLIST element: Contains list of CONTAINERMODEL elements.
- CONTAINERMODEL element: Constrains the parent model element that can own model element defined by the model prototype. If the value specified, creation submenu of **[Add Model]** menu will be activated just only when model element specified in this element is selected.

Palette

PALETTE element describes additional palette and it's items.

```
<PALETTE>
    <NAME>....</NAME>
    <DISPLAYNAME>....</DISPLAYNAME>
    <PALETTEITEMLIST>
        <PALETTEITEM>....</PALETTEITEM>
        ....
    </PALETTEITEMLIST>
</PALETTE>
```

- NAME element: This is the name of the palette. This must be unique within the profile.
- DISPLAYNAME element: This is the name being displayed.
- PALETTEITEMLIST element: Lists palette items contained in the palette.
- PALETTEITEM element: Specifies an element name for palette item. The value of this element must be the name of element prototype defined in the profile or the name of UML standard element. Available names of UML standard elements are the same of what is enumerated in the BASEELEMENT part of the ElementPrototype section.

DiagramType

DIAGRAMTYPE element describes overall information of diagram type.

```
<DIAGRAMTYPELIST>
    <DIAGRAMTYPE>
        <NAME>....</NAME>
        <DISPLAYNAME>....</DISPLAYNAME>
        <BASEDIAGRAM>....</BASEDIAGRAM>
        <ICON>....</ICON>
        <AVAILABLEPALETTELIST>
            <AVAILABLEPALETTE>....</AVAILABLEPALETTE>
            ....
        </AVAILABLEPALETTELIST>
    </DIAGRAMTYPE>
</DIAGRAMTYPELIST>
```

- NAME element: This is the name of the palette. This must be unique within the profile.
- DISPLAYNAME element: This is the display name used in the user interface like the **[Add Diagram]** menu.
- ICON element: This element contains the name of the icon file for the diagram type using in the user interface like the **[Add Diagram]**
menu. The icon file of the diagram type must be .BMP formatted image file 16 X 16 sized. The icon file must be placed in the directory of profile document. It must be specified only the file name except directory path in this element.
- BASEDIAGRAM element: Specifies the name of UML standard diagram based to create a diagram of the diagram type. The names of available UML standard diagrams are as following.

Diagram names
ClassDiagram UseCaseDiagram SequenceDiagram SequenceRoleDiagram CollaborationDiagram CollaborationRoleDiagram StatechartDiagram ActivityDiagram ComponentDiagram DeploymentDiagram CompositeStructureDiagram

- AVAILABLEPALETTELIST
element: Specifies the list of activating palettes when a diagram of the diagram type is created.
- AVAILABLEPATTE
element: Specifies activating palette when a diagram of the diagram type is created. The value of this element must be the name of palette defined in the profile or built-in palette name included in StarUML basically. Built-in palettes of StarUMLare as following.

Built-in palette names
UseCase Class SequenceRole Sequence CollaborationRole Collaboration Statechart Activity Component Deployment CompositeStructure Annotation

Registering UML Profile

To make a profile to be recognized automatically by StarUML, must place it in the subdirectory of StarUML module directory(<install-dir>\modules). StarUML searches and reads all profiles in the module directory and registers them at the program automatically when StarUML is initializing. If profile file is invalid or it's extension file name is not .prf, StarUML will not read the profile and ignore it. It is recommended that make a subdirectory in the StarUML module directory and place the profile in there to avoid modules being out of order.

Note:
To register profile icon, Make icon file for the profile and place it in the directory of the profile. Icon of the profile is displayed with the name at profiles list in the **[Profiles]**
dialog. If there is no icon file which name is same of the profile's, default icon is registered as icon of the profile.

Note: Delete files of the profile from the StarUML module directory(<install-dir>\modules) not to use the profile

Note: Delete files of the profile from the StarUML module directory(<install-dir>\modules) not to use the profile any more.

Extension Element Object Management

Description of Extension Elements

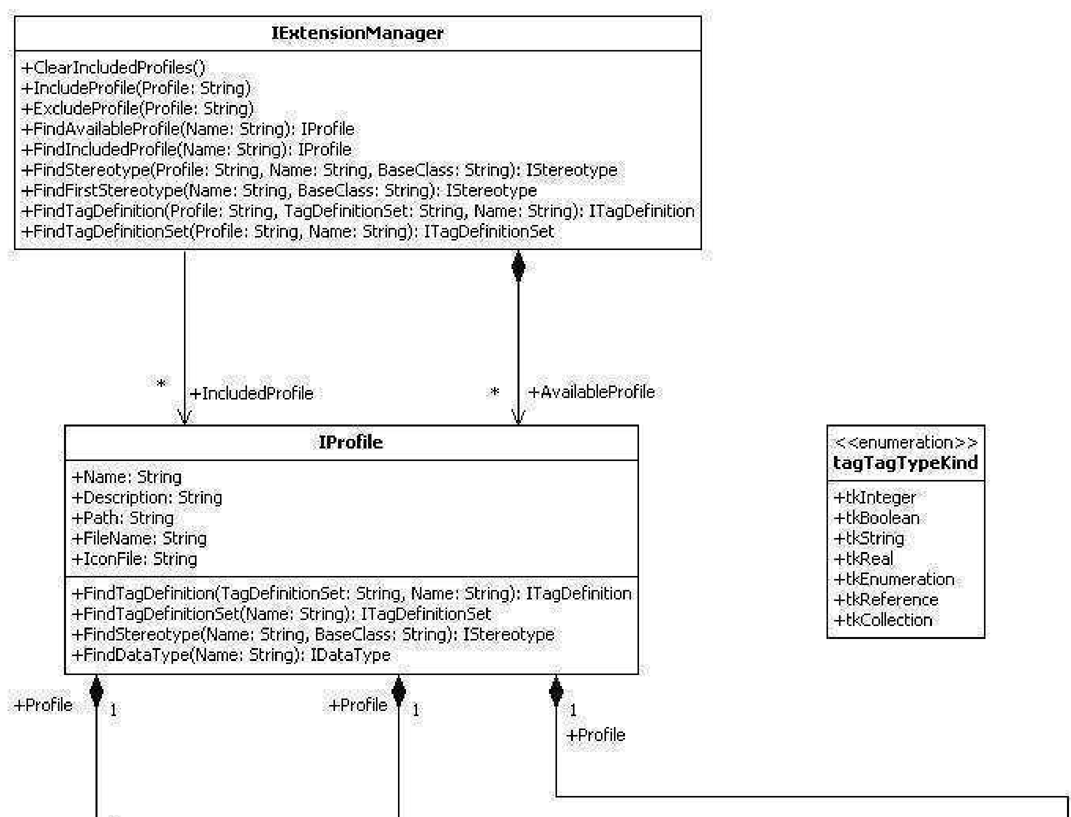
The extension elements defined in the profile can be accessed through StarUML™'s external API. The COM interface related to extension in StarUML™ is organized in the same way as the actual UML extension structure, and is managed through **IExtensionManager**. It is rare for the developer to directly manage extension element objects. On the contrary, it is much more usual for the developer to obtain stereotypes or tagged values from the actual model elements extended. In this case, the methods provided by the **IExtensionModel** can be used. For details on the IExtensibleModel interface and modeling elements, see **"Chapter 4. Using Open API".**

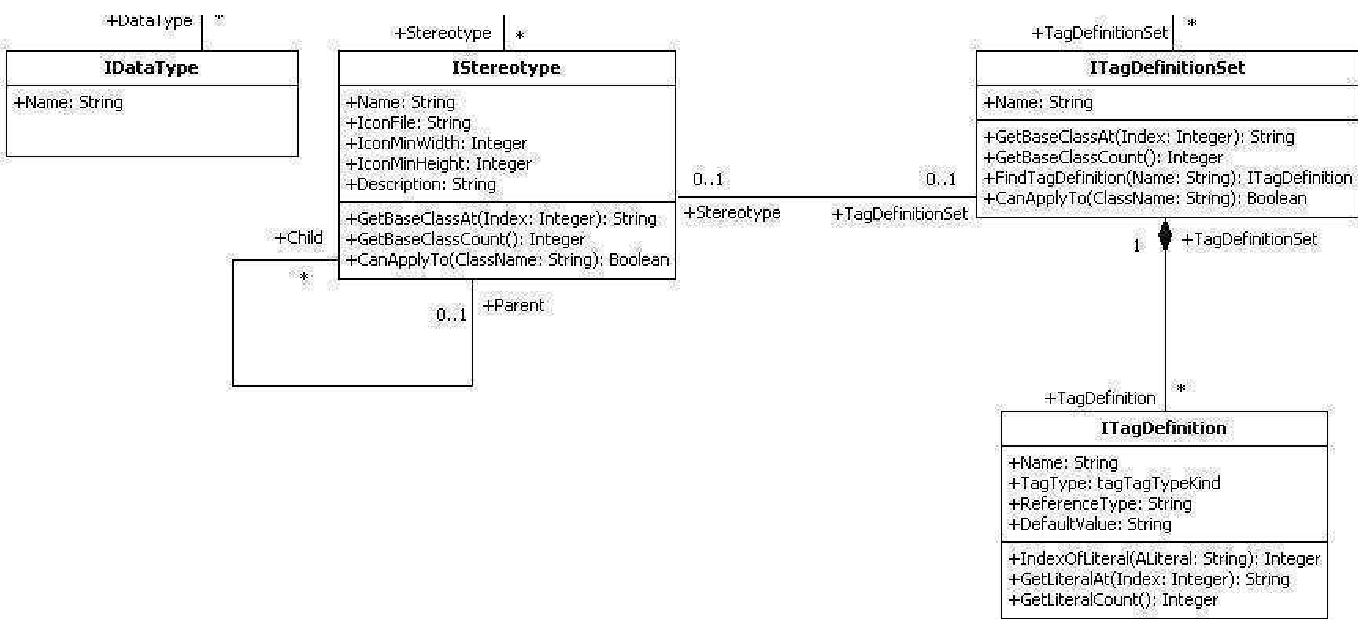
As mentioned earlier, extension elements are not created during the actual modeling process but are definitions of extension structures. Since they should not be modified during the initial loading of a program or a project, most of the properties defined in these interfaces are read-only.

The following interfaces are available for managing extension element objects.

- **IExtensionManager**: Manages profiles registered in a program, and provides a method for searching extension elements. IExtensionManager is the first interface that accesses the profile or the extension elements defined in the profile.
- **IProfile**: Manages the extension elements defined in the profile, and provides methods for accessing and searching them. It also contains information for the profile. IProfile maintains the extension elements defined in the profile as collections of IStereotype, ITagDefinition, and IDataType.
- **IStereotype**: Provides information for stereotypes.
- **ITagDefinitionSet**: Provides information for TagDefinitionSets, and manages tag definitions defined in TagDefinitionSets as a collection of ITagDefintion.
- **ITagDefintion**: Provides information for TagDefinition.
- **IDataType**: Provides information for DataType.

The diagram below illustrates the organization of the COM interface for StarUML's extension elements.





Accessing IExtensionManager

In order to manage profiles and extension elements, reference to the **IExtensionManager** interface must be acquired first. IStarUMLApplication provides properties for accessing the ExtensionManager object. The following code is a Jscript example of obtaining reference to IExtensionManager.

```
var app = new ActiveXObject("StarUML.StarUMLApplication");
var ext = app.ExtensionManager;
```

Including/Excluding Profile

IExtensionManager provides methods for including or excluding profiles in/from projects. **IncludeProfile()** includes the profile entered in the current project, and **ExcludeProfile()** excludes the profile entered from the current project. The profile entered as the parameter for the methods must be registered in the system. An error occurs if the profile entered is not present or registered in the system. The method usage is as follows.

```
IExtensionManager.IncludeProfile(Profile: String)
IEXtensionManager.ExcludeProfile(Profile: String)
```

The following is a JScript example of excluding a profile named "StandardProfile" from the current project.

```
var app = new ActiveXObject("StarUML.StarUMLApplication");
var ext = app.ExtensionManager;
ext.ExcludeProfile("UMLStandard");
```

Acquiring Extension Elements Defined in Profile

The extension objects that constitute a profile can be accessed through the **IProfile** interface. **IProfile** provides the following collection access methods for accessing the interfaces of extension objects (**IStereotype**, **ITagDefinitionSet**, and **IDataType**). The Index argument used in **GetStereotypeAt()**, **GetTagDefinitionSetAt()**, **GetDataType(),** etc. must be equal to or less than Count - 1 of the collection.

```
IProfile.GetStereotypeCount(): Integer
IProfile.GetStereotypeAt(Index: Integer): IStereotype
IProfile.GetTagDefinitionSetCount(): Integer
IProfile.GetTagDefinitionSetAt(Index: Integer): ITagDefinitionSet
IProfile.GetDataTypeCount(): Integer
IProfile.GetDataTypeAt(Index: Integer): IDataType
```

The following is a Jscript example of looping the sterotypes defined in the profile.

```
var app = new ActiveXObject("StarUML.StarUMLApplication");
var ext = app.ExtensionManager;
var prf = ext.FindIncludedProfile("UMLStandard");
if (prf != null) {
    var st;
    for (i = 0; i <= prf.GetStereotypeCount() - 1; i++) {
        st = prf.GetStereotypeAt(i);
        // do something...
    }
}
```

Finding Extension Elements

The **IProfile** interface provides methods for searching interfaces of extension elements defined in the profile.

```
FindTagDefinition(TagDefinitionSet: String, Name: String): ITagDefinition
FindTagDefinitionSet(Name: String): ITagDefinitionSet
FindStereotype(Name: String, BaseClass: String): IStereotype
FindDataType(Name: String): IDataType
```

Managing Stereotype

The **IStereotype**
interface provides information for stereotypes defined in the profile. Basic stereotype information such as the name, description, and icon file can be obtained through the read-only property of the IStereotype interface. **IStereotype** includes definitions of methods for recognizing the UML elements that can be applied with stereotypes: **GetBaseClassCount()**, **GetBaseClassAt()**, **CanApplyTo()**, etc. The **GetBaseClassCount()** and **GetBaseClassAt()**
methods allow names of the UML elements that can be applied with stereotypes to be obtained. The **CanApplyTo()** method indicates whether the UML element received as an argument can be applied with the current stereotype by returning a Boolean value The BaseClass of a stereotype can specify not only the UML elements expressible in diagrams, but also more of the upper-level elements like UMLClassifier. In this case, the selected stereotype can be applied to all the lower-level elements under the upper-level elements. For example, suppose UMLClassifier is defined as the BaseClass, then it works the same as if all lower-level elements like UMLClass, UMLInterface, UMLUseCase, and UMLActor are defined as the BaseClass. For the inheritance structure between elements, see Plastic Application Model.

GetStereotype() of **IExtensibleModel** returns **IStereotype** objects from stereotyped models. If the stereotype of a model is not defined in the profile, a null value is returned. In this case, the **StereotypeName** property of **IExtensibleModel** can be used to obtain the name of the stereotype.

The following is a JScript example of displaying in the message box the descriptions of the stereotypes for the currently selected model.

```
var app = new ActiveXObject("StarUML.StarUMLApplication");
var selMgr = app.SelectionManager;

if (selMgr.GetSelectedModelCount() > 0) {
    var selModel = selMgr.GetSelectedModelAt(0);
    var st = selModel.GetStereotype();
    if (st != null) {
        WScript.Echo(st.Description)
    }
}
```

Managing TagDefinition

The ITagDefinition interface provides information for tag definitions defined in the profile. ITagDefinition provides

the following properties.

Property	Description
Name: String	Name of the tag definition. Tag definition name must be unique within the TagDefinitionSet.
TagType: tagTagTypeKind	Type of tag. The following tag types are available. • tkInteger = 0 (integer) • tkBoolean = 1 (boolean) • tkString = 2 (string) • tkReal = 3 (real number) • tkEnumeration = 4 (enumeration) • tkReference = 5 (reference) • tkCollection = 6 (collection) Different methods are used for obtaining tagged values from models depending on the tag type. IExtensibleModel includes definitions of methods for obtaining tagged values according to each tag type.
ReferenceType: String	Indicates the types of object reference available for definition by tagged values when the TagType is tkReference or tkCollection. For example, setting this to "UMLClass" allows connection of Class type only. If the definition for ReferenceType is omitted in the profile document, "UMLModelElement" is taken as the default value. If TagType is not tkReferece or tkCollection, this property has no effect.
DefaultValue: String	Defines the default value of a tag. If the TagType is tkEnumeration, it is a string value for the enumeration order. If the TagType is tkReference or tkCollection, the default value is set as null and this property has no effect.

The following is a JScript example of displaying the default value of a tag in the message box.

```
var app = new ActiveXObject("StarUML.StarUMLApplication");
var ext = app.ExtensionManager;
var tag = ext.FindTagDefinition("UMLStandard", "Default", "Derived");
WScript.Echo(tag.DefaultValue);
```

Chapter 8. Extending Menu

Basic Concepts of Menu Extension

In order to provide ways for the user to call the Add-In functions, the StarUML™ menu system can be extended. For this, Add-In developers must provide menu extension files. This involves the following steps.

1. Creating a menu extension file.
2. Registering a menu extension file.

An Add-In menu extension file (*.mnu) is an XML-formatted text file. Each Add-In must provide one menu extension file. StarUML™ uses the definition contents of this menu file to extend the application's main and popup menus to add new menu items, to execute defined actions, or to send messages to related Add-In objects. StarUML™'s Add-In menu extension file can contain the following definitions.

- New menu items to add
- Division of main menu items and popup menu items
- StarUML's basic menu items where the new menu items would be added
- Display names and hot-keys for menu items
- Points for activation and deactivation of menu items
- Script files to execute when menu items are selected
- IDs of the menu items that are sent to Add-In objects when selected
- Locations of the menu items in their upper-level group menus
- Icon files for menu items

A menu extension file is written in the XML format. It has to be a well-formed document and its contents must be valid. This chapter discusses the XML DTD (Document Type Definition), which has to be observed to ensure the validity of menu extension files, and the structure of menu extension files, and also provides related examples.

Note:
Add-In menu extension file must have *.mnu extension file name and placed in the subdirectory of StarUML™ module directory(<insall-dir>\modules).

Creating Menu Extension File

DTD of Menu Extension File

StarUML™'s Add-In menu extension file must be a valid XML that conforms to the defined DTD. The following is the entire contents of the DTD defined for a menu extension file.

```
<?xml version="1.0" encoding="UTF-8"?>

<!ELEMENT NAME (#PCDATA)>
<!ELEMENT VERSION (#PCDATA)>
<!ELEMENT DESCRIPTION (#PCDATA)>
<!ELEMENT COMPANY (#PCDATA)>
<!ELEMENT COPYRIGHT (#PCDATA)>

<!ELEMENT MAINITEM (MAINITEM)*>
<!ATTLIST MAINITEM
          base (FILE|EDIT|FORMAT|MODEL|VIEW|TOOLS|HELP|UNITS|IMPORT|EXPORT|NEW_TOP) #IMPLIED
          caption CDATA #REQUIRED
          index CDATA #IMPLIED
          beginGroup CDATA #IMPLIED
          script CDATA #IMPLIED
          actionId CDATA #IMPLIED
          availableWhen (ALWAYS|PROJECT_OPENED|MODEL_SELECTED|VIEW_SELECTED|UNIT_SELECTED|DIAGRAM_
          iconFile CDATA #IMPLIED>
```

```
<!ELEMENT POPUPITEM (POPUPITEM)*>
<!ATTLIST POPUPITEM
          location (EXPLORER|DIAGRAM|BOTH) “BOTH”
          caption CDATA #REQUIRED
          index CDATA #IMPLIED
          beginGroup CDATA #IMPLIED
          script CDATA #IMPLIED
          actionId CDATA #IMPLIED
          availableWhen (ALWAYS|PROJECT_OPENED|MODEL_SELECTED|VIEW_SELECTED|UNIT_SELECTED|DIAGRAM_
          iconFile CDATA #IMPLIED>

<!ELEMENT MAIMENU (MAINITEM)*>
<!ELEMENT POPUPMENU (POPUPITEM)*>

<!ELEMENT HEADER (NAME?, VERSION?, DESCRIPTION?, COMPANY?, COPYRIGHT?)>
<!ELEMENT BODY (MAINMENU?, POPUPMENU?)>

<!ELEMENT ADDINMENU (HEADER?, BODY)>
<!ATTLIST ADDINMENU addInID CDATA #REQUIRED>
```

Note:
Names of all XML elements must be written in upper case letters, and names of all attributes start with lower case ones. Pre-defined symbol values are represented in upper case with '_' (underscores). Such conventions must be observed throughout the whole menu file, and the pre-defined symbol values must be used properly.

Overall Structure of Menu Extension File

Menu extension files follow the XML document conventions, and user-defined menu items are contained within the 'ADDINMENU' element.

```
<?xml version="1.0" encoding="..."?>

<ADDINMENU addInID="...">
  <HEADER>...</HEADER>
  <BODY>...</BODY>
</ADDINMENU>
```

- encoding property: Defines the encoding property value of the XML document (e.g. UTF-8, EUC-KR). For details on this property value, see XML-related resources.
- addInID property: Unique ID of each Add-In. This must be a unique value that identifies the current Add-In from others. It is recommended that the company name or product name be used as a part of the value (e.g. StarUML.StandardAddIn).
- HEADER element: Contains general information for the Add-In. See the **Header Contents** section.
- BODY element: Contains information for actual menu items. See the **Body Contents** section.

