OPEN API

version 17.0.1

user guide

No Magic, Inc.

2011

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INTRODUCTION

This document describes MagicDraw Open Java API and provides instructions how to write your own plug-ins, create actions in the menus and toolbars, change UML model elements, and create new patterns.

The following chapters are included in this document:

In the generated JavaDoc you will find detailed descriptions of classes, their attributes, and operations. JavaDoc is located in <MagicDraw installation directory>\openapi\docs.

All MagicDraw OpenAPI classes are packaged in these jar files:

- <MagicDraw installation directory>\lib\md_api.jar
- <MagicDraw installation directory>\lib\md_common_api.jar MagicDraw plugin's classes are packed in the concrete plugin's jar file(s).
  (E.g. classes of Model Transformation plugin - "<MagicDraw installation directory>plugins\com.nomagic.magicdraw.modeltransformations\modeltransformations_api.jar")

Do not forget to add all jar files recursively (*except md_commontw.jar and md_commontw_api.jar*) from <MagicDraw installation directory>/lib directory into your (IDE) classpath and make sure the patch.jar is the first in the classpath.

We provide a set of plug-ins samples in <MagicDraw installation directory>\openapi\examples directory. Examples sometimes is the best way to find out how to use some Open API.

PLUG-INS

Plug-ins are the only one way to change functionality of MagicDraw. The main purpose of plug-in architecture is to add new functionality to MagicDraw although there is a limited ability to remove existing functionality using plug-ins.

Plug-in must contain the following resources:

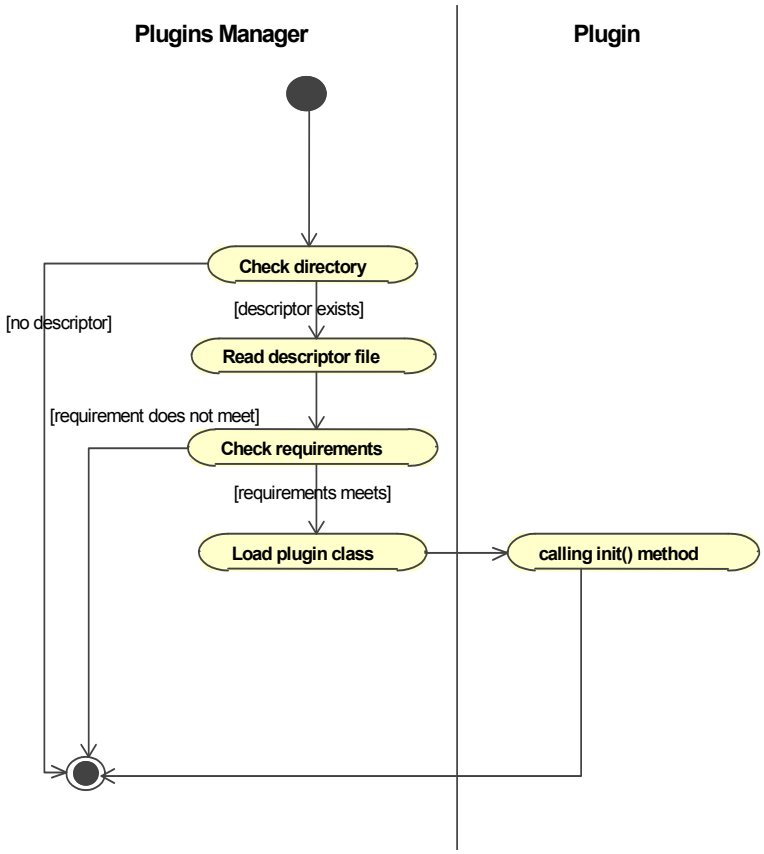
- Directory.
- Compiled java files, packaged into jar file.
- Plug-in descriptor file.
- Optional files used by plug-in.

Typically plug-in creates some GUI components allowing user to use plug-in functionality. Generally this is not necessary because plug-in can listen for some changes in project and activate itself on desired changes.

How plug-ins work

MagicDraw on every startup scans plug-ins directory, and searches there for subdirectories:

- If subdirectory contains plug-in descriptor file, plug-ins manager reads descriptor file.
- If requirements specified in descriptor file is fulfilled, plug-ins manager loads specified class (specified plug-in class must be derived from *com.nomagic.magicdraw.plugins.Plugin* class). Then method *init()* of loaded class is called. *init()* method can add GUI components using actions architecture or do other activities and return from the method. *init()* method is called only if isSupported() returns true.



Writing plug-in

With this example we will create a plug-in that displays a message on MagicDraw startup.