Header Contents

The Header element of a menu extension file contains information for the Add-In and menu file. The contents in the Header section do not have any effect on the actual structure of the menu items. Although this section may be omitted, it is recommended to include it to provide menu extension files that are self-explanatory.

```
<HEADER>
  <NAME>...</NAME>
  <VERSION>...</VERSION>
  <DESCRIPTION>...</DESCRIPTION>
  <COMPANY>...</COMPANY>
  <COPYRIGHT>...</COPYRIGHT>
</HEADER>
```

- NAME element: Contains the explanatory name of the Add-In (string value).

- VERSION element: Contains the version information (string value).
- DESCRIPTION element: Contains brief description of the Add-In (string value).
- COMPANY element: Contains information of the Add-In developer company / individual (string value).
- COPYRIGHT element: Contains the copyright notice (string value).

BODY CONTENTS

The Body element of a menu extension file contains the actual menu items to add. Information in this section must be accurate.

```
<BODY>
  <MAINMENU>
    <MAINITEM>...</MAINITEM>
    <MAINITEM>...</MAINITEM>
  </MAINMENU>

  <POPUPMENU>
    <POPUPITEM>...</POPUPITEM>
    <POPUPITEM>...</POPUPITEM>
  </POPUPMENU>
</BODY>
```

The Body element can largely be divided into definitions of the main menu and definitions of the popup menu.

- MAINMENU element: Contains the main menu items to add.
- POPUPMENU element: Contains the popup menu items to add.
- MAINITEM element: Contains information of an actual menu item (main menu).
- POPUPITEM element: Contains information of an actual menu item (popup menu).

Main menu items and popup menu items are written separately. According to the functions provided by each Add-In, a menu item can be added to the main menu or to the popup menu. Either the MAINMENU element or the POPUPMENU element may be omitted, but not both. If a menu item of the same functionality needs to be added both to the main menu and to the popup menu, information should be entered appropriately in MAINMENU and POPUPMENU. In this case, the two items should have identical script or actionID properties. However, when adding a lower-level menu item to an StarUML™ basic menu item such as **[Format]** and **[Unit]**, that is shared by both the main menu and the popup menu, the information should be contained in MAINMENU only.

MAINMENU

The MAINMENU element can contain multiple MAINITEM elements. Each MAINITEM element constitutes one main menu item. For defining a group menu item with sub menu items, the MAINITEM element can in turn contain multiple MAINITEM elements.

```
<MAINITEM base="..." caption="..." index="..." beginGroup="..." script="..." actionId="..." availa
  <MAINITEM>...</MAINITEM>
  <MAINITEM>...</MAINITEM>
</MAINITEM>
```

Property	Description	Range of Value	Omission
base	This is one of the StarUML™ basic menu items to which the new menu item will be added. This property has no effect if the MAINITEM element belongs to another upper-level MAINITEM element.	Must be FILE, EDIT, FORMAT, MODEL, VIEW, TOOLS, HELP, UNITS, IMPORT, EXPORT, or NEW_TOP. *	If omitted, the new menu item is added as a sub menu item under the **[Tools]** menu.
caption	Specifies the display name for the menu item. This value may contain the hot-key. To define the hot-key, add '&' and the hot-key	String value	Cannot be omitted.

	character at the end of this value. Note that the StarUML™ program does not check for duplication of the hot-key with other menu items.		
index	Specifies the order of this menu item under the upper-level menu. For instance, if this value is '0', the menu item becomes the first sub menu for the base menu item. If the value of this property conflicts with the values of other menu items, the menu may not be displayed accurately.	An integer greater than 0.	Generally omitted. If omitted, Add-Ins are added in the order they are registered.
beginGroup	Determines whether to add the separator in front of the menu item.	Must be TRUE or FALSE.	FALSE if omitted.
script	Specifies the pathname and filename of the script to run, if any. The pathname is relative to the location of the Add-In program. This value can also be a website URL.	String value	Can be omitted.
actionId	Set this to an integer greater than 0 in order to process the menu command through a COM object. If the Add-In adds more than one menu item, each menu item can be distinguished by its unique actionId value.	An integer greater than 0.	Can be omitted.
availableWhen	Specifies when the menu item becomes enabled.	Must be ALWAYS, PROJECT_OPENED, MODEL_SELECTED, VIEW_SELECTED, UNIT_SELECTED, or DIAGRAM_ACTIVATED. **	PROJECT_OPENED is selected if omitted.
iconFile	Specifies the pathname and filename for the menu item icon file, if any. The pathname is relative to the location of the Add-In program.	String value	Can be omitted.

Note:
Unless the menu item groups its sub menu items, the property value for either script or actionId must be defined.

* **base property value range**

- FILE: The menu item is added as a sub menu item of the **[File]** menu.
- EDIT: The menu item is added as a sub menu item of the **[Edit]** menu.
- FORMAT: The menu item is added as a sub menu item of the **[Format]** menu.
- MODEL: The menu item is added as a sub menu item of the **[Model]** menu.
- VIEW: The menu item is added as a sub menu item of the **[View]** menu.
- TOOLS: The menu item is added as a sub menu item of the **[Tools]** menu. (default)
- HELP: The menu item is added as a sub menu item of the **[Help]** menu.
- UNITS: The menu item is added as a sub menu item of the **[File]** -> **[Unit]** menu.
- IMPORT: The menu item is added as a sub menu item of the **[File]** -> **[Import]** menu.
- EXPORT: The menu item is added as a sub menu item of the **[File]** -> **[Export]** menu.
- NEW_TOP: The menu item is created as a new top-level main menu item.

** **availableWhen property value range**

- ALWAYS: Enabled as long as the StarUML™ application is running.
- PROJECT_OPENED: Enabled when a project element is present. (default)
- MODEL_SELECTED: Enabled when a model element is selected.
- VIEW_SELECTED: Enabled when a view element is selected.
- UNIT_SELECTED: Enabled when a unit element is selected.
- DIAGRAM_ACTIVATED: Enabled when a diagram is opened.

POPUPMENU

The POPUPMENU element can contain multiple POPUPITEM elements. Each POPUPITEM element constitutes one popup menu item. For defining a menu item with sub menu items, the POPUPITEM element can in turn contain multiple POPUPITEM items.

```
<POPUPITEM location="..." caption="..." index="..." beginGroup="..." script="..." actionId="..." a
  <POPUPITEM>...</POPUPITEM>
  <POPUPITEM>...</POPUPITEM>
</POPUPITEM>
```

Property	Description	Range of Value	Omission
location	Specifies the popup menu system where the new popup menu item will be added. This property has no effect if the POPUPITEM belongs to another upper-level POPUPITEM element.	Must be EXPLORER, DIAGRAM, or BOTH. *	BOTH if omitted.
caption	Specifies the display name for the menu item. This value may contain the hot-key. To define the hot-key, add '&' and the hot-key character at the end of this value. Note that the StarUML™ program does not check for duplication of the hot-key with other menu items.	String value	Cannot be omitted.
index	Specifies the order of this menu item under the upper-level menu. For instance, if this value is '0', the menu item becomes the first sub menu for the base menu item. If the value of this property conflicts with the values of other menu items, the menu may not be displayed accurately.	An integer greater than 0.	Generally omitted. If omitted, menu items are added in the order the Add-In is registered.
beginGroup	Determines whether to add the separator in front of the menu item.	Must be TRUE or FALSE.	FALSE if omitted.
script	Specifies the pathname and filename of the script to run, if any. The pathname is relative to the location of the Add-In program. This value can also be a website URL.	String value	Can be omitted.
actionId	Set this to an integer greater than 0 in order to process the menu command through a COM object. If the Add-In adds more than one menu item, each menu item can be distinguished by its unique actionId value.	An integer greater than 0.	Can be omitted.
availableWhen	Specifies when the menu item becomes enabled.	Must be ALWAYS, PROJECT_OPENED, MODEL_SELECTED	Set to PROJECT_OPENED if omitted.

		MODEL_SELECTED, VIEW_SELECTED, UNIT_SELECTED, or DIAGRAM_ACTIVATED **	
iconFile	Specifies the pathname and filename for the menu item icon file, if any. The pathname is relative to the location of the Add-In program.	String value	Can be omitted.

Note:
Unless the menu item is grouping its sub menu items, the property value for either script or actionId must be defined.

* **location property value range**

- EXPLORER: The menu item is added to the **Model Explorer** popup menu.
- DIAGRAM: The menu item is added to the **Diagram** popup menu.
- BOTH: The menu item is added to both the **Model Explorer** and **Diagram** popup menus. *(default)*

** **availableWhen property value range** - Same as the MAINMENU element.

Example of Menu Extension File

The following example is the complete menu file for the StarUML™ default extension pack that is installed together with the StarUML™ program.

```
<?xml version="1.0" encoding="UTF-8"?>

<ADDINMENU addInID="StarUML.StandardAddIn">
    <HEADER>
        <NAME>Default module of StarUML</NAME>
        <VERSION>1.0.0</VERSION>
        <DESCRIPTION>Default extension pack of Agora Plastic to convert diagram</DESCRIPTION>
        <COMPANY>Plastic Software, Inc.</COMPANY>
        <COPYRIGHT>Copyright (C) 2005 Plastic Software, Inc. All rights reserved.</COPYRIGHT>
    </HEADER>
    <BODY>
        <MAINMENU>
            <MAINITEM base="MODEL" caption="Convert Diagram" beginGroup="TRUE" availableWhen="MODE
            <MAINITEM caption="Convert Sequence(Role) to Collaboration(Role)" script="ConvSeq2Col.
            <MAINITEM caption="Convert Collaboration(Role) to Sequence(Role)" script="ConvCol2Seq.
        </MAINMENU>
    </BODY>
</ADDINMENU>
```

Registering Menu Extension File

To make a menu extension to be recognized automatically by StarUML, must place it in the subdirectory of StarUML module directory(<install-dir>\modules). StarUML searches and reads all menu extension files in the module directory and registers them at the program automatically when StarUML is initializing. If menu extension file is invalid or it's extension file name is not .mnu, StarUML will not read the menu extension file and ignore it. It is recommended that make a subdirectory in the StarUML module directory and place the profile in there to avoid modules being out of order.

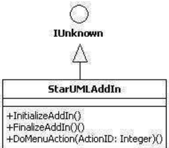
Note: Delete the menu extension file from the StarUML module directory(<install-dir>\modules) not to use the menu extension any more.

Chapter 9. Writing Add-In COM Object

Basic Concepts of Add-In COM Object

As discussed in **'Chapter 3. Hello world Example'**
simple Script codes can be defined to add new functionalities to StarUML™. However, to facilitate more complex and useful functionalities, it is better to use a program development environment that supports COM objects. For implementing StarUML™ Add-In COM Objects, it does not matter whether Delphi, Visual Basic or any other programming environment is used, as long as it supports COM technology.

The most important point about implementing StarUML™ Add-In COM Objects is that the **IStarUMLAddIn** interface defined by StarUML™ must be used.



As illustrated above, the **IStarUMLAddIn**
interface inherits IUnknown and defines the three additional interface methods: **InitializeAddIn()**, **FinalizeAddIn()**, and **DoMenuAction()**.

IStarUMLAddIn Interface Methods

The methods to be defined for implementing the **IStarUMLAddIn** interface are as follows.

Method	Description
InitializeAddIn()	The **InitializeAddIn()** method is used by the StarUMLApplication object to initialize each Add-In COM Object when it is created. As will be discussed in below section this is used to define the actions required for initialization of an Add-In COM Object such as event subscription registration.
FinalizeAddIn()	The **FinalizeAddIn()** method is called by the StarUMLApplication object just before disconnecting reference from an Add-In COM Object. As will be discussed in below section this is used to define the actions required before terminating an Add-In COM Object such as event subscription removal.
DoMenuAction(ActionID: Integer)	As seen in **'Chapter 8. Extending Menu'** the **DoMenuAction()** method is called when the user selects an extension menu item defined by each Add-In. The '**actionId**' value of each menu item defined by the menu extension file is passed on as an argument.

Add-In COM Object Example

The following is a simple example of an StarUML™ Add-In COM Object implementing the IStarUMLAddIn interface. This is written in the Delphi Pascal syntax.

```
type
    AddInExample = class(TComObject, IStarUMLAddIn)
    private
        StarUMLApp: IStarUMLApplication;
    protected
        function InitializeAddIn: HResult; stdcall;
        function FinalizeAddIn: HResult; stdcall;
        function DoMenuAction(ActionID: Integer): HResult; stdcall;
```

```
        ...
    public
        procedure Initialize; override;
        destructor Destroy; override;
        ...
    end;

...

implementation

procedure AddInExample.Initialize;
begin
    inherited;
    StarUMLApp := CreateOleObject('StarUML.StarUMLApplication') as IStarUMLApplication;
    ...
end;

destructor AddInExample.Destroy;
begin
    ...
    StarUMLApp := nil;
    inherited;
end;

function AddInExample.InitializeAddIn: HResult;
begin
    ...
    Result := S_OK;
end;

function AddInExample.FinalizeAddIn: HResult;
begin
    ...
    Result := S_OK;
end;

function AddInExample.DoMenuAction(ActionID: Integer): HResult; stdcall;
begin
    Result := S_OK;
    ...
end;
```

Writing Add-In Description File

Basic Concept of Add-In Description File

Add-In Description file(*.aid) is XML based text file. All add-Ins plug-ined in StarUML must offer one add-in description file. StarUML registers Add-In object at system registry and initializes the Add-In object and menu extension file associated with it on the reference of add-in description file context.

Note:
Add-In description file must have *.aid extension file name and placed in the subdirectory of StarUML module directory(<install-dir>\modules).

Structure of Approach Document File

Add-In description files follow the XML document conventions, and user-defined menu items are contained within the 'ADDIN' element.

```
<?xml version="1.0" encoding="..."?>

<ADDIN>
    <NAME>...</NAME>
    <DISPLAYNAME>...</DISPLAYNAME>
    <COMOBJ>...</COMOBJ>
    <FILENAME>...</FILENAME>
```

```
    <COMPANY>...</COMPANY>
    <COPYRIGHT>...</COPYRIGHT>
    <HELPFILE>...</HELPFILE>
    <ICONFILE>...</ICONFILE>
    <ISACTIVE>...</ISACTIVE>
    <MENUFILE>...</MENUFILE>
    <VERSION>...</VERSION>
    <MODULES>
        <MODULEFILENAME>...</MODULEFILENAME>
    </MODULES>
</ADDIN>
```

- encoding property: Defines the encoding property value of the XML document (e.g. UTF-8, EUC-KR). For details on this property value, see XML-related resources.
- NAME element: Defines the name of Add-In. (string value)
- DISPALYNAME element: Defines the name of Add-In that is shown to users in user interface. (string value)
- COMOBJ element: Specifies a ProgID of COM object. This element is used only in case of COM object based add-in. (string value)
- FILENAME element: Specifies Add-In file name. (string value)
- COMPANY element: Describes information of the Add-In developer company / individual. (string value)
- COPYRIGHT element: Describes the copyright notice. (string value)
- HELPFILE element: Specifies URL that contains help of the Add-In. (string value)
- ICONFILE element: Specifies icon file name of Add-In. (string value)
- ISACTIVE element: Specifies whether activates Add-in automatically in the starting of the program. (boolean value)
- MENUFILE element: Specifies menu extension file name associated to the Add-In. (string value)
- MODULES/MODULEFILENAME element: Specifies file names for additional COM objects in case that an Add-In object uses another COM objects. StarUML registers all additional COM objects specified in this element on execution. (string value)

Registering Add-In Description File

To make an add-in description file to be recognized automatically by StarUML, must place the file in the subdirectory of StarUML module directory(<install-dir>\modules). StarUML searches and reads all add-in description files in the module directory and registers them at the program automatically when StarUML is initializing. If add-in description file is invalid or it's extension file name is not .aid, StarUML will not read the add-in description file and ignore it. It is recommended that make a subdirectory in the StarUML module directory and place the add-in description file in there to avoid modules being out of order.

Note: Delete the add-in description file from the StarUML module directory(<install-dir>\modules) not to use the add-in any more.

Option Extension

Basic Concept of Option Extension

StarUML supports setup options to adjust environment and detail functions of StarUML. Options are necessary not to StarUML application self but also add-ins supplies by third-party vendors. StarUML option extension enables Add-Ins to equip option configuring function without additional implementation. For using option extension, Add-In developer just defines option items with text file and places it in the Add-In directory. These option definitions are loaded on the program in initializing and displayed on option dialog. Add-In developer can save their time and efforts for implementing Add-In, and provide consistent user interface to users.

Follow the steps below to support setup options in Add-In.

1. Create an option schema document file (.opt) to define option items for the Add-In.
2. Copy the option schema document file (.opt) to subdirectory of module directory.

Hierarchy of Option Schema

StarUML constructs the option schema hierarchically as follows to manage many option items that defined in the application and add-ins in integrative.

- **Option Schema**: Option schema is the highest classification of option structure and is unit of option schema file. It appears as folder icon on the top level in the treeview that is placed in the left of option dialog.
- **Option Category:**
  Option category is the division of option schema by function, and displayed as lower level of treeview in the left of option dialog.
- **Option Classification:**
  Option classification classifies option items in detail, and corresponds to category row of inspector in option dialog. It has several option items that can be edited.
- **Option Item:**
  Option item is a unit of editing option value and corresponds to one row of inspector in option dialog.

Writing Option Schema

Option schema file to define option items is XML based text file which extension file name is *.opt. The option schema contents are contained within the **OPTIONSCHEMA** element, and there must not be any errors in syntax or contents.

```
<?xml version="1.0" encoding="..." ?>
<OPTIONSCHEMA id="...">
    <HEADER>
    ...
    </HEADER>
    <BODY>
    ...
    </BODY>
</OPTIONSCHEMA>
```

- encoding property: Specifies the encoding property value for the XML document (e.g. UTF-8, EUC-KR). For details on this property value, see XML-related resources.
- id property (OPTIONSCHEMA element): Specifies the name of the option schema. It is a unique name to identify the option schema from the others.
- HEADER element: See the **Header Contents** section.
- BODY element: See the **Body Contents** section.

Header Contents

The HEADER section of an option schema document contains general information for the option schema such as the option schema title and description. Structure of the header section is as follows.

```
<HEADER>
    <CAPTION>...</CAPTION>
    <DESCRIPTION>...</DESCRIPTION>
</HEADER>
```

- CAPTION element: This is a title of the option schema and displayed as caption of node in treeview of option dialog.
- DESCRIPTION element: Contains the description of the option schema.

Body Contents

The BODY section of an option schema document contains definition of all option items hierarchically.

```
<BODY>
    <OPTIONCATEGORY>
        <CAPTION>...</CAPTION>
        <DESCRIPTION>...</DESCRIPTION>
        <OPTIONCLASSIFICATION>
            <CAPTION>...</CAPTION>
```

```
            <DESCRIPTION>...</DESCRIPTION>
            <OPTIONITEM>
               ...
            </OPTIONITEM>
            ...
        </OPTIONCLASSIFICATION>
         ...
    </OPTIONCATEGORY>
     ...
</BODY>
```

- OPTIONCATEGORY element: Defines structure of option category.
  - CAPTION element: Specifies caption of the option category displayed as node in treeview of the option dialog.
  - DESCRIPTION element: Contains brief description of the option category that displayed at option description memo box appears in the option dialog.
- OPTIONITEM element: Defines a number of option items. See the **Option Item Definition** section.

Option Item Definition

OPTIONCLASSIFICATION element can contain a number of option item definitions. Option item type are defined as several types such as integer, real, boolean, enumeration and so on. Option dialog supports information for inputting value or restricts value according to option item type.

Available types of option item are as follows.

Option item type	XML element name	Input in the option dialog
Integer	OPTIONITEM-INTEGER	Input only integer value.
Real	OPTIONITEM-REAL	Input only real number.
String	OPTIONITEM-STRING	Input only string.
Boolean	OPTIONITEM-BOOLEAN	Input true or false with check box.
Text	OPTIONITEM-TEXT	Input multiple line of text in pop-up text box.
Enumeration	OPTIONITEM-ENUMERATION	Select one of items that defined with OPTION-ENUMERATIONITEM in combo box.
Font name	OPTIONITEM-FONTNAME	Select one of font names installed in the system.
File name	OPTIONITEM-FILENAME	Input file name or select the file in the open file dialog.
Path name	OPTIONITEM-PATHNAME	Input directory name or select the directory in the open directory dialog.
Color	OPTIONITEM-COLOR	Select a color in the color combo box or select the color in the color dialog.
Range	OPTIONITEM-RANGE	Input an integer value within specified range. Can change the value as amount of specified step with spin button.

The following represents format of option item definitions that belongs to OPTIONCLASSIFICATION in the option schema file.

```
<OPTIONCLASSIFICATION>
    <OPTIONITEM-INTEGER key="...">
        <CAPTION>...</CAPTION>
        <DESCRIPTION>...</DESCRIPTION>
        <DEFAULTVALUE>...</DEFAULTVALUE>
    </OPTIONITEM-INTEGER>
    <OPTIONITEM-REAL key="...">
        <CAPTION>...</CAPTION>
        <DESCRIPTION>...</DESCRIPTION>
        <DEFAULTVALUE>...</DEFAULTVALUE>
    </OPTIONITEM-REAL>
    <OPTIONITEM-STRING key="...">
        <CAPTION>...</CAPTION>
        <DESCRIPTION>...</DESCRIPTION>
        <DEFAULTVALUE>...</DEFAULTVALUE>
    </OPTIONITEM-STRING>
    <OPTIONITEM-BOOLEAN key="...">
```

```
    <OPTIONITEM-BOOLEAN key="...">
        <CAPTION>...</CAPTION>
        <DESCRIPTION>...</DESCRIPTION>
        <DEFAULTVALUE>...</DEFAULTVALUE>
    </OPTIONITEM-BOOLEAN>
    <OPTIONITEM-TEXT key="...">
        <CAPTION>...</CAPTION>
        <DESCRIPTION>...</DESCRIPTION>
        <DEFAULTVALUE>...</DEFAULTVALUE>
    </OPTIONITEM-TEXT>
    <OPTIONITEM-ENUMERATION key="...">
        <CAPTION>...</CAPTION>
        <DESCRIPTION>...</DESCRIPTION>
        <DEFAULTVALUE>...</DEFAULTVALUE>
        <ENUMERATIONITEM>...</ENUMERATIONITEM>
        ...
    </OPTIONITEM-ENUMERATION>
    <OPTIONITEM-FONTNAME key="...">
        <CAPTION>...</CAPTION>
        <DESCRIPTION>...</DESCRIPTION>
        <DEFAULTVALUE>...</DEFAULTVALUE>
    </OPTIONITEM-FONTNAME>
    <OPTIONITEM-FILENAME key="...">
        <CAPTION>...</CAPTION>
        <DESCRIPTION>...</DESCRIPTION>
        <DEFAULTVALUE>...</DEFAULTVALUE>
    </OPTIONITEM-FILENAME>
    <OPTIONITEM-PATHNAME key="...">
        <CAPTION>...</CAPTION>
        <DESCRIPTION>...</DESCRIPTION>
        <DEFAULTVALUE>...</DEFAULTVALUE>
    </OPTIONITEM-PATHNAME>
    <OPTIONITEM-COLOR key="...">
        <CAPTION>...</CAPTION>
        <DESCRIPTION>...</DESCRIPTION>
        <DEFAULTVALUE>...</DEFAULTVALUE>
    </OPTIONITEM-COLOR>
    <OPTIONITEM-RANGE key="...">
        <CAPTION>...</CAPTION>
        <DESCRIPTION>...</DESCRIPTION>
        <DEFAULTVALUE>...</DEFAULTVALUE>
        <MINVALUE>...</MINVALUE>
        <MAXVALUE>...</MAXVALUE>
        <STEP>...</STEP>
    </OPTIONITEM-RANGE>
     ...
</OPTIONITEMCLASSIFICATION>
```

- key property (all OPTIONITEM elements): Specifies it's own key value of the option item which is unique in the option schema. It is used in reading option values with COM interface.
- CAPTION element: Specifies caption of option item used in option dialog.
- DESCRIPTION element: Contains brief description of the option item that displayed at option description memo box appears in the option dialog.
- DEFAULTVALUE 요소 : Specifies default value of the option item. It must be in the range of valid values as follows. If default value is not valid as the type specified, can't edit value in the option dialog.

Option item type	Range of valid values
OPTIONITEM-INTEGER	Integer in -2147483648 ~ 2147483647
OPTIONITEM-REAL	Integer or floating-point value
OPTIONITEM-STRING	String value
OPTIONITEM-BOOLEAN	True or False
OPTIONITEM-TEXT	String value
OPTIONITEM-ENUMERATION	String defined in ENUMERATIONITEM element
OPTIONITEM-FONTNAME	Font name. e.g. Tahoma
OPTIONITEM-FILENAME	File name with full path or empty string

<table>
<tr><td></td><td>e.g. C:\My Document\Default.xml</td></tr>
<tr><td>OPTIONITEM-PATHNAME</td><td>Valid path name or empty string
e.g. C:\My Document</td></tr>
<tr><td>OPTIONITEM-COLOR</td><td>Formatted string as follows
${W}{B}{G}{R}
<table>
<tr><td>{W}</td><td>Reserved . Must be 00</td></tr>
<tr><td>{B}</td><td>Blue of the color. Hexadecimal value in 0 ~ 255 (00 ~ FF)</td></tr>
<tr><td>{G}</td><td>Green of the color. Hexadecimal value in 0 ~ 255 (00 ~ FF)</td></tr>
<tr><td>{R}</td><td>Red of the color. Hexadecimal value in 0 ~ 255 (00 ~ FF)</td></tr>
</table>
i.e. $00FF0000 , $00A0A0A0, $00FF00FF</td></tr>
<tr><td>OPTIONITEM-RANGE</td><td>Integer value between minimum value specified in MINVALUE and maximum value specified in MAXVALUE</td></tr>
</table>

- ENUMERATIONITEM element: Enumerate items that selectable in the enumeration typed option item(OPTION-ENUMERATION). OPTION-ENUMERATION element must have at least one ENUMERATIONITEM element.
- MINVALUE element: Specifies minimum integer value in range typed option item(OPTION-RANGE).
- MAXVALUE element: Specifies maximum integer value in range typed option item(OPTION-RANGE).
- STEP element: Specifies an increment of range typed option value when click the spin button for editing.

The following example is the part of option schema file for StarUML.

```
<?xml version="1.0" encoding="UTF-8" ?>
<OPTIONSCHEMA id="ENVIRONMENT">
    <HEADER>
        <CAPTION>Environment</CAPTION>
        <DESCRIPTION> </DESCRIPTION>
    </HEADER>
    <BODY>
        <OPTIONCATEGORY>
            <CAPTION>General</CAPTION>
            <DESCRIPTION>General Configuration is a group of the basic and general option items for
            <OPTIONCLASSIFICATION>
                <CAPTION>General</CAPTION>
                <DESCRIPTION></DESCRIPTION>
                <OPTIONITEM-RANGE key="UNDO_LEVEL">
                    <CAPTION>Max. number of undo actions</CAPTION>
                    <DESCRIPTION>Specifies the maximum number of actions for undo and redo.</DESCRI
                    <DEFAULTVALUE>30</DEFAULTVALUE>
                    <MINVALUE>1</MINVALUE>
                    <MAXVALUE>100</MAXVALUE>
                    <STEP>1</STEP>
                </OPTIONITEM-RANGE>
                <OPTIONITEM-BOOLEAN key="CREATE_BACKUP">
                    <CAPTION>Create backup files</CAPTION>
                    <DESCRIPTION>Specifies whether to create backup files when saving changes.</DES
                    <DEFAULTVALUE>True</DEFAULTVALUE>
                </OPTIONITEM-BOOLEAN>
            </OPTIONCLASSIFICATION>
        </OPTIONCATEGORY>
    </BODY>
</OPTIONSCHEMA>
```

Registering Option Schema

To make a option schema to be recognized automatically by StarUML, must place the file in the subdirectory of StarUML module directory(<install-dir>\modules). StarUML searches and reads all option schema files in the module directory and registers them at the program automatically when StarUML is initializing. If option schema file is invalid or it's extension file name is not .opt, StarUML will not read the option schema file and ignore it. It is recommended that make a subdirectory in the StarUML module directory and place the add-in description file in there to avoid modules being out of order.

modules being out of order.

Note: Delete option schema file from the StarUML module directory(<install-dir>\modules) not to use the option extension any more.

Accessing Option Values

Accessing Option Values with COM Interface

You can access the option values that user changed in option dialog by using COM interface of StarUML. **GetOptionValue()** of **IStarUMLApplication** returns option value depends on SchemaID and Key inputted as variant.
The method usage is as follows.

```
IStarUMLApplication.GetOptionValue(SchemaID: String, Key: String): Variant
```

- SchemaID: Schema id that defined in the option schema file.
- Key: Key of option item that defined in the option schema file.

Use the *Variant*
typed return value of GetOptionValue() by casting it according to the type of each option item. You can read the value directly without additional type casting in script languages such as JScript and VBScript.

The following is JScript example that reads "UNDO_LEVEL" option value defined in the StarUML environment option schema and output it to message box.

```
var app = new ActiveXObject("StarUML.StarUMLApplication");
var undoLevel = app.GetOptionValue("ENVIRONMENT", "UNDO_LEVEL");

WScript.Echo("Max. number of undo actions : " + undoLevel);
```

Processing change event of option value

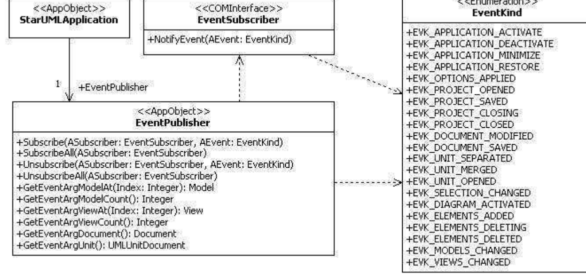
StarUML propagates events that occurs in using the program to Add-ins that implement **IEventSubscriber** interface. If user changes option values in option dialog, Application invokes event handler- **NotifyEvent()**- of Add-ins that implement **IEventSubscriber**. If you want to apply option values promptly to the Add-in when user changes the option values, implement **IEventSubscriber** interface and **NotifiyEvent()** to read the option values by using **IStarUMLApplication.GetOptionValue()** method in case of **EVK_OPTIONS_APPLIED** event. Add-Ins that use script such as VBScript and JScript cannot apply option values to the Add-in becase they can't implement **IEventSubscriber** interface.

For the details of event handling, it will be featured in the next section.

Basic Concepts of Event Subscription

An Add-In Object that implements the **IEventSubscriber** interface can subscribe to various internal events of the StarUML™ application. Whenever an internal event occurs, the StarUML™ application calls the **NotifyEvent** method of the registered **IEventSubscriber** type objects.

The class diagram below illustrates the organization of the external API interfaces related to event subscription.



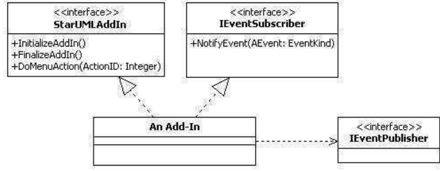
Kinds of Events

As illustrated above, the **EventKind**
enumeration defines the kinds of internal events of the StarUML™ application that can be subscribed by Add-In objects that implement the **IEventSubscriber** interface. The table below describes each literal of the **EventKind** enumeration.

Event Kind (literal)	Integer Value	Event Description
EVK_APPLICATION_ACTIVATE	0	Occurs when the StarUML™ application window is activated.
EVK_APPLICATION_DEACTIVATE	1	Occurs when the StarUML™ application window is deactivated.
EVK_APPLICATION_MINIMIZE	2	Occurs when the StarUML™ application window is minimized.
EVK_APPLICATION_RESTORE	3	Occurs when the minimized StarUML™ application window is restored to the previous size.
EVK_OPTIONS_APPLIED	4	Occurs when an option value is modified.
EVK_PROJECT_OPENED	5	Occurs when a project element is created or a project file is opened.
EVK_PROJECT_SAVED	6	Occurs whenever a project is saved.
EVK_PROJECT_CLOSING	7	Occurs when "Close Project" is selected.
EVK_PROJECT_CLOSED	8	Occurs when a project is closed.
EVK_DOCUMENT_MODIFIED	9	Occurs when a document (project or unit) is modified.
EVK_DOCUMENT_SAVED	10	Occurs when a document (project or unit) is saved.
EVK_UNIT_SEPARATED	11	Occurs when a unit element is separated.
EVK_UNIT_MERGED	12	Occurs when a separated unit element is merged.
EVK_UNIT_OPENED	13	Occurs when a unit is opened.
EVK_SELECTION_CHANGED	14	Occurs when the modeling element selection is changed.
EVK_DIAGRAM_ACTIVATED	15	Occurs when a diagram is opened.
EVK_ELEMENTS_ADDED	16	Occurs whenever a new modeling element is created.
EVK_ELEMENTS_DELETING	17	Occurs when deleting a modeling element.
EVK_ELEMENTS_DELETED	18	Occurs when a modeling element is deleted.
EVK_MODELS_CHANGED	19	Occurs when a model element property value is modified.
EVK_VIEWS_CHANGED	20	Occurs when a view element property value is modified.

Subscribing to Events

In order for an Add-In to subscribe to the StarUML™ application events, it needs to implement the **IEventSubscriber** interface in addition to the **IStarUMLAddIn** interface, which is the common interface for all StarUML™ Add-Ins.



The following example shows the class definition of an StarUML™ Add-In object that implements the **IStarUMLAddIn** interface and the **IEventSubscriber** interface. This example is written in Delphi Pascal.

```
type
    AddInExample = class(TComObject, IStarUMLAddIn, IEventSubscriber)
    private
        StarUMLApp: IStarUMLApplication;
        EventPub: IEventPublisher;
    protected
        function InitializeAddIn: HResult; stdcall;
        function FinalizeAddIn: HResult; stdcall;
        function DoMenuAction(ActionID: Integer): HResult; stdcall;
```

```
        function NotifyEvent(AEvent: EventKind): HResult; stdcall;
        ...
    public
        procedure Initialize; override;
        destructor Destroy; override;
        ...
    end;
```

Event Subscription Registration and Removal

In order for an Add-In object, which implements the **IEventSubscriber** interface, to subscribe to events, the event subscription must be registered. Event subscription registration and removal can be done through the **IEventPublisher** type object. Reference to the **IEventPublisher** type object can be obtained through the **IStarUMLApplication** element. The following Delphi Pascal example shows obtaining reference to **IStarUMLApplication** and the **IEventPublisher** type object.

```
implementation

procedure AddInExample.Initialize;
begin
    inherited;
    StarUMLApp := CreateOleObject('StarUML.StarUMLApplication') as IStarUMLApplication;
    EventPub := StarUMLApp.EventPublisher;
end;

destructor AddInExample.Destroy;
begin
    EventPub := nil;
    StarUMLApp := nil;
    inherited;
end;
```

The **IEventPublisher**
interface provides the following methods for registration and removal of event subscription. The "ASubscriber" argument for each method represents the actual Add-In object that implements the **IEventSubscriber** interface.

Method	Description
Subscribe(ASubscriber: IEventSubscriber; AEvent: EventKind)	Registers subscription to an event specified by the AEvent argument.
SubscribeAll(ASubscriber: IEventSubscriber)	Registers subscription to all events.
Unsubscribe(ASubscriber: IEventSubscriber; AEvent: EventKind)	Removes subscription to an event specified by the AEvent argument.
UnsubscribeAll(ASubscriber: IEventSubscriber)	Removes subscription to all events.

Use the **Subscribe**
method if an Add-In object needs to subscribe to certain events only. For instance, for subscribing to two specific events, call the **Subscribe** method for each event. Use the **SubscribeAll** method to subscribe to all events. In general, the **Subscribe** and **SubscribeAll** methods are called by the **IPlasticAddIn.InitializeAddIn** method.

If an Add-In object no longer needs to subscribe to the registered events (e.g. when the object is terminated), all the events registered must be unregistered. Use the **Unsubscribe** method if the subscription was registered by the **Subscribe** method, and use the **UnsubscribeAll** method if the subscription was registered by the **SubscribeAll** method. In general, the **Unsubscribe** and **SubscribeAll** methods are called by the **IStarUMLAddIn**.**FinalizeAddIn** method.

The following example shows registration and removal of subscription to the EVK_ELEMENTS_ADDED and EVK_ELEMENTS_DELETED events.

```
implementation

function AddInExample.InitializeAddIn: HResult;
begin
    EventPub.Subscribe(Self, EVK_ELEMENTS_ADDED);
    EventPub.Subscribe(Self, EVK_ELEMENTS_DELETED);
```

```
    ...
    Result := S_OK;
end;

function AddInExample.FinalizeAddIn: HResult;
begin
    EventPub.Unsubscribe(Self, EVK_ELEMENTS_ADDED);
    EventPub.Unsubscribe(Self, EVK_ELEMENTS_DELETED);
    ...
    Result := S_OK;
end;
```

Acquiring Event Argument

When an event occurs, it is necessary to acquire the related arguments. For instance, when an event related to the creation of a modeling element occurs (**EVK_ELEMENTS_ADDED**), it is necessary to identify which modeling element is created. The **IEventPublisher** interface provides the following methods in respect of event arguments.

Method	Description
GetEventArgModelCount (): Integer	Returns the model element count related to the event.
GetEventArgModelAt(Index: Integer): IModel	Returns reference to the (index)th model element related to the event.
GetEventArgViewCount: Integer	Returns the view element count related to the event.
GetEventArgViewAt(Index: Integer): IView	Returns reference to the (index)th view element related to the event.
GetEventArgDocument: IDocument	Returns reference to the document element related to the event.
GetEventArgUnit: IUMLUnitDocument	Returns reference to the unit element related to the event.

Processing Events

When a subscribed event occurs, the Add-In needs to execute appropriate processes. Whenever a subscribed event occurs, the StarUML™ application calls the **NotifyEvent**
method of the respective Add-In and passes the event kind as an argument. The event kind is passed as an argument for the **NotifyEvent**
method because it is possible for an Add-In to subscribe to more than one event. Each Add-In needs to implements the **NotifyEvent** method to arrive at a logic to execute various processes according to the event kinds.

The following example shows implementation of the **NotifyEvent** method. This example verifies the semantic validity of the element connections when the association element (**UMLAssociation**) or the generalization element (**UMLGeneralization**) is created in the StarUML™ application. (This example is a continuation of the examples above. For definition of the Add-In object, see the examples above.)

```
implementation

function AddInExample.NotifyEvent(AEvent: EventKind): HResult;
var
    M: IModel;
    Assoc: IUMLAssociation;
    Gen: IUMLGeneralization;
    End1, End2: IUMLClassifier;
begin
    if AEvent = EVK_ELEMENTS_ADDED then
    begin
        if EventPub.GetEventArgModelCount = 1 then
        begin
            M := EventPub.GetEventArgModelAt(0);

            // Association
            if M.QueryInterface(IUMLAssociation, Assoc) = S_OK then
            begin
                End1 := Assoc.GetConnectionAt(0).Participant;
                End2 := Assoc.GetConnectionAt(1).Participant
                if End1.IsKindOf('UMLPackage') or End2.IsKindOf('UMLPackage') then
                    ShowMessage('Packages cannot have associations.')
                ...
```

```
            end;

          // Generalization
          if M.QueryInterface(IUMLGeneralization, Gen) = S_OK then
          begin
              if Gen.Child.IsRoot then
                  ShowMessage('Root elements cannot have parent elements.');
              if Gen.Parent.IsLeaf then
                  ShowMessage('Leaf elements cannot have child elements.');
           end;
        end;
    end;

    Result := S_OK;
end;
```

Chapter 10. Extending Notation

This chapter gives an introduction of Notation Extension. It gives basic concepts of Notation Extension and simple specification of language syntax for Notation Extension. For example, it shows how to add new sort diagram to take advantage of Notation Extension.

Why Notation Extension?

Notation Extension is a extension concept for user to define and use user's own notation for UML model. StarUML supports platform to operate the featrue of Notation Extension. Well, why Notation Extension is needed?

- Profile supports iconic and decoration view but it can't express exactly in required form for notation.
- For mapping ER-Diagram to UML, mapping ER model to UML model looks proper but mapping notation to UML notation looks unnatural.
- UML meta model is an enough data container to contain all kinds of modeling semantics. If UML tool can extend its notation freely, it can play a meta-modeling tool role in all modeling area.

By expressing notation(form) in the same way as before but describing model with UML model, it gives to users mutual supplement, efficiency, and compatibility between old area and UML area.

Notation Extension Language

Basic Syntax

Syntax of Notation Extension Language is similar to Scheme language(dialect of LISP). Basic unit is expression and whole statement consists of one expression. Expression is composed of value or operation expression. Value means real, integer, string, boolean, identifier. Operation expression starts with "(" and ends with ")". Operator and operands(they describe another expressions) appear in parentheses. Operator and identifier are not case-sensitive. Comment style follows the comment rule of C++ and Java. Comment uses "//" on one line and "/* */" on multiple lines.

```
expr ::= flt | int | str | bool | nil | ident | "(" oper (expr)* ")" ;
```

First statement of Notation Extension Language is "notation" expression. Operator is "notation", and arguments are "onarrange" and "ondraw" expressions. A "notation" expression corresponds to a "stereotype" in profile. The "notation" expression describes how stereotype shape is shown. When stereotyped element is shown in diagram, the expression is executed. First, "onarrange" expression executes argumented expressions to recalculate element position . "ondraw" expression is executed to draw element after "onarrange" expression execution.

```
(notation
    (onarrange ...)
    (ondraw ...)
)
```

The followings are available argument expression for "onarrange" and "ondraw" expression.