To create plug-in you need to:

- Write plug-in descriptor.

Step 1: Create your plug-in directory in *plugins* directory

Create a myplugin directory in *plugins* directory in MagicDraw installation directory.

Step 2: Write plug-in code

Plug-in must contain at least one class derived from *com.nomagic.magicdraw.plugins.Plugin* class.

```
package myplugin;
public class MyPlugin extends com.nomagic.magicdraw.plugins.Plugin
{
     public void init()
     {
           javax.swing.JOptionPane.showMessageDialog(null, "My Plugin init");
     }


     public boolean close()
     {
```

```
            javax.swing.JOptionPane.showMessageDialog( null, "My Plugin close");
            return true;
      }

      public boolean isSupported()
      {
            //plugin can check here for specific conditions
            //if false is returned plugin is not loaded.
            return true;
      }
}
```

This plug-in shows message when it is initialized, and another message when it is closed.

Step 3: Compile and pack plug-in to jar file

To compile the written code, add all .jar files recursively from <MagicDraw installation directory>/lib to java *classpath*.

IMPORTANT! Make sure that the first three .jar files are added in the following order:

1. patch.jar
2. brand.jar
3. brand_api.jar

Order is not important for the rest .jar files.

Compiled code must be packed to jar file.

To create jar file, use jar command in the *plugins* directory:

```
jar -cf myplugin\myplugin.jar myplugin\*.class
```

Step 4: Write plug-in descriptor

Plug-in descriptor is a file named *plugin.xml*. This file should be placed in myplugin directory.

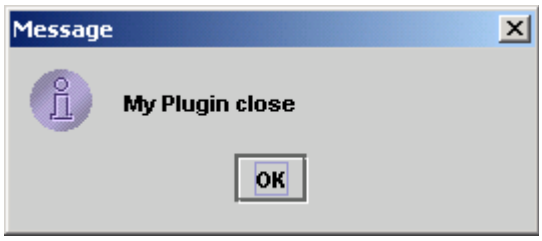
```
<?xml version="1.0" encoding="UTF-8"?>
<plugin
        id="my.first.plugin"
        name="My First Plugin"
        version="1.0"
        provider-name="Coder"
        class="myplugin.MyPlugin">

        <requires>
           <api version="1.0"/>
        </requires>

        <runtime>
           <library name="myplugin.jar"/>
        </runtime>
</plugin>
```

For detailed information about plug-in descriptor, see “Plug-in descriptor” on page 13.

Testing plug-in

1. Restart MagicDraw. On startup message should appear:

2. Then close MagicDraw (File menu -> Exit). Another message should appear:



- Another way to check plug-in is to look at *md.log* file. This file is located in the <User home directory>\.magicdraw\<version> directory.
  Also all plugins and their status are listed in the MagicDraw EnvironmentOptions Plugins tab.

  After startup this file end should contain such information:

```
LOAD PLUGINS:
  com.nomagic.magicdraw.plugins.PluginDescriptor@edf730[ id = my.first.plugin, name =
  My First Plugin, provider = Coder, version = 1.0, class = myplugin.MyPlugin,
  requires api = 1.0, runtime = [Ljava.net.URL;@ff94b1]
```

INIT PLUGINS:

```
  com.nomagic.magicdraw.plugins.PluginDescriptor@edf730[ id = my.first.plugin, name =
  My First Plugin, provider = Coder, version = 1.0, class = myplugin.MyPlugin,
  requires api = 1.0, runtime = [Ljava.net.URL;@ff94b1]
```

TIP!	Looking at file is the best way to find problems when plug-in does not work.