- sequence
- if
- for
- set
- logical, comparison operator
- built-in function

sequence expression

"sequence" expression groups and executes arguments in order. The arguments of "sequence" expression are also expression and the number of them is not limited.

```
(sequence expr1 expr2 ...)
```

The following example shows that one "sequence" expression groups 3 expressions.

```
(sequence
  (+ 10 20)        // 10 + 20
  (- 20 30 40)     // 20 - 30 - 40
  (/ 10 20)        // 10 / 20
)
```

if expression

"if" expression represents conditional syntax. First argument is condition, second argument is executed if condition is true, and third argument is executed if condition is not. Third argument appears optionally. If third argument is omitted and condition is false, "if" expression doesn't execute anything.

```
(if condition-expr on-true-expr on-false-expr? )
```

The following example shows that expression increases "count" variable if "i" value is between 0 and 30, but decreases "count" variable if not.

```
(if (or (<= i 0) (>= i 30))     // if (i <= 0 || i >= 30)
    (set count (+ count 1))     //   count++;
    (set count (- count 1))     // else
)                               //   count--;
```

for expression

"for" expression repeats expression while specified variable is from initial value to end value. First argument is a variable name to be used for repetition. Second is initial value and third is end value. The last is expression to be executed on each step of repetition.

```
(for identifier init-expr end-expr expr)
```

The following is example which prints 1 to 10 on the screen.

```
(for i 1 10                           // for (int i = 1; i <= 10; i++)
    (textout 100 (+ 100 (* i 20))     //    textout(100, 100+(i*20), i);
             i
    )
)
```

set expression

"set" expression assigns variable to value. Variable declaration is not required. It is declared automatically and bounded as global variable when it is used.

```
(set identifier value-expr)
```

The following example shows that it assigns a, b variables, concatenates a and b, and assigns result to c variable.

```
(set a 'My name is ')        // a = "My name is ";
```

```
(set a 'My name is ')         // a = "My name is ";
(set b 'foo')                 // b = "foo";
(set c (concat a b))          // c = a + b;
```

arthmetic, logical, comparison operator

Supported mathematical operators are "+", "-", "*", "/", and logical operators are "and", "or", "not". And it supports "=", "!=", "<", "<=", ">", ">=" operators for comparison.

```
(+ 1 (/ 10 5) (- (* 2 3) 6))     // 1 + (10/5) + (2*3-6)
(and (< i 10) (not (= j 20)))    // (i < 10) && (!(j == 20))
```

built-in function

Built-in functions supported on Notation Extension Language are grouped by the followings:

- Mathematical functions
- String functions
- List functions
- Model access functions
- Graphic functions

Mathematical functions

The following is list of built-in functions related to mathematic.

Signature	Description
(sin angle)	returns the sine of the angle.
(cos angle)	returns the cosine of the angle.
(tan angle)	returns the tangent of the angle.
(trunc val)	truncates a real-type value to an integer-type value. val is a real-type expression.
(round val)	returns an integer value that is the value of val rounded to the nearest whole number. If val is exactly halfway between two whole numbers, the result is always the even number.

String functions

The following is list of built-in functions related to string processing.

Signature	Description
(concat str1 str2...)	concatenates all argument strings to one string.
(trim str)	removes leading and trailing spaces and control characters from the given string.
(length str)	returns the number of characters in argument string.
(tokenize str deli)	returns the list of strings that results when a string is separated by deli delimiter.

List functions

The following is list of built-in functions related to list processing.

Signature	Description
(list val1 val2 ...)	returns list which is composed of arguments.

(append lst lst)	appends item to the end of list list.
(append lst item)	
(itemat lst index)	returns an item at index in list.
(itemcount lst)	returns the number of items in argument list.

Mode access functions

The following is list of built-in functions related to model acess.

Signature	Description
(mofattr elem attr)	returns in strings the default type attribute values of modeling elements as defined by arguments.
(mofsetattr elem attr val)	assigns "val" value to "attr" attribute of modeling elements.
(mofref elem ref)	returns the reference type attribute (object reference) values of modeling elements as defined by arguments.
(mofcolat elem col at)	returns the attribute value (object reference) of the "at" order item in the reference collection of modeling elements as defined by arguments.
(mofcolcount elem col)	returns the count number of items in reference collection as defined by arguments.
(constraintval elem name)	returns constraint contained in the element.
(tagval elem tagset name)	returns taggedvalue, whose type is primitive type, of element in tagd efinition set.
(tagref elem tagset name)	returns taggedvalue, whose type is reference, of element in tag definition set.
(tagcolat elem tagset name at)	returns item in taggedvalue(collectio type) of element in tag definition set.
(tagcolcount elem tagset name)	returns length of items in taggedvalue(collectio type) of element in tag definition set.

Graphic functions

The following is list of built-in functions related to style.

Signature	Description
(setpencolor color)	set Color to change the color used to draw lines or outline shapes. The way the color is used by the pen depends on the Mode and Style properties. Color can have one of the following values:

Value	Meaning
clNone	White
clAqua	Aqua
clBlack	Black
clBlue	Blue
clCream	Cream
clDkGray	Dark Gray
clFuchsia	Fuchsia
clGray	Gray
clGreen	Green

<table>
<tr><td></td><td>
<table>
<tr><td>clLime</td><td>Lime green</td></tr>
<tr><td>clLtGray</td><td>Light Gray</td></tr>
<tr><td>clMaroon</td><td>Maroon</td></tr>
<tr><td>clMedGray</td><td>Medium Gray</td></tr>
<tr><td>clMoneyGreen</td><td>Mint green</td></tr>
<tr><td>clNavy</td><td>Navy blue</td></tr>
<tr><td>clOlive</td><td>Olive green</td></tr>
<tr><td>clPurple</td><td>Purple</td></tr>
<tr><td>clRed</td><td>Red clGrayText</td></tr>
<tr><td>clSilver</td><td>Silver</td></tr>
<tr><td>clSkyBlue</td><td>Sky blue</td></tr>
<tr><td>clTeal</td><td>Teal</td></tr>
<tr><td>clWhite</td><td>White</td></tr>
<tr><td>clYellow</td><td>Yellow</td></tr>
</table>
</td></tr>
<tr><td>(setpenstyle style)</td><td>Use Style to draw a dotted or dashed line, or to omit the line that appears as a frame around shapes.

Style can have one of the following values:
<table>
<tr><th>Value</th><th>Meaning</th></tr>
<tr><td>psSolid</td><td>A solid line.</td></tr>
<tr><td>psDash</td><td>A line made up of a series of dashes.</td></tr>
<tr><td>psDot</td><td>A line made up of a series of dots.</td></tr>
<tr><td>psDashDot</td><td>A line made up of alternating dashes and dots.</td></tr>
<tr><td>psDashDotDot</td><td>A line made up of a series of dash-dot-dot combinations.</td></tr>
<tr><td>psClear</td><td>No line is drawn (used to omit the line around shapes that draw an outline using the current pen).</td></tr>
<tr><td>psInsideFrame</td><td>A solid line, but one that may use a dithered color if Width is greater than 1.</td></tr>
</table>
</td></tr>
<tr><td>(setbrushcolor color)</td><td>set the color of the brush. Color can have one of the color list above.</td></tr>
<tr><td>(setbrushstyle style)</td><td>bsSolid, bsClear, bsHorizontal, bsVertical, bsFDiagonal, bsBDiagonal, bsCross, bsDiagCross</td></tr>
<tr><td>(setfontface font)</td><td>set the typeface of the font.</td></tr>
<tr><td>(setfontcolor color)</td><td>set the color of the font. Color can have one of the color list above.</td></tr>
<tr><td>(setfontsize size)</td><td>set size of the font.</td></tr>
<tr><td>(setfontstyle style)</td><td>set the style of the font. Style is composed of the followings and seperator is "|" character.
<table>
<tr><th>Value</th><th>Meaning</th></tr>
<tr><td>fsBold</td><td>The font is boldfaced.</td></tr>
<tr><td>fsItalic</td><td>he font is italicized.</td></tr>
</table>
</td></tr>
</table>

	fsUnderline	The font is underlined.
	fsStrikeOut	The font is displayed with a horizontal line through it.
(setdefaultstyle)	Restore the Pen, Brush, Font informations to the default value.	

The following is list of built-in functions related to graphic.

Signature	Description
(textheight str)	Returns the height of a string in pixels, rendered in the current font.
(textwidth str)	Returns the width of a string rendered in the current font (in pixels).
(textout x y str)	Writes a string on the screen, starting at the point (X,Y).
(textbound x1 y1 x2 y2 yspace text clipping)	writes a string on area (x1, y1) to (x2, y2) of screen. yspace is line space. if clipping is true, string bounded to area is written.
(textrect x1 y1 x2 y2 x y str)	writes a string on area (x1, y1) to (x2, y2) of screen, starting at the point (X,Y).

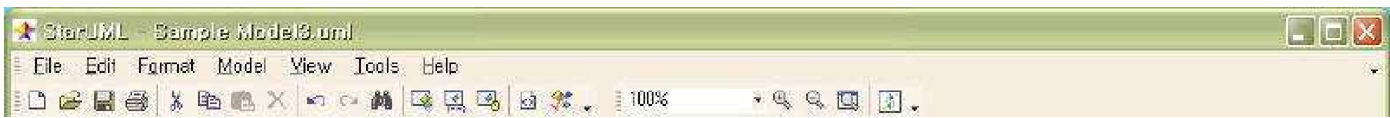
The following is list of built-in functions related to shape.

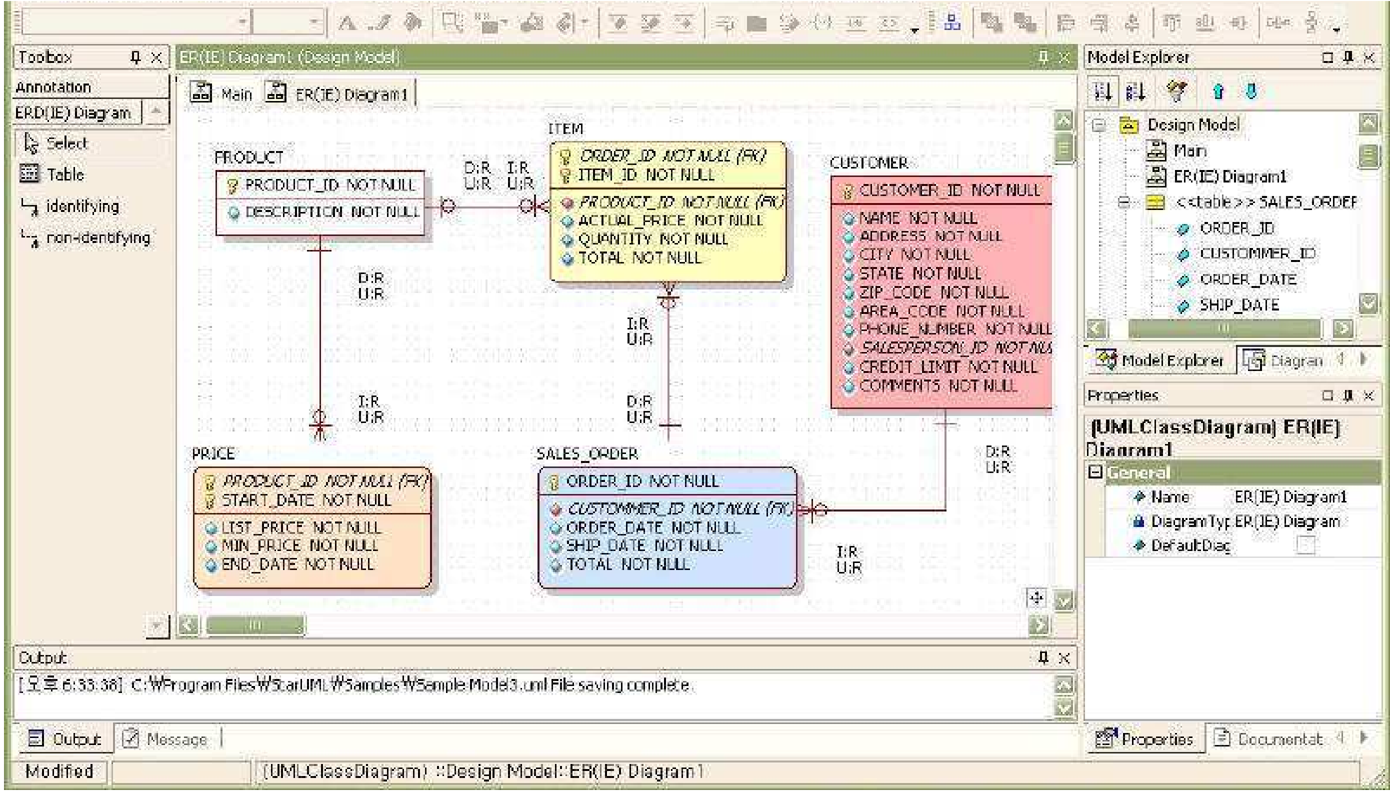
Signature	Description
(rect x1 y1 x2 y2)	Draws a rectangle defined by the points (X1,Y1) and (X2,Y2).
(filerect x1 y1 x2 y2)	Fills the specified rectangle on the canvas using the current brush.
(ellipse x1 y1 x2 y2)	Draws the ellipse defined by a bounding rectangle on the screen.
(roundrect x1 y1 x2 y2 x3 y3)	Draws a rectangle with rounded corners on the screen.
(arc x1 y1 x2 y2 x3 y3 x4 y4)	draws an arc inside an ellipse bounded by the rectangle defined by (X1,Y1) and (X2,Y2). The arc starts at the intersection of the line drawn between the ellipse center ((X1+X2) / 2.0,(Y1+Y2) / 2.0) and the point (X3,Y3) and is drawn counterclockwise until it reaches the intersection of the line drawn between the ellipse center and the point (X4,Y4)
(pie x1 y1 x2 y2 x3 y3 x4 y4)	draws a pie-shaped wedge on the image. The wedge is defined by the ellipse bounded by the rectangle determined by the points (X1, Y1) and X2, Y2). The section drawn is determined by two lines radiating from the center of the ellipse through the points (X3, Y3) and (X4, Y4)
(drawbitmap x y img transparent)	renders the image specified by the parameter on the screen at the location given by the coordinates (X, Y). Use transparent argument to specify that the image be drawn transparently. Use x2, y2 argument to stretch image.
(drawbitmap x1 y1 x2 y2 img transparent)	
(moveto x y)	changes the current drawing position to the point (X,Y).
(lineto x y)	draws a line on the canvas from pen position to the position specified by X and Y, and sets the pen position to (X, Y).
(line x1 y1 x2 y2)	draws a line on the canvas from (x1, y1) position to the position specified by (x2, y2).
(pt x y)	returns a Point structure from a pair of coordinates.
(polygon (pt x1 y1) (pt x2 y2) ...)	draws a series of lines on the canvas connecting the points passed in and closing the shape by drawing a line from the last point to the first point.
(polyline (pt x1 y1) (pt x2 y2) ...)	draws a series of lines on the canvas with the current pen, connecting each of the points passed to it in Points.
(polybezier (pt x1 y1) (pt x2	draws a set of Bezier curves.

<table>
<tr><td>(polybezier (pt x1 y1) (pt x2 y2) ...)</td><td>draws a set of bezier curves.</td></tr>
<tr><td>(ptatx index)</td><td>It is available when current view element is edge element. it returns x value of point structure at index of edge.</td></tr>
<tr><td>(ptaty index)</td><td>It is available when current view element is edge element. it returns y value of point structure at index of edge.</td></tr>
<tr><td>(ptcount)</td><td>It is available when current view element is edge element. it returns the number of points of edge.</td></tr>
<tr><td>(drawedge headOrTail endStyle)</td><td>It is available when current view element is edge element. it draws end of edge in argument style. Style is composed of the followings and seperator is "|" character.
<table>
<tr><th>Value</th><th>Shape</th></tr>
<tr><td>esStickArrow</td><td></td></tr>
<tr><td>esSolidArrow</td><td></td></tr>
<tr><td>esTriangle</td><td></td></tr>
<tr><td>esDiamond</td><td></td></tr>
<tr><td>esMiniDiamond</td><td></td></tr>
<tr><td>esArrowDiamond</td><td></td></tr>
<tr><td>esCrowFoot</td><td></td></tr>
<tr><td>esHalfStickArrow</td><td></td></tr>
<tr><td>esBar</td><td></td></tr>
<tr><td>esDoubleBar</td><td></td></tr>
<tr><td>esBelowCircle</td><td></td></tr>
<tr><td>esCircle</td><td></td></tr>
<tr><td>esRect</td><td></td></tr>
<tr><td>esFilledTriangle</td><td></td></tr>
<tr><td>esFilledDiamond</td><td></td></tr>
<tr><td>esMiniFilledDiamond</td><td></td></tr>
<tr><td>esArrowFilledDiamond</td><td></td></tr>
<tr><td>esFilledHalfStickArrow</td><td></td></tr>
<tr><td>esFilledCircle</td><td></td></tr>
<tr><td>esFilledRect</td><td></td></tr>
<tr><td>esMiniHalfDiamond</td><td></td></tr>
</table></td></tr>
<tr><td>(drawobject elem)</td><td>draws element in original style.</td></tr>
<tr><td>(arrangeobject elem)</td><td>arranges element in original style.</td></tr>
</table>

Creating a New Type of Diagram

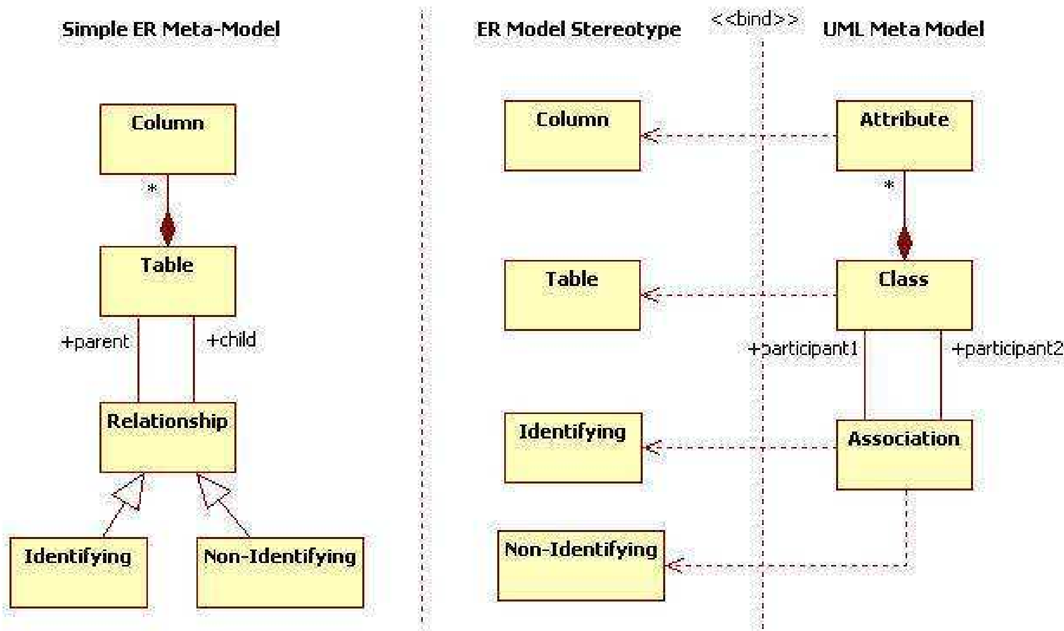
There are some preparations to utilize Notation Extension. First, profile is needed. It describes which stereotype it applies Notation Extension to. Second, Notation Extension file(*.NXT) is needed. It describes how notation is drawn. You should connect Notation Extension to stereotype in profile. Properties to be used in Notation Extension should also be inserted as tagged value in profile. Let me introduce to you how to create ER-Diagram notations for example of Notation Extension.





Profile Definition

Looking around elements in ER-Diagram, it consists of several elements (Table, Column, Relationship, etc.).



You should make stereotypes for table, column, relationship, etc. and apply stereotypes to UML models (Class, Association, Attribute) to map ER models to UML models. These are described like the followings in profile. You add <STEREOTYPE> sub element named "table" to <STEREOTYPELIST> element and assign <BASECLASS> element's value as "UMLClass" to apply stereotype to "UMLClass" typed model. In order for the class stereotyped "table" to be shown as ER notation, Notation Extension filename("table.nxt") should be specified to <NOTATOIN> element.

For "column" stereotype, Additional tagged values are required to indicate whether column is PK, FK, AK, or IK. So tag definition set name("table" in this case) that define these tagged values are defined is described in <RELATEDTAGDEFINITIONSET> element.

```
<PROFILE version="1.0">
    <HEADER>
        ...
    </HEADER>
    <BODY>
        <STEREOTYPELIST>
            <STEREOTYPE>
                <NAME>table</NAME>
                <BASECLASSES>
                    <BASECLASS>UMLClass</BASECLASS>
                </BASECLASSES>
                <NOTATION>table.nxt</NOTATION>
            </STEREOTYPE>

            <STEREOTYPE>
                <NAME>column</NAME>
                <BASECLASSES>
                    <BASECLASS>UMLAttribute</BASECLASS>
                    <RELATEDTAGDEFINITIONSET>table</RELATEDTAGDEFINITIONSET>
                </BASECLASSES>
            </STEREOTYPE>
            ...

        </STEREOTYPELIST>
```

Tag definition set is described in <TAGDEFINITIONSET> element of <TAGDEFINITIONSETLIST> and <TAGDEFINITIONSET> element is composed of <TAGDEFINITION> elements that describe tagged value's properties(name, type, and default value) added for column stereotype. In the following example, tagged values to Identify PK and FK are added, each tagged value's type is boolean, and each default value is false. (it means that every column is neither primary key nor foreign key at the first time after construction)

```
        ...
        </STEREOTYPELIST>

        <TAGDEFINITIONSETLIST>
            <TAGDEFINITIONSET>
                <NAME>column</NAME>
                <BASECLASSES>
                    <BASECLASS>UMLAttribute</BASECLASS>
                </BASECLASSES>

                <TAGDEFINITIONLIST>
                    ...
                    <TAGDEFINITION lock="False">
                        <NAME>PK</NAME>
                        <TAGTYPE>Boolean</TAGTYPE>
                        <DEFAULTDATAVALUE>false</DEFAULTDATAVALUE>
                    </TAGDEFINITION>

                    <TAGDEFINITION lock="False">
                        <NAME>FK</NAME>
                        <TAGTYPE>Boolean</TAGTYPE>
                        <DEFAULTDATAVALUE>false</DEFAULTDATAVALUE>
                    </TAGDEFINITION>
                    ...
                </TAGDEFINITIONLIST>
            </TAGDEFINITIONSET>
        </TAGDEFINITIONSETLIST>
```

To select diagram that shows stereotypes after definition of stereotypes, define new diagram named "ER Diagram" to <DIAGRAMTYPE> element in <DIAGRAMTYPELIST> element, describe <BASEDIAGRAM> element's value as "ClassDiagram" for diagram to be based on class diagram, and describe pallette reference name("ERD(IE)") to <AVALIABLEPALLETTE> element.

```
        <DIAGRAMTYPELIST>
            <DIAGRAMTYPE>
                <NAME>ER(IE) Diagram</NAME>
                <DISPLAYNAME>ER(IE) Diagram</DISPLAYNAME>
                <BASEDIAGRAM>ClassDiagram</BASEDIAGRAM>
                <ICON>DataModelDiagram.bmp</ICON>
                <AVAILABLEPALETTELIST>
                    <AVAILABLEPALETTE>ERD(IE)</AVAILABLEPALETTE>
                </AVAILABLEPALETTELIST>
            </DIAGRAMTYPE>
        </DIAGRAMTYPELIST>
```

The pallette informations are described in <PALLETTE> element. <PALLETTE> element is list that has reference of pallete button item.The detail informations for pallette button item are described to <ELEMENTPROTOTYPE> element. <NAME> element describes the element's name to be created, <DISPLAYNAME> and <ICON> elements describes the button item's name and image file name on pallette, <DRAGTYPE> element means whether mouse action style is like rectangle or edge style, <BASEELEMENT> and <STEREOTYPENAME> elements mean that created element is "Class" element and the element's stereotype is assigned to "table". To draw element by notation extension at once after element creation, <SHOWEXTENSION> element's value should be set to true.

```
        <PALETTELIST>
            <PALETTE>
                <NAME>ERD(IE)</NAME>
                <DISPLAYNAME>ERD(IE) Diagram</DISPLAYNAME>
                <PALETTEITEMLIST>
                    <PALETTEITEM>Table</PALETTEITEM>
                    <PALETTEITEM>identifying</PALETTEITEM>
                    <PALETTEITEM>non-identifying</PALETTEITEM>
                </PALETTEITEMLIST>
            </PALETTE>
        </PALETTELIST>

        <ELEMENTPROTOTYPELIST>
            <ELEMENTPROTOTYPE>
                <NAME>Table</NAME>
                <DISPLAYNAME>Table</DISPLAYNAME>
                <ICON>Table.bmp</ICON>
                <DRAGTYPE>Rect</DRAGTYPE>
                <BASEELEMENT>Class</BASEELEMENT>
                <STEREOTYPENAME>table</STEREOTYPENAME>
                <SHOWEXTENDEDNOTATION>True</SHOWEXTENDEDNOTATION>
            </ELEMENTPROTOTYPE>
            ...
        <ELEMENTPROTOTYPELIST>
    ...
```

Writing Notation Extension

Though data modeling is available by defining profile only, Notation Extension file(*.nxt) that is described to profile's <NOTATION> element should be written in order that models are shown in ER notation.

The following is summary of "table.nxt" file that draw notation for "table" stereotype. "onarrange" expression configures status required to draw "table". "ondraw" expression draws parts of table name, PK column, and other columns.

```
(notation
    (onarrange ...)

    (ondraw
        // draw name part ...

        // draw PK column part ...

        // draw other column part ...
    )
)
```

```
)
```

The first part (name compartment) is that variables for drawing are configured and name string got from model is written starting at the point (x, y).

```
(set x left)
(set y top)
...
(set name (mofattr model 'Name'))
(textout x y name)
...
```

Here, "left" and "top" variables are reserved variables. They take values from StarUML platform on each time of executing Notation Extension, and may return values to StarUML platform again on end time of execution Notation Extension. The followings behaving like this are reserved variables.

Variable	View element	Returns to StarUML platform	Description
view	Node,Edge	not return	target view to be drawn
model	Node,Edge	not return	model of target view to be drawn
left	Node	return	target view's left-most position
top	Node	return	target view's top-most position
right	Node	return	target view's right-most position
bottom	Node	return	target view's bottom-most position
width	Node	return	target view's width
height	Node	return	target view's height
minwidth	Node	not return	minimum width of target view
minheight	Node	not return	minimum height of target view
points	Edge	not return	point collection of target edge view
head	Edge	not return	head element of target edge view
tail	Edge	not return	tail element of target edge view

The following checks whether current table is dependent on others and draws property table shape. Repeating current table(class)'s association, if association's head end connects to current table, it means table is dependent, table is drawn as rounded rectangle. Unless, table is drawn as rectangle and it means that table is independent on others.

```
(set isSuperType true)

(set c (mofcolcount model 'Associations'))
(for i 0 (- c 1)
    (sequence
        (set assocEnd (mofcolat model 'Associations' i))
        (if (= assocEnd (mofcolat (mofref assocEnd 'Association') 'Connections' 1))
            (set isSuperType false)
            nil)))
...
// outline
(setdefaultstyle)
(if isSuperType
    (rect x y right bottom)
    (roundrect x y right bottom 10 10))
```

When displaying columns, repeating all the columns that table contains, elements whose PK tagged value is true are drawn over the other columns, PK icon is drawn on the left side and column name is drawn on the right side.

```
...
(for i 0 (- (mofColCount model 'Attributes') 1)
    (sequence
        // select i-th column
        (set attr (mofColAt model 'Attributes' i))
        ...
        // column is PK?
        (if (tagVal attr 'ERD' 'column' 'PK')
            (sequence
                ...
                (set attrName (mofAttr attr 'Name'))
                ...
                (drawbitmap x y 'primarykey.bmp' true)
                (textout (+ x 16) y attrName)
                (setdefaultstyle)
                ... ))))
...
(line left y right y)
```

And so repeating all the columns again, elements whose PK tagged value is not true are drawn with column icon and name under the PK columns.

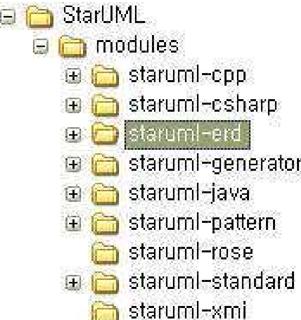
```
...
(for i 0 (- (mofColCount model 'Attributes') 1)
    (sequence
        // select i-th column
        (set attr (mofColAt model 'Attributes' i))
        (set keys '')
        ...
        // column is not PK?
        (if (= (tagVal attr 'ERD' 'column' 'PK') false)
        (sequence
            ...
            (set attrName (mofAttr attr 'Name'))
            ...
            // draw column
            (drawbitmap x y 'column.bmp' true))
            (textout (+ x 16) y attrName)
            (setdefaultstyle)
                ... ))))
```

Installing and Using Notation Extension

The Notation Extension file must exist in path that is described in profile. In this case of "table" stereotype, because path is not described and file name is only described, put profile and notation extension file in same folder.

If you have done all, do the following steps for installation.

1. Create new module folder in staruml/modules folder.
2. Put profile, notation extension file, and related image files into the module folder.
3. Restart StarUML and installation is done.



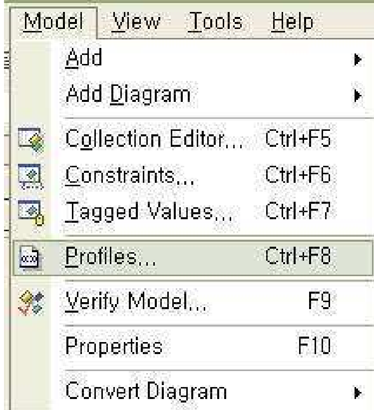
Reference

- Download complete notation extension file, profile, etc. for ER-Diagram from module downloads of StarUML official homepage of StarUML and install according to above steps.

The following is how to take advantage of notation extension.

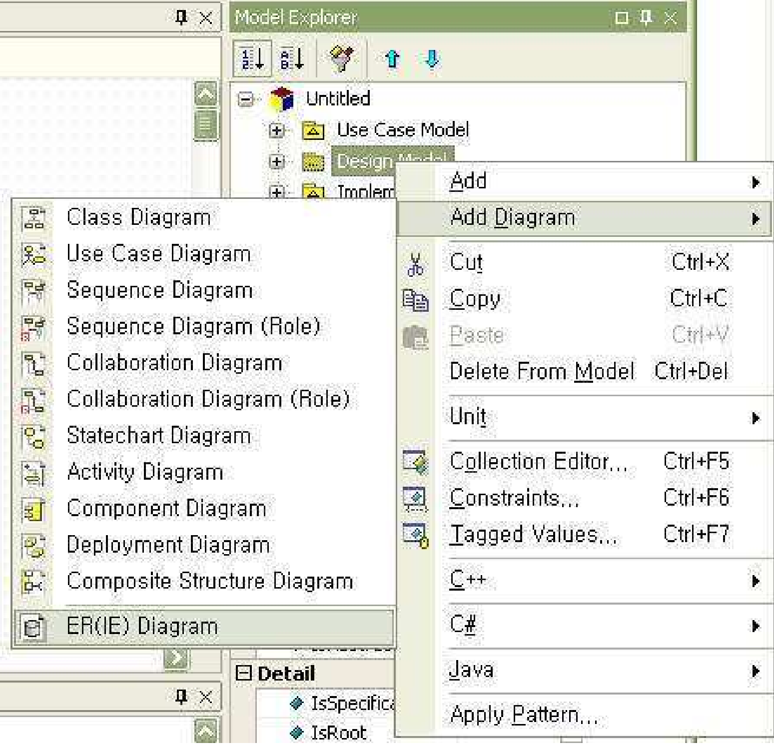
1. Start StarUML.

2. Click **[Model]** -> **[Profiles...]** menu.

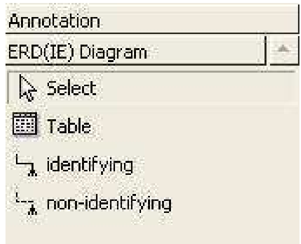


3. **[Profile Manager]** dialog box appears and select Data Modeling profile in **[Available profiles]** listbox and click **[Include]** button.

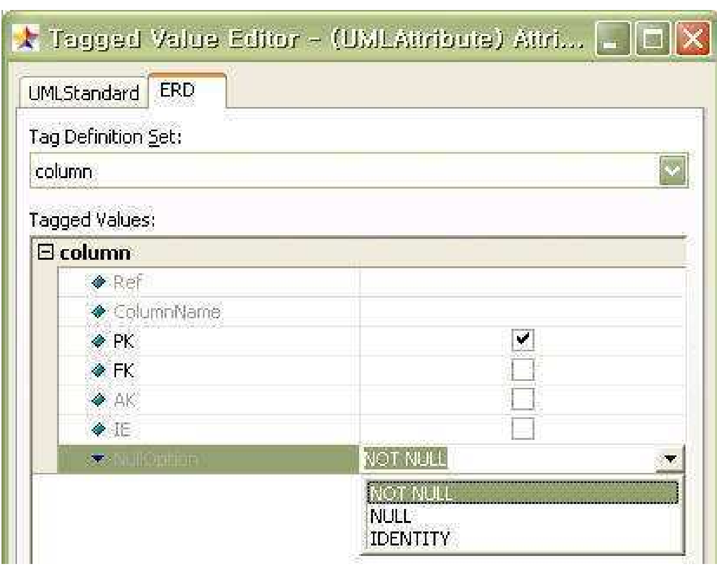
4. Select package that is going to contain ER-Diagram on **[Model Explorer]**, and click **[Add Diagram] -> [ER(IE) Diagram]** popup menu.



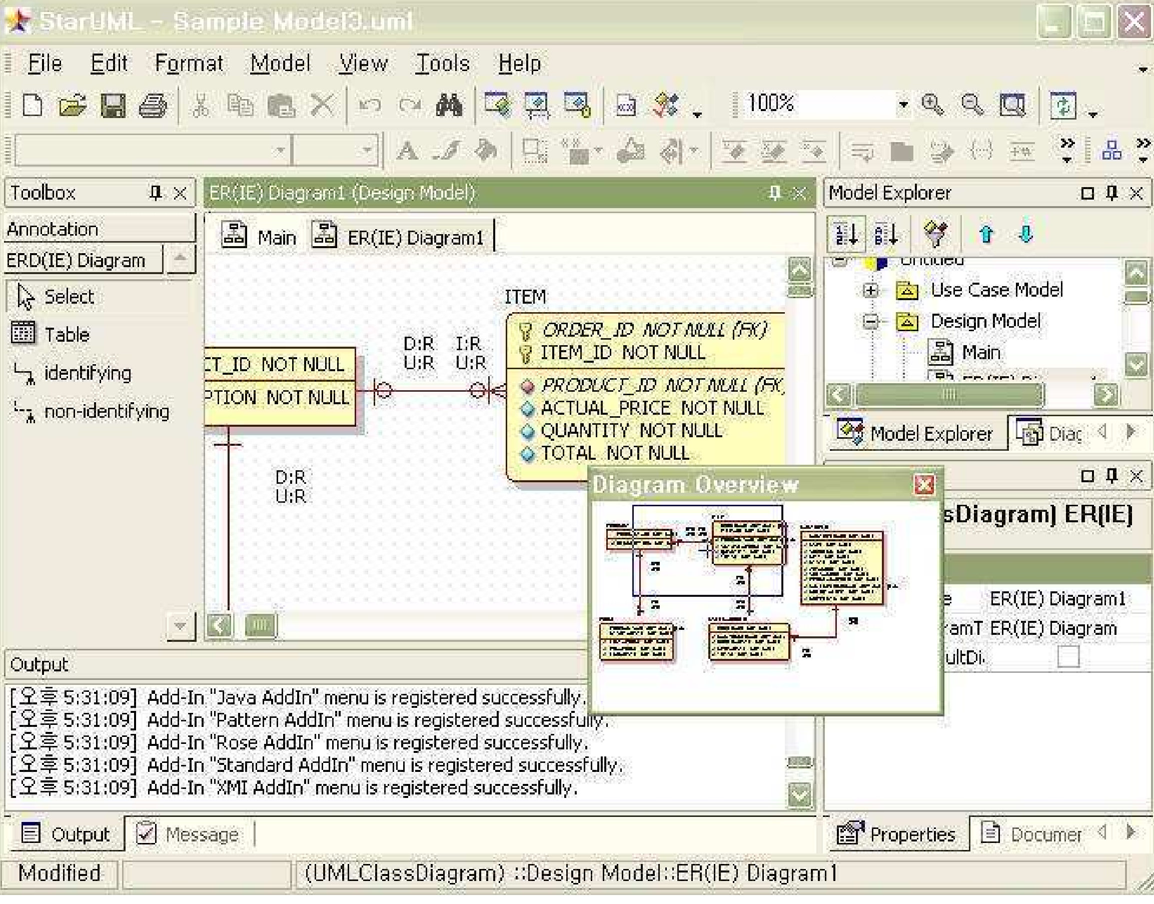
5. ER-Diagram appears on **[Main]** window and pallette for ER modeling is shown on **[toolbox]**.



6. Use notation on pallette and do modeling. Click button and set tagged values on **[Tagged Value Editor]**'s **[ERD]** tab to configure column property.



7. Write ER Modeling.



Chapter 11. Writing Templates

This chapter gives an introduction of composition element used for generating artifacts like Microsoft Word, Microsoft Excel, Microsoft PowerPoint, Code. It shows how user defines, registers, and distributes his own template by example.

Component elements of Template

StatUML Generator Template consists of two area. one is style area that defines document form style and the other is command area defining which model element the generator get from UML model. To represent command in command area, MS Office templates(Word, Excel, PowerPoint) use MS Office's comment and code template uses text surrounded with special characters. Command area contains commands like iteration, comparison, evaluation, drawing for UML model. Commands of each template command are different slightly but common commands like the followings are used.

- REPEAT ~ ENDREPEAT
- IF ~ ENDIF
- DISPLAY
- SCRIPT

REPEAT command

REPEAT is command that iterates model satisfying arguments. Repeating style existing between REPEAT and ENDREPEAT command, generator writes the style to generated document at each time. REPEAT command has the following four arguments.

Argument	Description	Remarks
Pathname	Repeats the elements existing below Pathname.	Optional
FilterType	Repeats the element whose type is FilterType.	Optional
CollectionName	Repeats elements in collections named by CollectionName of elements that are selected by Pathname and FilterType.	Optional
Condition	Repeats elements that satisfy Condition.	Optional

The first argument "Pathname" specifies the starting point of UML model repetition. It is in the form of path name separated by "::" string. The element's pathname is shown in status bar. There are two sort of Pathname (absolute and relative). Absolute pathname starts with "::". For example, "::A" means element named "B" under top of project, "A" means element named "A" under current element. Also "{R}" string can be appear in front of pathname string. "{R}" string means that it iterates recursively all the elements existing in all the sub path under pathname. If pathname is omitted, it repeats element under last path selected by command.

The second argument "FilterType" means repeat element type. If argument value is "UMLClass", it iterates only elements whose type is "UMLClass". If argument is omitted, it iterates all element regardless of type.

The third argument "CollectionName" means that it iterates elements in selected element's collection named by CollectionName. For example, first argument is "::A", second argument is "UMLClass", and third argument is "OwnedElements", it means that it iterates elements in "OwnedElements" collection of typed "UMLClass" elements existing under "::A" path.

The fourth argument "Condition" means condition for repeat element to satisfy. If argument value is "current().StereotypeName == 'boundary'", it iterates elements that selected element's stereotype is "boundary". The argument default value is true. If the argument is omitted, it do repetition for all element regardless of condition.

Reference

- current() is Built-in function to be used in Generator. Refer to "Element composing template > Built-in Functions" for details.

Variation of command in WORD template.

- Not only ENDREPEAT but also ENDREPEATTRouresonds to REPEAT command. REPEAT and ENDREPTR are used for repetition of table row. For example, to make list of classes, put REPEAT command in the first cell of row, put ENDREPTR command in the last cell of row. And so it makes table's rows iterating elements.

IF command

In case of satisfying argument condition, IF command displays styles existing between IF and ENDIF commands. IF command has the following arguments. The argument value is expressed in JScript.

Argument	Description	Remarks
Condition	condition to be satisfying	Mandatory

Reference

- IF command is not available in Excel and Powerpoint Templates. (to be implemented in the future)

Variation of command in WORD template.

- There exists command variation "IF..ENDIFTR" for IF command. It shows table's row in the only case that condition is true. Argument settings are equal to "REPEAT..ENDREPTR"case. Put IF command in the first cell of row and put ENDIFTR command in the last cell of row.

DISPLAY command

DISPLAY command print value of model element. DISPLAY command has the following arguments.

Argument	Description	Remarks
Pathname	Path of element to select	Optional
Expression	Expression for value to be written	Optional

The first argument is the pathname that the second argument refers. The pathname is expressed in the form of absolute and relative path. If pathname is omitted, current path is the last path selected by previous command.

The second argument is expression for value to be written. If first argument is "::A" and second argument is "current().Documentation", it selects element named "A" under top project and writes the element's property value named "Documentation".

Variation of command in WORD template.

- In WORD template, DISPLAY command usage is slightly different. If the type of element selected by the first argument is UMLDiagram and second argument is omitted, Selected diagram image is inserted to generated document.
- In WORD template, DISPLAY command has third argument unlike in the other templates. The third argument means whether written value is marked as index. It is required to generate the list of indices automatically. If the argument is set to "I", it marks word written by DISPLAY as index.

Variation of command in POWERPOINT template.

- In POWERPOINT template, two kinds of DISPLAY command exist (DISPLAY-TEXT and DISPLAY-IMAGE). DISPLAY-TEXT command is explicitly used to write text and DISPLAY-IMAGE command is explicitly used to draw diagram image. The argument settings are equal to DISPLAY command's. For DISPLAY-IMAGE command, the first argument should be pathname to select diagram and the second argument sholud be omitted.

SCRIPT command

Use SCRIPT command to express something except common commands. The argument is composed of JScript

statements. SCRIPT command's argument unlike the other argument expression has several expression(statements).

Built-In Functions

The followings are available Built-In functions in command.