Detail information

Plug-in descriptor

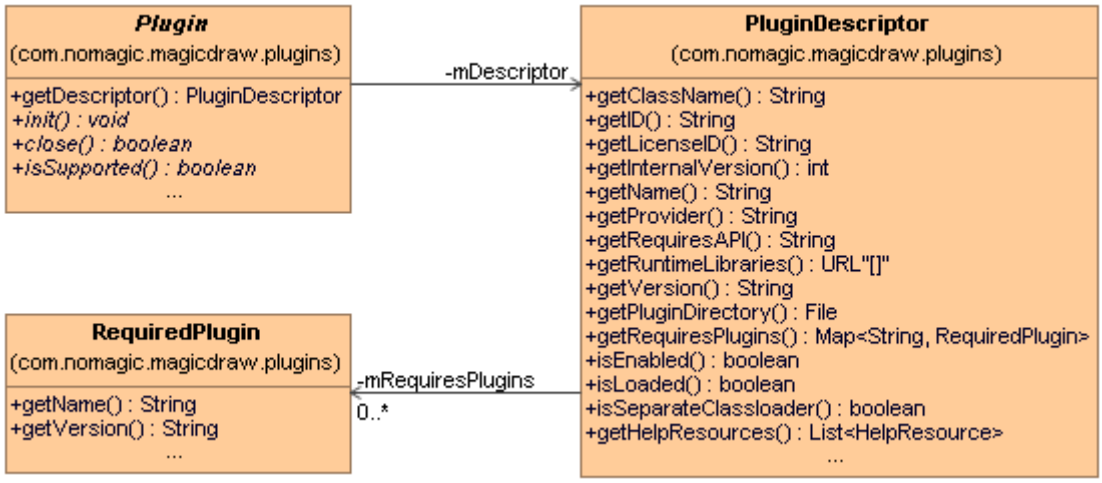
Plug-in descriptor is a file written in XML and named *plugin.xml*. Each descriptor contains properties of one plug-in. Descriptor file should contain one *plugin* element definition.

In the table below, you will find the structure of *plugin.xml*.

Element	Description	
	Name	**Description**
plugin	**Attributes**	
	id	Plug-in ID should be unique. Used to identify plug-in by plug-ins manager internals and by requirements of other plug-ins. Example: “my.first.plugin.0”
	name	Plug-in name. No strict rules applied to this attribute. Example: “Example plugin”
	version	Plug-in version. Version can be used to check other plug-ins dependencies. Allows numbers separated with one dot value.
	provider-name	Plug-in provider name. Company or author name. Example: "No Magic"
	class	Full qualified class name. Class must be derived from *com.nomagic.magicdraw.plugins*. Plugin and stored in plug-in runtime library. This class will be loaded and initialized by plug-ins manager. Example:”myplugin.MyPlugin”
	ownClassloader	*Optional; default value - “false“.* Indicate if to use plugin own (separate from other plugins) classloader. All MagicDraw plugins are loaded by one classloader. If there are plugins that can not be loaded by the same classloader (conflicts plugin libraries versions or etc.) their descriptors must define to use own classloaders.
	class-lookup	*Optional; possible values - “LocalFirst”, “GlobalFirst” default value - “GlobalFirst“.* Specifies priority of “parent” class loader if plugin is using ownClassloader. LocalFirst forces to load classes from plugin class loader even if such classes exists in MagicDraw core class path. This option should be used if you want to use in your plugin different versions of some libraries used in core.
	Nested elements	
	requires	MagicDraw API version required by plug-in. Plug-ins and their versions required by plug-in.
	runtime	Runtime libraries needed by plug-in.
requires	**Nested elements**	
	api	Required MagicDraw API version.
	required-plugin	Required plug-in(s) to run plug-in.
api	**Attributes**	
	version	Required MagicDraw API version. Example: “1.0”

Element	Description	
required-plugin	**Attributes**	
	id	ID of required plug-in. Example: “my.first.plugin.0”
	version	Version of required plug-in. Example: “1.1”
runtime	**Nested elements**	
	library	Runtime library for running plug-in.
library	**Attributes**	
	name	Name of the required library. Example: "patterns.jar"
help	**Attributes**	
	name	Name of a compressed JavaHelp file (JAR file). **TIP!** Adobe RoboHelp provides support for the Java-Help format and automatically creates all Java-based Help features and the HTML-based features such as HTML content and hypertext links.
	path	Relative path to the JavaHelp file.