Signature	Description	Target template
StarUMLApp(): IStarUMLApplication	Returns StarUML Application COM object.	WORD,EXCEL, POWERPOINT
StarUMLProject(): IUMLProject	Returns COM object on top of project of StarUML Application.	TEXT
MSWord(): WordApplication	Returns Word Application COM object.	WORD
MSExcel(): ExcelApplication	Returns Excel Application COM object.	EXCEL
MSPPT(): PowerpointApplication	Returns Powerpoint Application COM object.	POWERPOINT
findByFullpath(Path): IElement	Returns element existing at argument path.	WORD,EXCEL, POWERPOINT,TEXT
findByLocalpath(RootElem, Path): IElement	Returns element existing at relative path on RootElem.	WORD,EXCEL, POWERPOINT,TEXT
itemCount(RootElem, CollectionName): int	Returns count of elements in collection named as CollectionName.	WORD,EXCEL, POWERPOINT,TEXT
item(RootElem, CollectionName, Index): IElement	Returns element existing at index in collection named as ColletionName.	WORD,EXCEL, POWERPOINT,TEXT
attr(Elem, AttrName): Value	Returns attribute or reference value named as AttrName of Elem element.	WORD,EXCEL, POWERPOINT,TEXT
current(): IElement	Returns the last selected element.	WORD,EXCEL, POWERPOINT,TEXT
pos(): int	Returns the index of current element in container element.	WORD,EXCEL, POWERPOINT
createFile(path): TextStream	Creates file at argument path and returns file object.	TEXT
deleteFile(path)	Deletes file existing at argument path.	TEXT
createFolder(path): Folder	Creates folder at argument path and returns folder object.	TEXT
deleteFolder (path)	Deletes folder existing at argument path.	TEXT
fileExists(path): Boolean	Return whether file exists at argument path.	TEXT
folderExists(path): Boolean	Return whether folder exists at argument path.	TEXT
fileBegin(path)	Creates file at argument path and all the outputs by commands will be printed to the file while fileEnd is not called.	TEXT
fileEnd(path)	Corresponds to fileBegin function and stops printing to file assigned by fileBegin.	TEXT
getTarget(path): String	Returns configured output path on StarUML Generator UI by user.	TEXT

Writing a Text-Based Template

Before writing text template, the following steps should be executed.

1. Download sample document(template-text.zip) for generating text template from downloads/templates of StarUML official hompage.
2. Create new folder named "template-text" and unzip downloaded file under the folder.
3. Run StarUML.
4. Click **[Tools]** -> **[StarUML Generator...]** menu.
5. Select "Default Code Template" template on **[Select templates for generator]** page.
6. Click **[Clone Template]** button, specify template name and path to be stored, and click **[OK]** button.
7. Select new created template in **[List of templates]**, click **[Open Template]** button, and new text template will be opened on the editor screen.
8. Make commands as following on the editor screen.

The commands described in "Element composing template" paragraphs are represented differently in each template. The command in text template is surrounded by "<@" and "@>". Command name appears next to "<@", first argument appears after one space character, the other arguments separated by ";" appear. Texts existing out of "<@" and "@>" are treated as style, and they are printed to generated document the way they are.

To iterate "UMLClass" typed element existing in all sub path under "::Design Model" path, do as following.

```
<@REPEAT {R}::Design Model;UMLClass;;@>
...
<@ENDREPEAT@>
```

You want to print java class definition from model information. Between REPEAT and ENDREPEAT command, place text like "class", "{", "}" for java style and DISPLAY command for class name, documentation as following.

```
<@REPEAT {R}::Design Model;UMLClass;;@>
class <@DISPLAY ;current().Name@> {
  // <@DISPLAY ;current().Documentation@>
}
<@ENDREPEAT@>
```

In text template, there is shortcut-command similar to DISPLAY command but it hasn't path argument. It is in the form of "<@=expression@>" and uses only second argument of DISPLAY command. If above template is expressed in term of "<@= .. @>", it is like following.

```
<@REPEAT {R}::Design Model;UMLClass;;@>
class <@=current().Name@> {
  // <@=current().Documentation@>
}
<@ENDREPEAT@>
```

Take advantage of IF and ENDIF commands and you can print something selectively. In the following case, class documentation is shown if any.

```
<@REPEAT {R}::Design Model;UMLClass;;@>
class <@DISPLAY ;current().Name@> {
<@IF current().Documentation != ""@>
  // <@DISPLAY ;current().Documentation@>
<@ENDIF@>
}
<@ENDREPEAT@>
```

Expression used as command argument is expressed in JScript. At this time, Built-In function can be used. If you want to use other function except built-in functions, define new function on SCRIPT command and call new function at other command argument. The following example defines myfunc function and displays the returned value after calling myfunc function.

calling myfunc function.

```
<@SCRIPT
function myfunc(a, b) {
  ...
}
@>

<@DISPLAY ;myfunc(1, 2)@>
```

SCRIPT command can be used in other cases. The following shows other example of SCRIPT command, it stores each class to file named by self-name.

```
<@REPEAT {R}::Design Model;UMLClass;;@>

<@SCRIPT fileBegin(getTarget()+"\\"+current().Name+".java"); @>

class <@DISPLAY ;current().Name@> {
  // <@DISPLAY ;current().Documentation@>
}

<@SCRIPT fileEnd(); @>

<@ENDREPEAT@>
```

If editing template is done for all the commands and document is stored, you can generate codes utilizing your own text template. Refer to "Generating by template" chapter for the detailed steps.

Writing a Word Template

Before writing WORD template, the following steps should be executed.

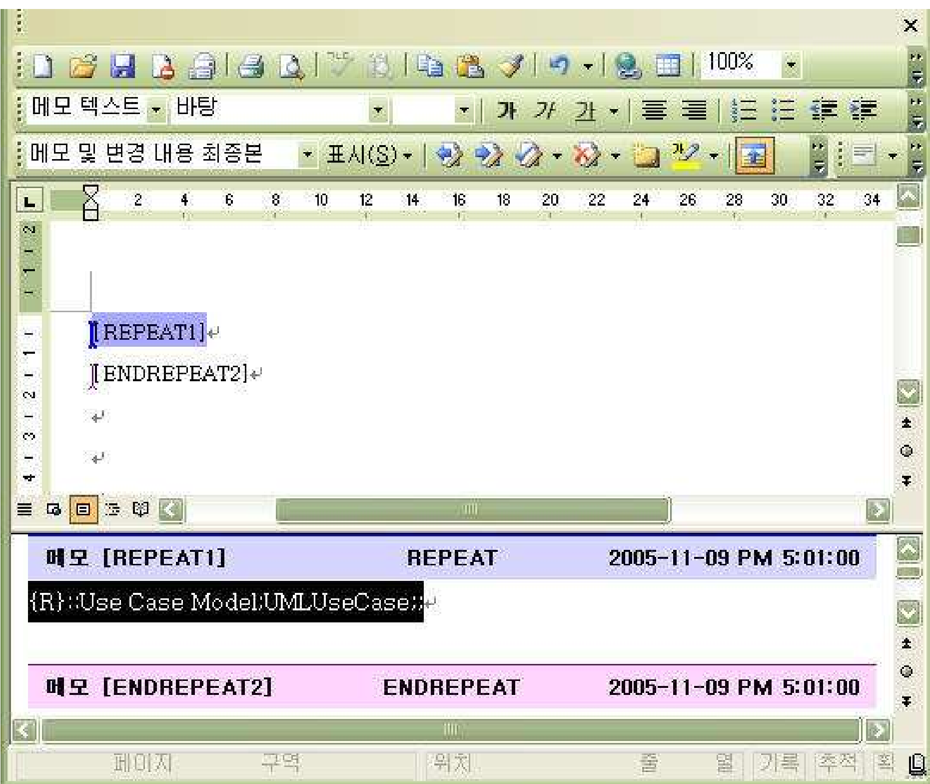
1. Download sample document(template-word.zip) generating WORD document from downloads/templates of StarUML official hompage.
2. Create new folder named "template-word" and unzip downloaded file under the folder.
3. Run StarUML.
4. Click **[Tools]** -> **[StarUML Generator...]** menu.
5. Select "Default Word Template" template on **[Select templates for generator]** page.
6. Click **[Clone Template]** button, specify template name and path to be stored, and click **[OK]** button.
7. Select new created template in **[List of templates]**, click **[Open Template]** button, and new WORD template will be opened on the editor screen.
8. Make commands as following on the MS Word application.

In WORD template, command area is expressed in WORD's comment. Command name is specified at comment author property and arguments are specified at comment text. Argument separator is ";" character. all areas but comment areas are regarded as style area and they are printed to generated document the way they are.

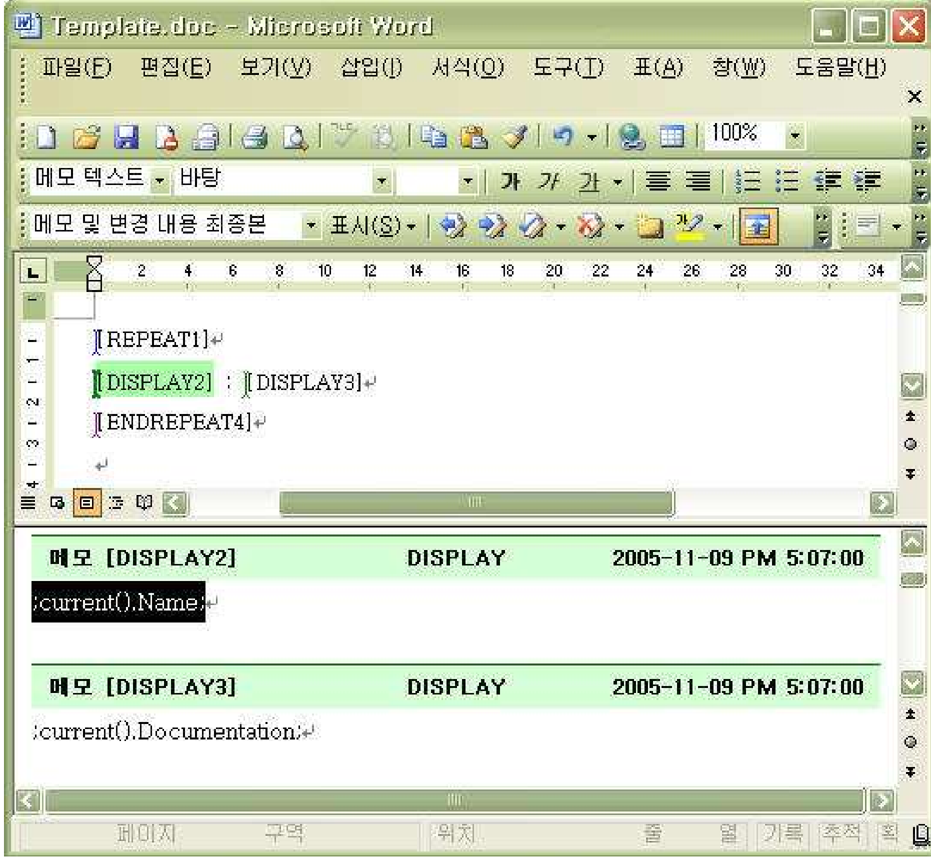
To iterate "UMLClass" typed element existing in all sub path under "::Design Model" path, copy **[REPEAT]** and **[ENDREPEAT]** comment, paste them. Select **[REPEAT]** comment and click WORD's comment inspect button to set REPEAT command argument. Inspector Window appears, input **[REPEAT]** comment's property as following.

Remarks

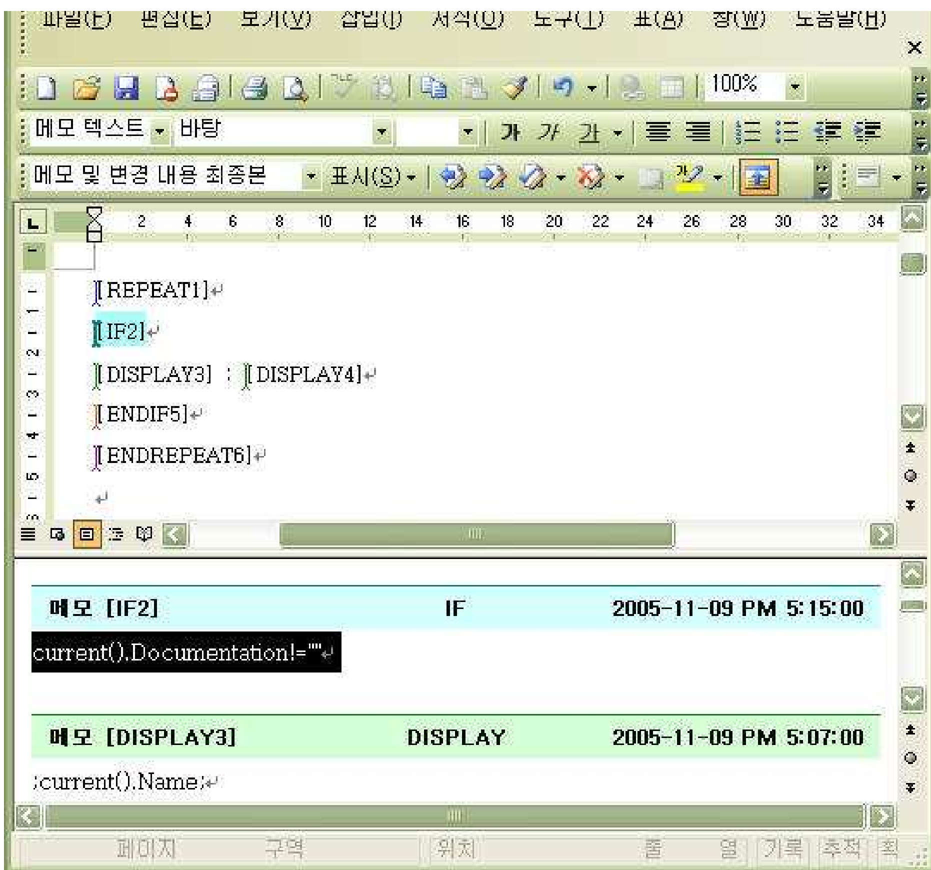
- Comment author property is not set by user. Therefore copy existing comment in current template and paste it position where you want.



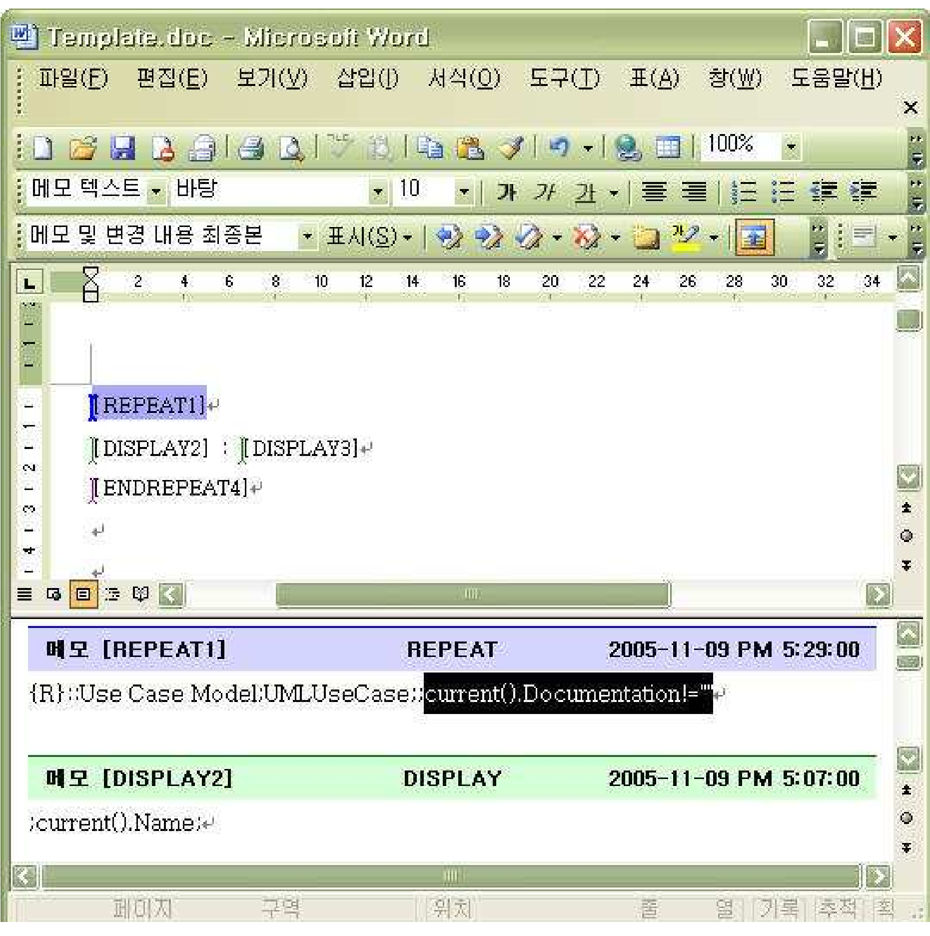
Copy **[DISPLAY]** comment and paste it between **[REPEAT]** and **[ENDREPEAT]** comment, fill argument value in comment text like the following. Repeating all usecases under "::Use case Model", it prints its name and documentation.



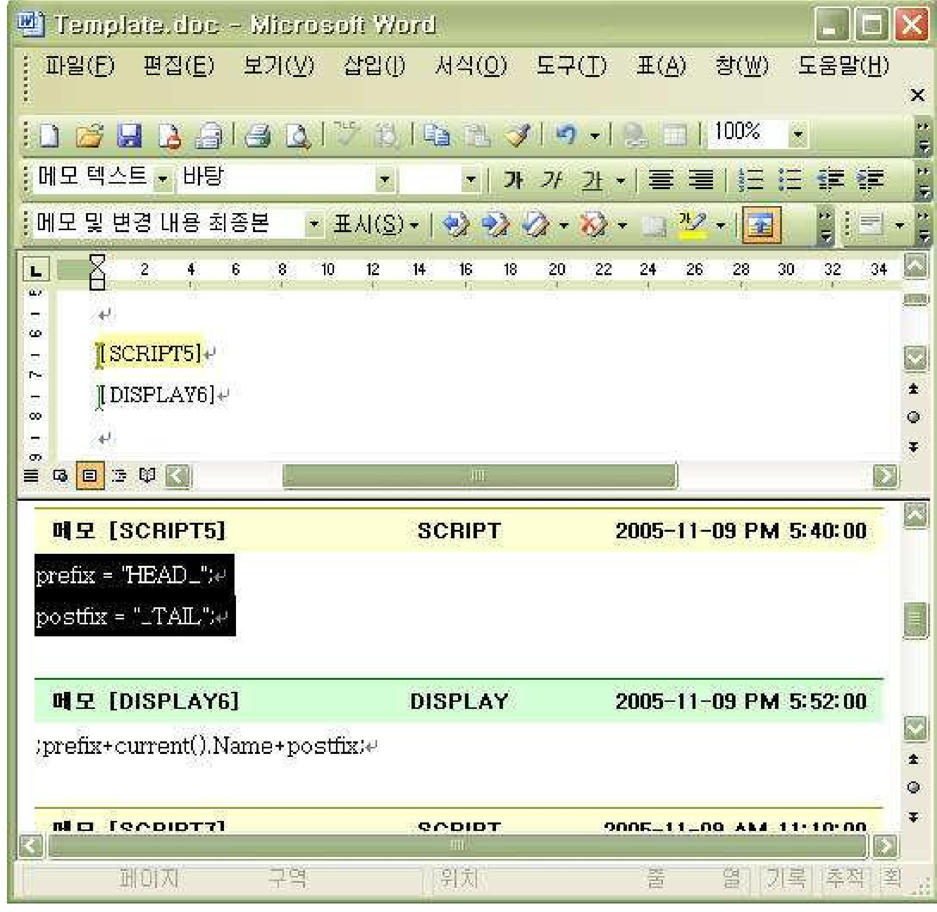
To do something in the only case of satisfying special condition, make **[IF]** and **[ENDIF]** comment as following.



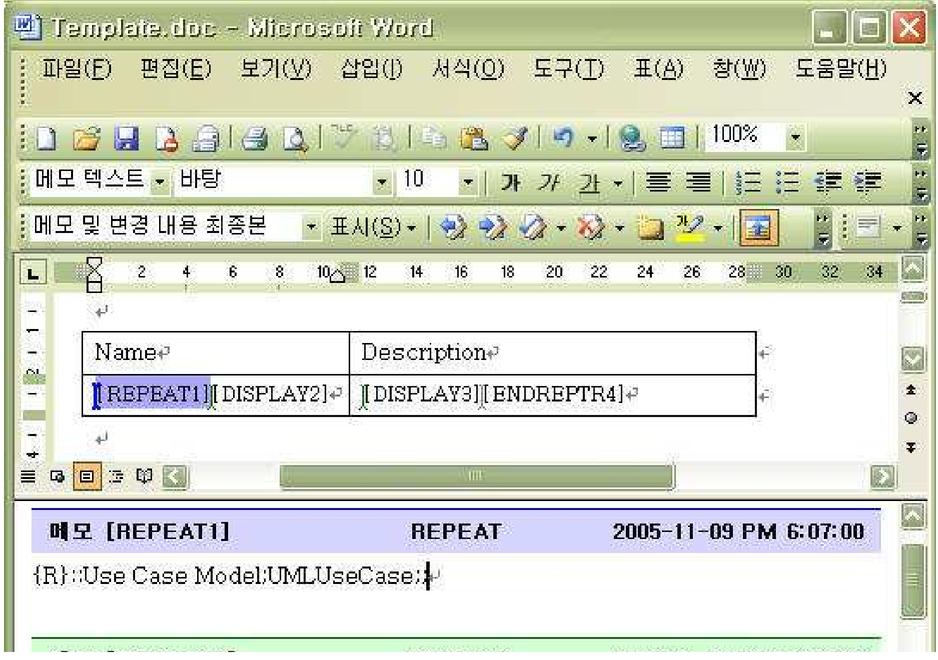
The combination of **[REPEAT]** and **[IF]** comment is replaceable by one **[REPEAT]** comment. Move **[IF]** command's condition argument to **[REPEAT]** command's one and delete **[IF]** and **[ENDIF]** commands. It does equal the action.



Like other templates, WORD template can execute JScript statements with SCRIPT command. If you want to print result value evaluated by JScript, fill JScript statements that has variable assignment statement into **[SCRIPT]** comment's text and place variable in **[DISPLAY]** command's argument.



In WORD template, You can iterate special row of table. To do this, use **[REPEAT]** and **[ENDREPTR]** command. The arguments are same in the case of **[REPEAT]** and [ENDREPEAT]. But **[REPEAT]** comment should be placed in the first cell of row and **[ENDREPTR]**
comment should be placed in the last cell of row. The following is example that generates table with Usecase's name and documentation.



If WORD template editing is done, store the template document. Then you can generate word document from your own WORD template. Refer to "Generating by template" chapter for the detailed steps.

Writing an Excel Template

Before writing EXCEL template, the following steps should be executed.

1. Download sample document(template-excel.zip) generating EXCEL document from downloads/templates of StarUML official hompage.
2. Create new folder named "template-excel" and unzip downloaded file under the folder.
3. Run StarUML.
4. Click **[Tools]** -> **[StarUML Generator...]** menu.
5. Select "Default Excel Template" template on **[Select templates for generator]** page.
6. Click **[Clone Template]** button, specify template name and path to be stored, and click **[OK]** button.
7. Select new created template in **[List of templates]**, click **[Open Template]** button, and new EXCEL template will be opened on the editor screen.
8. Make commands as following on the MS Excel application.

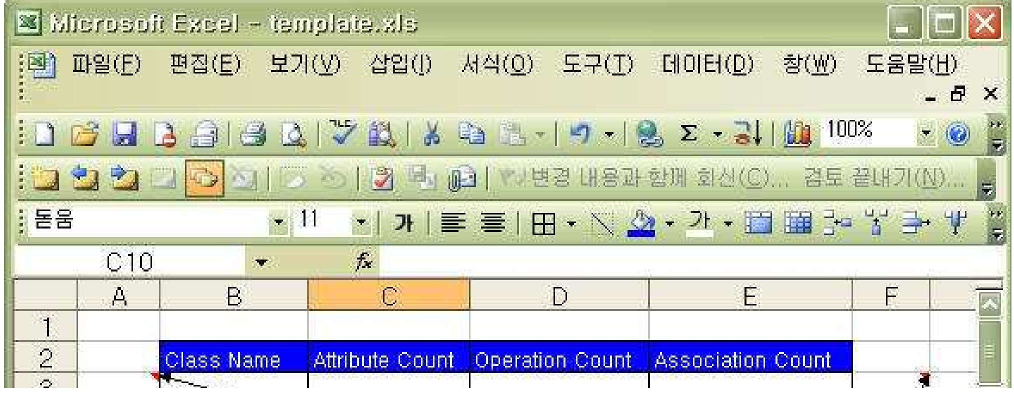
In EXCEL template, command area is expressed in EXCEL's comment. Command name and arguments are specified at comment text property. Comment text is composed of command name and arguments sequentially. Name and arguments in comment text is separated by ";" character. all areas but comment areas are regarded as style area and they are printed to generated document the way they are.

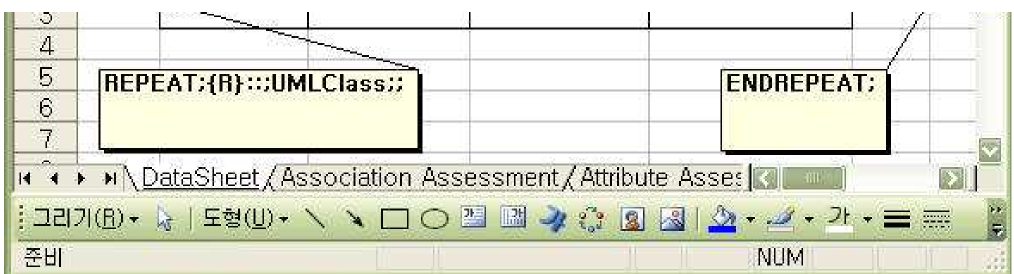
EXCEL template can analyze and assess model information by utilizing EXCEL's feature (statistics, chart). This paragraph shows how to extract numerical value related to class from model and make a graph of it.

To make data for statistics, you need to iterate all the classes in the model by using REPEAT command. Place REPEAT and ENDREPEAT command at the start and end cells of target row.

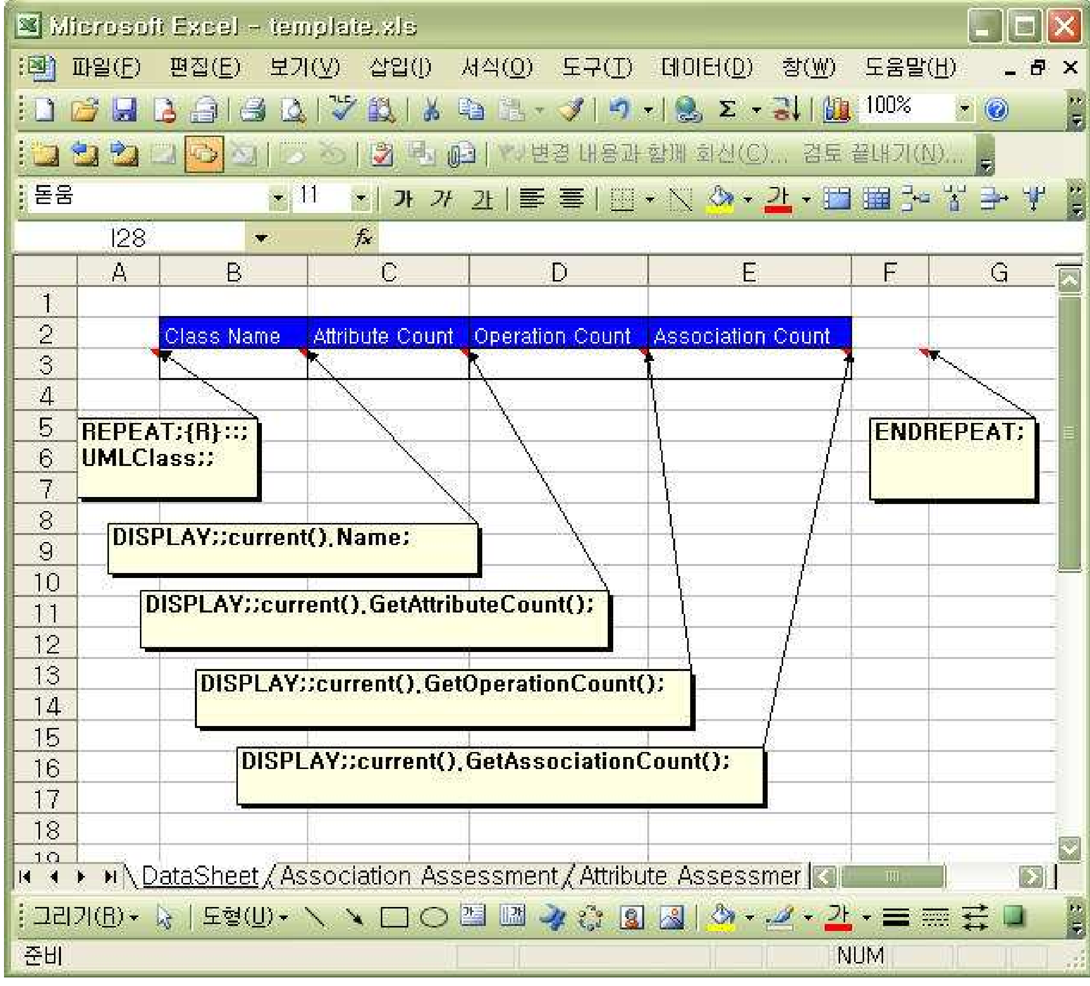
Notice

- In EXCEL template, REPEAT command repeats for only row and not for column.

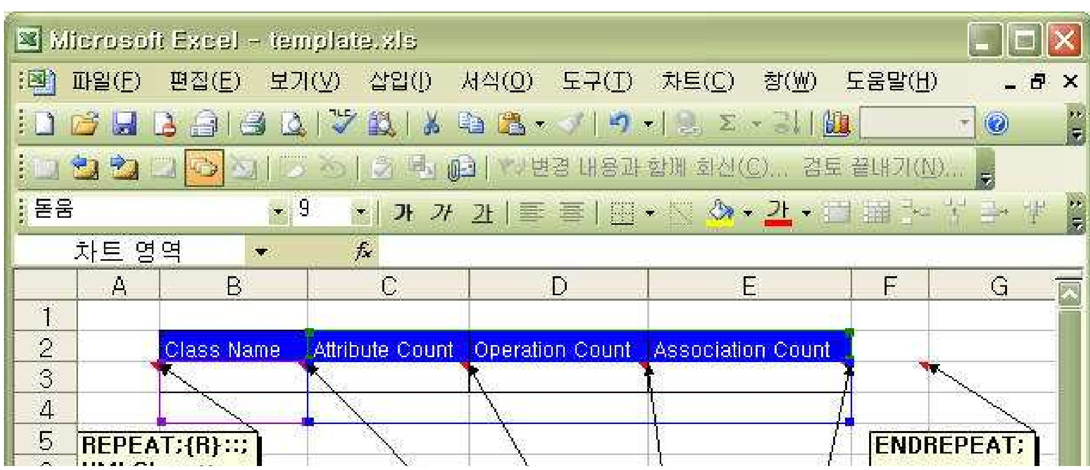


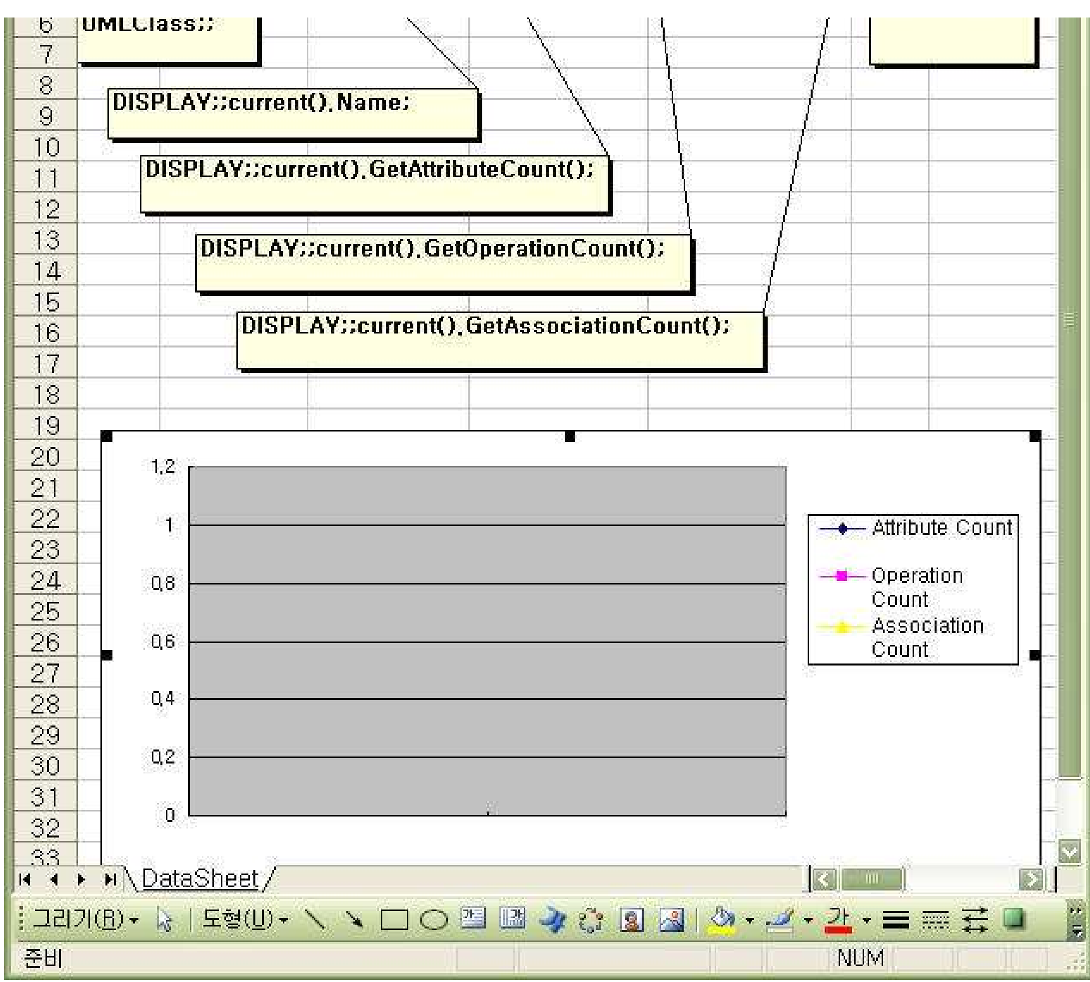


And insert DISPLAY commands that print class name, the number of attributes, the number of operations, the number of associations, between REPEAT and ENDREPEAT commands as following.

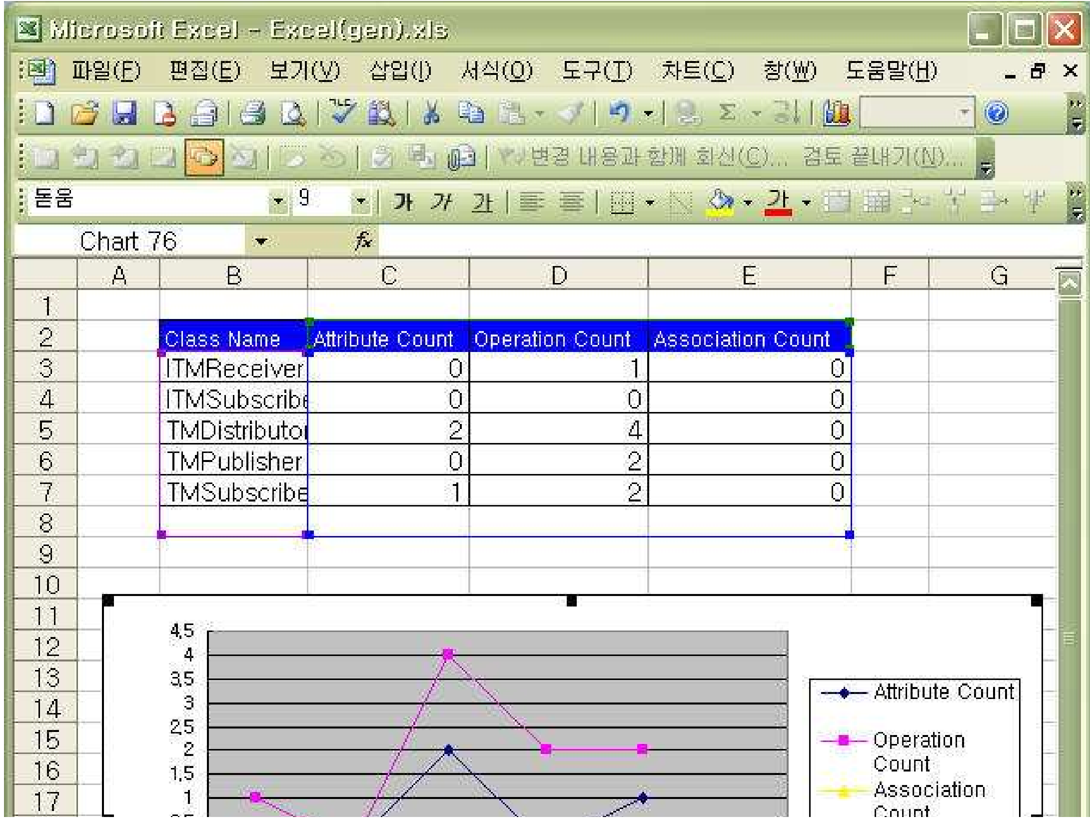


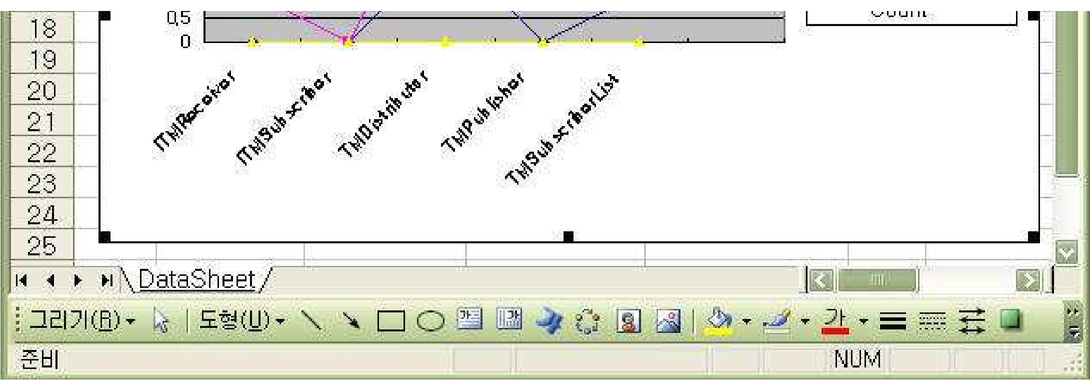
To make a graph of information for classes, insert EXCEL chart here and select attribute, operation, and association count as source data.





If EXCEL template editing is done, store the template document. Then you can generate EXCEL document from your own EXCEL template. Refer to "Generating by template" chapter for the detailed steps. The following is result generated automatically from model information.





Writing a PowerPoint Template

Before writing POWERPOINT template, the following steps should be executed.

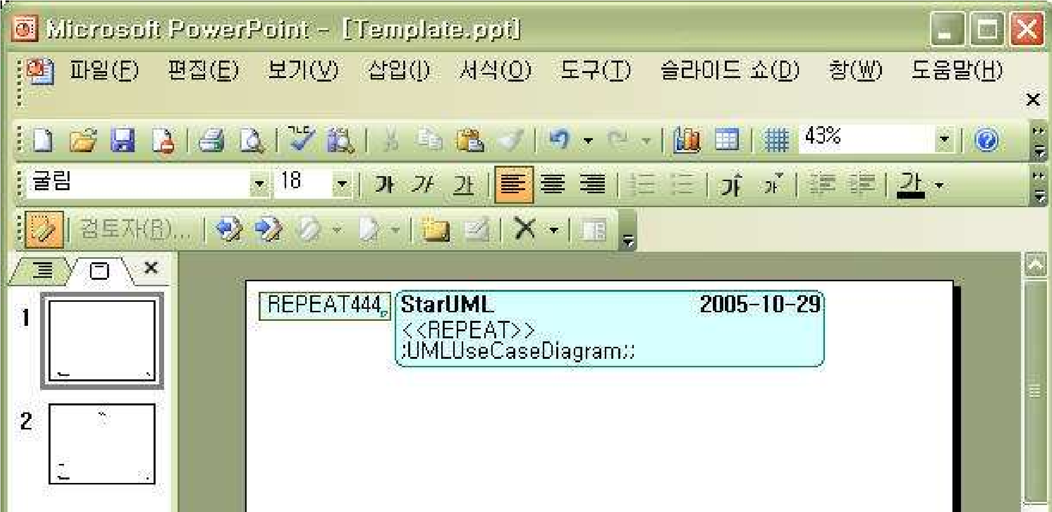
1. Download sample document(template-powerpoint.zip) generating POWERPOINT document from downloads/templates of StarUML official hompage.
2. Create new folder named "template-powerpoint" and unzip downloaded file under the folder.
3. Run StarUML.
4. Click **[Tools]** -> **[StarUML Generator...]** menu.
5. Select "Default Powerpoint Template" template on **[Select templates for generator]** page.
6. Click **[Clone Template]** button, specify template name and path to be stored, and click **[OK]** button.
7. Select new created template in **[List of templates]**, click **[Open Template]** button, and new text template will be opened on the editor screen.
8. Make commands as following on the MS Powerpoint application.