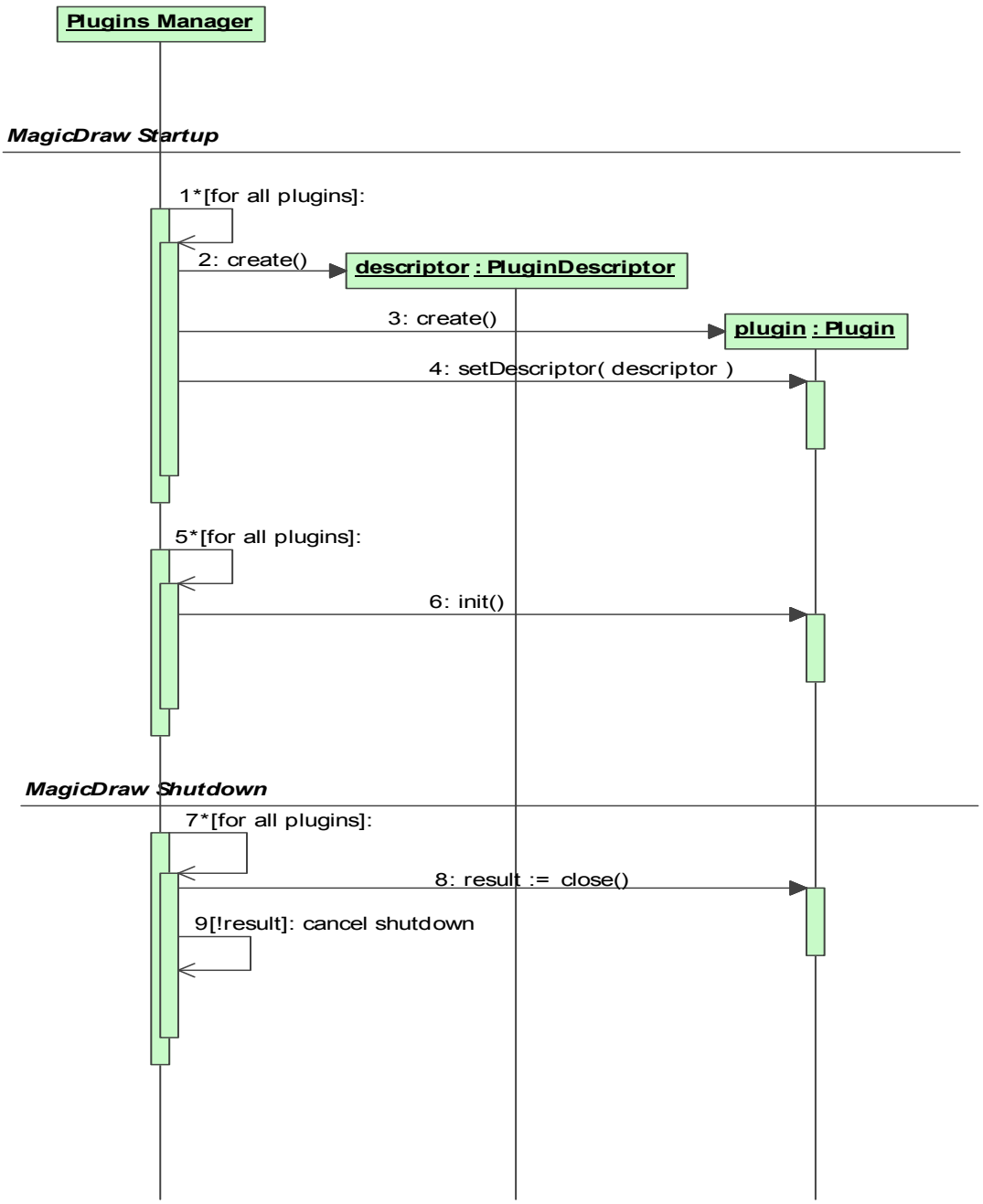
Plug-in classes



Plugin is the base abstract class for any MagicDraw plug-in. User written plug-in must be extended from this class. Every plug-in has its own descriptor set by plug-ins manager. Plug-in has two special methods:

- *public abstract void init()* method is called on MagicDraw startup. Plug-in must override this method and implement there its own functionality.
- *public abstract boolean close()* method is called on MagicDraw shutdown. Plug-in must override this method and return to true if plug-in is ready to shutdown or false in other case. If plug-in returns false, MagicDraw shutdown will be canceled.
- *public abstract boolean isSupported()* method is called before plug-in init. If this method returns false, plugin will not be initialized. isSupported() may be used to check if plugin can be started for example on this OS.

PluginDescriptor is the class that provides information loaded from *plugin.xml* file (plug-in descriptor) to plug-in. Detail information about these classes can be found in javadoc.



Plug-In class loading

All MagicDraw plug-ins (classes and runtime libraries) are loaded by one classloader. If there are plugins that can not be loaded by the same classloader (conflicts plugin libraries versions or etc.) their descriptors should be defined to use own classloaders. In this case the plug-in classes are loaded by separate classloader.

Optional property “class-lookup” controls how classes are loaded if plugin has its own classloader. If value of this property is LocalFirst, class is loaded from plugin classpath even if such class is already loaded in global MagicDraw core class loader. This property is important if you want to use different version of the same classes (libraries) used in MagicDraw core.