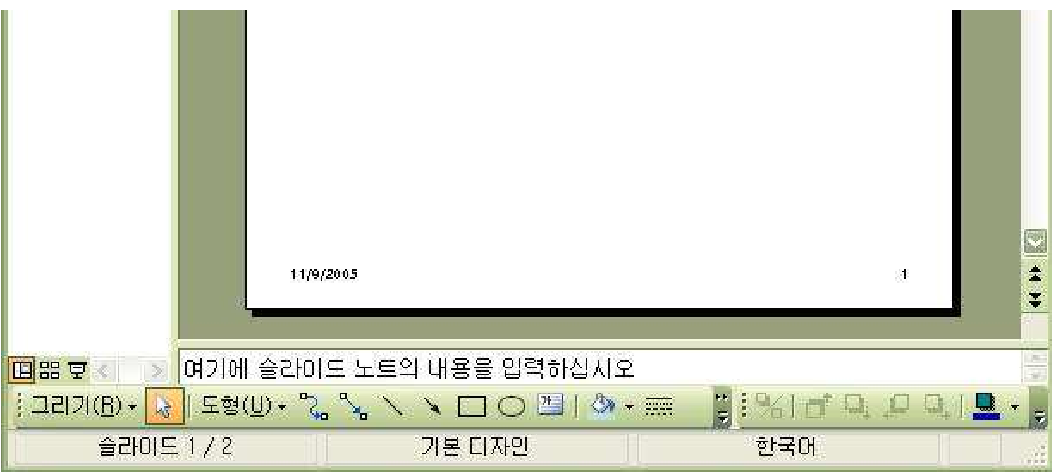
In POWERPOINT template, command area is expressed in POWERPOINT's comment. Command name is surrounded by "<<" and ">>" at the first line of comment text and arguments are specified at the second line of comment text. The separator among the arguments is ";" character. all areas but comment areas are regarded as style area and they are printed to generated document the way they are.

For example, let me introduce how to write POWERPOINT template that generates slides consisting of diagrams and documentations of diagrams. First of all to place a diagram in a slide, insert comment at left-top corner of slide and set comment text as following. At this time you must not insert ENDREPEAT comment. The reason will be explained later.

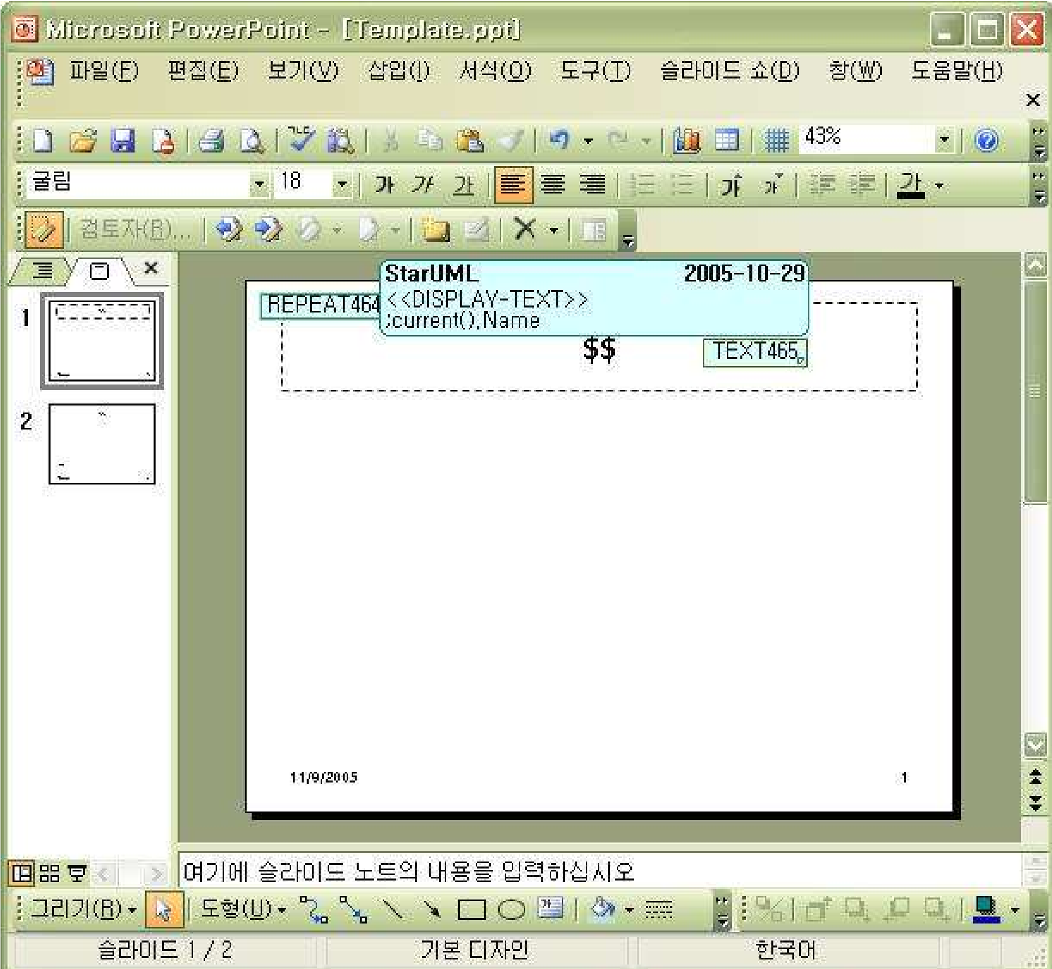
Notice

- Before writing POWERPOINT template, REPEAT command repeats slide but not anything except slide.

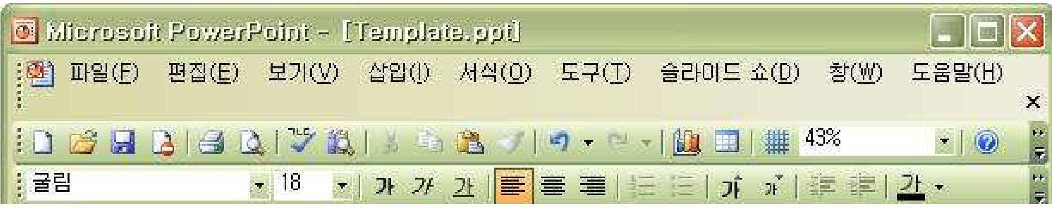


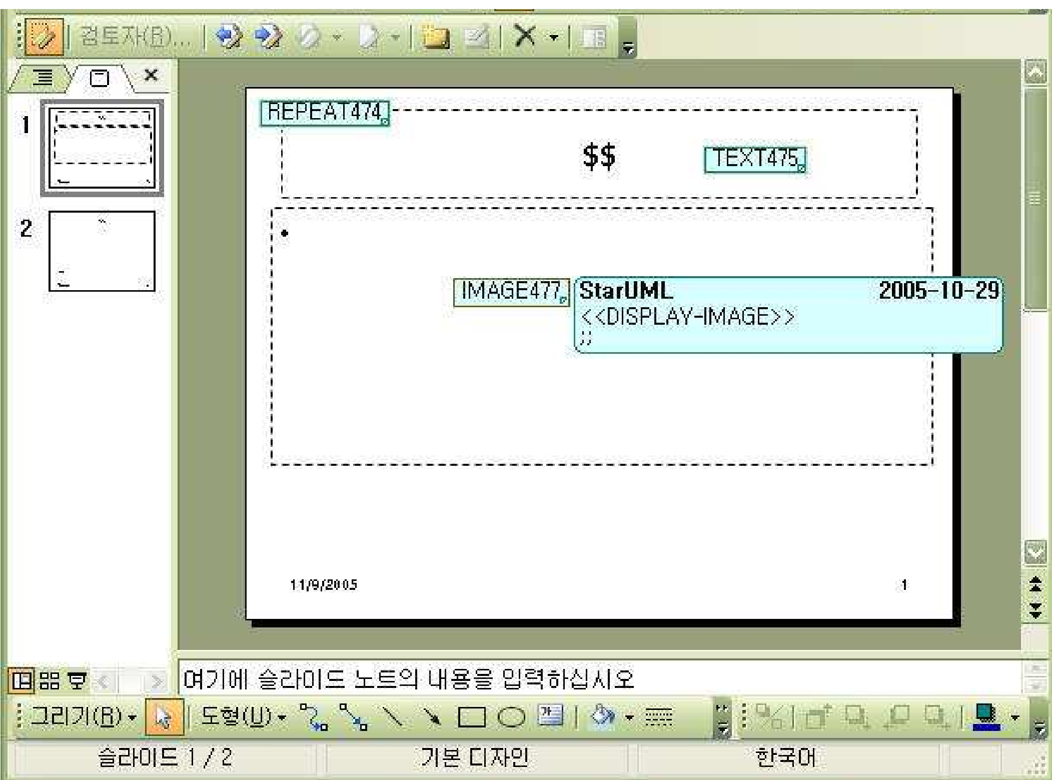


Next, To print diagram name as slide title, insert textbox and DISPLAY-TEXT comment, and input text as following. And insert "$$" string into textbox for DISPLAY-TEXT command to know where to print text. DISPLAY-... command prints for the only time when text or image box contain boundary of the command exactly. Therefore you must place DISPLAY command in boundary of text or image box.

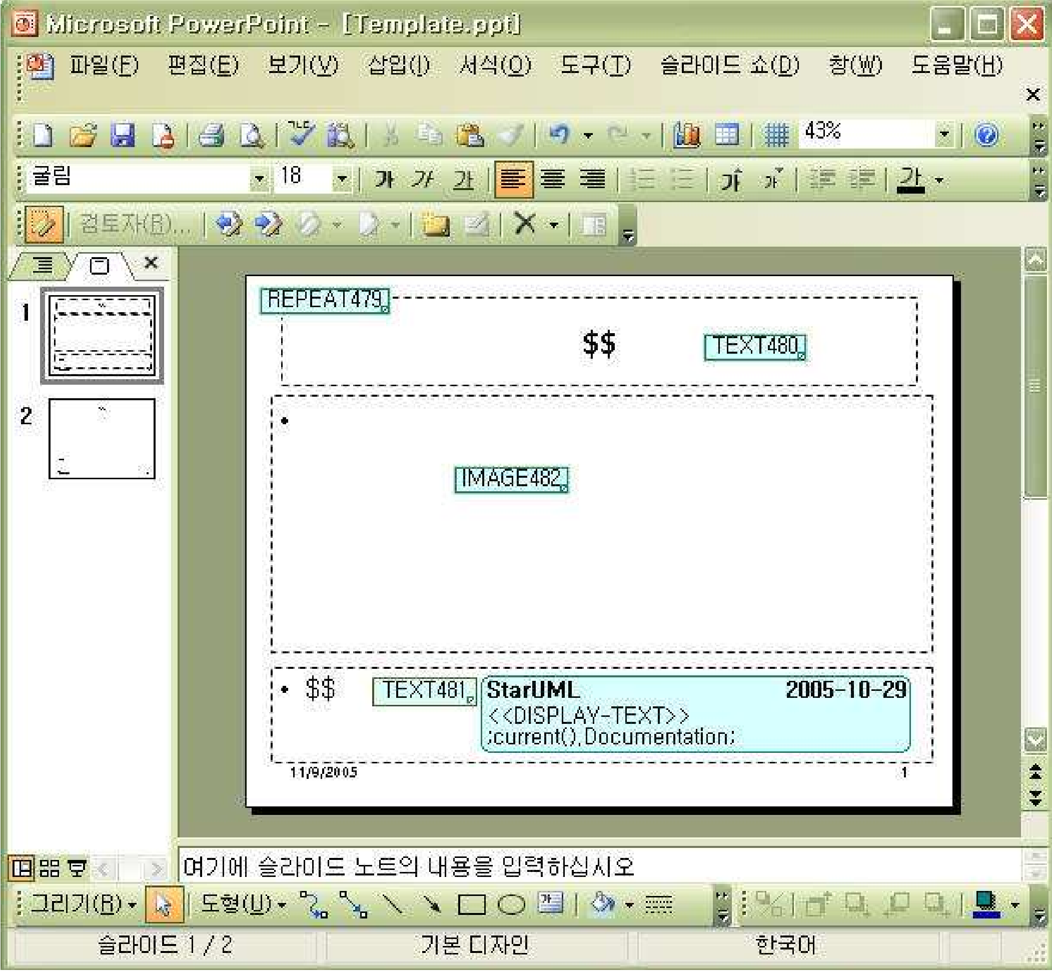


To draw diagram in the middle of slide, insert textbox and resize it. Also insert DISPLAY-IMAGE command, place it in the textbox, and input text as following.



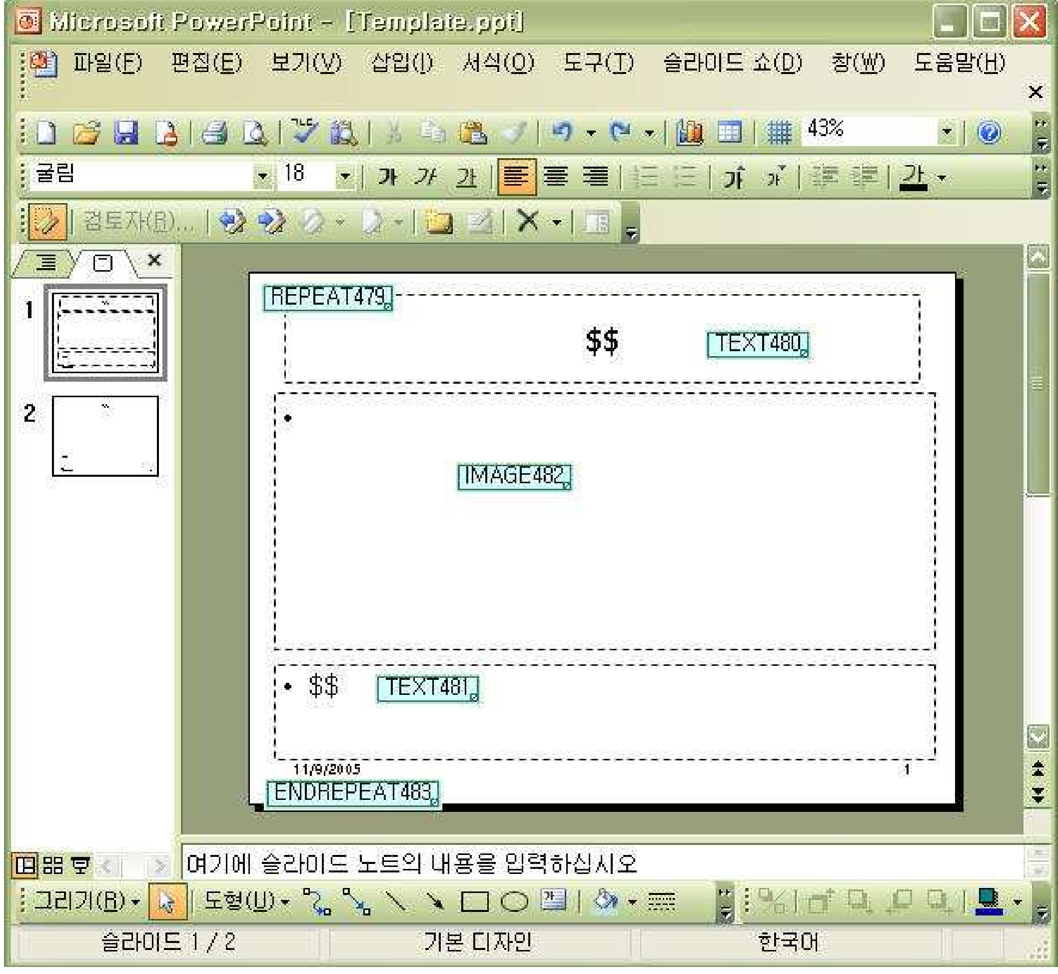


To print diagram documentation at the bottom of slide, insert DISPLAY-TEXT command and textbox, set comment text as following.



Last of all to mark boundary of repetition, insert ENDREPEAT command at the bottom of slide. The reason inserting

ENDREPEAT last of all is that in POWERPOINT template generator's interpretation order is not depend on position of comment but creation order of comment. Command is not executed because it is higher position than other but executed because it creation is prior to other. If you insert REPEAT, ENDREPEAT, DISPLAY-TEXT in order, generator interprets there exists no command between REPEAT and ENDREPEAT. To repeat other commands by REPEAT command, you must create REPEAT command, target ones of repetition, and ENDREPEAT one in order.



If POWERPOINT template editing is done, store the template document. Then you can generate powerpoint document from your own POWERPOINT template. Refer to "Generating by template" chapter for the detailed steps.

Registering Templates

User can register his own template document to generator.

1. Click **[Register Template]** button on the **[Select templates for generation]** page.
2. If **[Register Template]** dialog appear, click button and select template description file's path.
3. Input template information on **[Properties:]** window, click **[OK]** button and registration is done.

Basic Information

Set information for template name, group, category, and description.

Item	Description
Template Name	Specifies target template name.
Group	Specifies group containing target template.
Category	Specifies template category under group.
Description	Specifies description for template.

Detail Information

Set detail information for template.

<table>
<tr><th>Item</th><th>Description</th></tr>
<tr><td>Document Type</td><td>Specifies type of document. Select one of DOCUMENT, REPORT, CODE.</td></tr>
<tr><td>Format</td><td>Specifies result document format.</td></tr>
<tr><td>Version</td><td>Specifies version information of template.</td></tr>
<tr><td>Related Profile</td><td>Specifies profile related to template.</td></tr>
<tr><td>Related Approach</td><td>Specifies approach related to template.</td></tr>
<tr><td>Translator Type</td><td>Specifies type of generator. One of the followings is available.
<table>
<tr><th>Value</th><th>Meaning</th></tr>
<tr><td>WORD</td><td>word document generator</td></tr>
<tr><td>EXCEL</td><td>excel document generator</td></tr>
<tr><td>POWERPOINT</td><td>Powerpoint document generator</td></tr>
<tr><td>TEXT</td><td>code generator</td></tr>
<tr><td>COM</td><td>COM-based generator defined by user</td></tr>
<tr><td>SCRIPT</td><td>Script-based generator defined by user</td></tr>
<tr><td>EXE</td><td>Executable file-typed generator made by user</td></tr>
</table></td></tr>
<tr><td>Translator</td><td>Specifies generator file name. It is available for user-defined generator.</td></tr>
<tr><td>Example</td><td>Specifies sample model file name that template applies to.</td></tr>
<tr><td>Parameters</td><td>Specifies required parameters.</td></tr>
<tr><td>Related files</td><td>Specifies related files for generation.</td></tr>
</table>

Parameters

1. Click button on parameters property.
2. If **[Parameters]** dialog appears, click button to insert new parameter, click button to delete parameter.
3. If **[New Parameter]** dialog appears, fill parameter name, type, and default value, and click **[OK]** button.

Set parameters for each translator type as following.

Item	Type	Translator type	Description
TemplateFile	FILENAME or STRING	WORD,EXCEL, POWERPOINT	Specifies template document file name.
OutputFile	FILENAME or STRING	WORD,EXCEL, POWERPOINT, TEXT	Specifies result document file name.
Keep Comment	BOOLEAN	WORD,EXCEL, POWERPOINT	Specifies whether result document contains

			command information.
ShowGenerationProcess	BOOLEAN	WORD,EXCEL, POWERPOINT	Specifies whether it shows progress on MS Office. If the value is set to true, generation performance may be slowed.
Normal Generation	BOOLEAN	WORD	Specifies starting target path for generation. If it is set to false, the starting element for generation is selected element on the StarUML.
Generate Index	BOOLEAN	WORD	Specifies whether indices is generated.
intermediate	STRING	TEXT	Specifies whether intermediate files for generation are generated.
target	STRING	TEXT	Specifies folder path that contains generated code files.

Reference

- Setting parameters, you can use environment constants supported by StarUML Generator as following.

Name	Description
$PATH$	means folder path which template and template description file exist in.
$GROUP$	means value of group property of template.
$CATEGORY$	means value of category property of template.
$NAME$	means template name
$TARGET$	means folder path that user select on **[Generator]** dialog.

About managing registered template, refer to "Generating by Template" paragraph in User Guide "Chapter7. Generating Codes and Templates"

Generating Codes and Templates".

Making a Template Distribution Package

Template is installed under "staruml-generator" folder. All the templates and batch tasks exist in "templates" folder under "staruml-generator" folder. Generally All the resource files related to one template exist in one folder. The folder must be right under "templates" folder. A template is composed of template description file (*.tdf) and template document (*.doc, *.ppt, *.xls, *.cot, etc.). The template description file contains the configurations at user guide "chatpter7.Generating Codes and Documents > Registering template". Batch task is described to batch task file. Batch task file is with ".btf" in "batches" folder under "staruml-generator" folder. The following is the summary of file extensions.

File extension name	description
BTF	contains batch task list, parameters for each task.
TDF	contains template information (name, type, template file name, parameters, etc.)
DOC, DOT	contains commands and style information for word template
XLS, XLT	contains commands and style information for excel template
PPT, POT	contains commands and style information for powerpoint template
COT	contains commands and style information for code template

Folder structure for generator

The folder structure for generator is composed as following.

```
staruml-generator\
    templates\
        template1\
            template1.tdf
            template1.doc
        template2\
            ...
    batches\
        batch1.btf
        ...
```

Installing and removing template

To install template is very simple. Copy folder (under "staruml-generator\templates" folder) that contains template to be distributed, and paste it under "staruml-generator\templates" folder in target computer. Then the installation is complete.

To remove template is also very simple. Remove the folder that has the template you want to remove.

Packaging template

Folder structure is available under "staruml-generator\templates" folder. Therefore you can arrange templates without changing batch list and template information. It makes you easy to manage and distribute templates. For example, you can collect several template folders under one folder, compress them into a archive file like zip, and distribute it to some computer. What the receiver should do to install is only to extract the file under "staruml-generator\templates" folder. Installing and removing batch task)

To install batch task is very simple. Before installing batch, install templates used in batch task. Next, copy batch task file(*.btf) under "staruml-generator\batches" folder and paste it under "staruml-generator\batches" folder in target computer. Then the installation is complete.

To remove batch task is also very simple. Remove the batch task file(*.btf) you want to remove.