Important notes for Unix systems

- By default plug-in directory is placed in the MagicDraw installation directory (global plug-in directory). For example if MagicDraw is installed in *c:\MagicDrawUML* plug-in directory will be in *c:\MagicDrawUML\plugins*.
  On Unix systems, plug-ins manager additionally uses special directory in user home directory *~\.magicdraw\<version>\plugins* for plug-in loading.
  For example, for user “Bob” MagicDraw version 10.0 will use directory *\home\bob\.magicdraw\10.0\plugins* for searching plug-in. Even on Unix systems global plug-in directory is used also. This allows to have global and user plug-ins.
- Another issue on Unix systems, is related to permissions of a user to write. If MagicDraw is installed by root, user will not be allowed to write in a global plug-in directory if a user has not such permissions.

Resource dependent plug-in

Starting with 16.6 version MagicDraw UML has new functionality to require loaded plug-ins for particular project. This feature was created to avoid incorrect data load because of missing plug-ins. Every plug-in can provide name and version of plug-in to be required for project correct load.

To become resource dependent plug-in, your plug-in class must implement com.nomagic.magicdraw.plugins.ResourceDependentPlugin interface (Figure 1 on page 17).

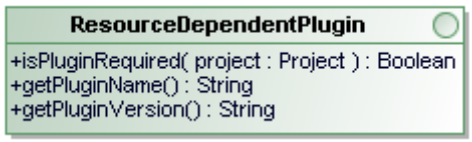


Figure 1 -- Interface for resource dependent plug-in

ResourceDependentPlugin has three special methods:

- **boolean isPluginRequired(Project project)** method is called on project save. Plug-in must return true if given project uses resources from plugin.
- **String getPluginName()** method should return plugin name.
- **String getPluginVersion()** method should return version of plugin.

Implementing ResourceDependentPlugin example

```
public String getPluginName()
{
      return getDescriptor().getName();
}
public String getPluginVersion()
{
      return getDescriptor().getVersion();
}
public boolean isPluginRequired(Project project)
{
      return ProjectUtilities.findAttachedProjectByName(project,
                                          "my_profile_filename") != null;
}
```

This plug-in will be required for projects if project contains module “my_profile_filename”. Plug-in name and version will be saved into project’s XMI file.

NEW! MagicDraw Plugin Integration with Eclipse

Extending Eclipse Main Menu with Plugin Command

Conventionally you do not need to write any additional code so that the main menu of MagicDraw was extended with some specific commands brought by a plugin after the plugin is installed. However, this is necessary when the same plugin is installed on MagicDraw which is integrated with Eclipse.

If an additional command should appear on the main menu or an additional button should be placed on the main toolbar in MagicDraw after plugin installation, you need to create an Eclipse bundle that tells Eclipse where the command or the button should be placed.

Example: Extending the Eclipse main menu with an additional command brought by a MagicDraw plugin

Lets say you have already created a MagicDraw plugin that extends the main menu of MagicDraw with a command whose id, for example, is “CUSTOM_ACTION_ID”.

To extend the Eclipse main menu with this command

1. Create a class for an Eclipse bundle to extend the “com.nomagic.magicdraw.integrations.eclipse.rcp.actions.MDEclipseActionWrapper” class.

TIP! This is an example of an Eclipse bundle class that connects to a MagicDraw command by its id “CUSTOM_ACTION_ID”:

```
public class MyCustomActionWrapper extends
MDEclipseActionWrapper
{
    public MyCustomActionWrapper()
    {
        super(CUSTOM_ACTION_ID);
    }
}
```

NOTE: This is a general way of connecting to an Eclipse command (“org.eclipse.ui.actions.ActionDelegate”) that should to be placed on the Eclipse main menu.

2. Create a descriptor (*plugin.xml* file) for the Eclipse bundle to place the command on the Eclipse main menu.

TIP! This is an example of a descriptor that should place the command with id "CUSTOM_ACTION_ID" under **Diagrams** > **Diagram Wizards** menu:

```
<!-- Define command and attach to category -->
<extension point="org.eclipse.ui.commands">
  <command id="MyCustomActionWrapper.cmd"
    name= "Command name"
    categoryId="MagicDraw"/>

<!-- Attach command (action) to menu -->
<extension point="org.eclipse.ui.actionSets">
  <actionSet id="Custom action set"
    label="Custom action label"
    visible="false">

    <action class= "org.my.path.MyCustomActionWrapper"
      label= "Custom action label"
      id= "Custom_action_id"
      menubarPath= "Diagrams/Diagram Wizards/group"
      definitionId="MyCustomActionWrapper.cmd"/>
  </actionSet>
</extension>

<!-- Attach to specific MagicDraw view and editor part -->
<extension name="Diagram or View Active"
point="org.eclipse.ui.actionSetPartAssociations">
  <actionSetPartAssociation targetID="Custom_Action_Part">
    <part
id="com.nomagic.magicdraw.integrations.eclipse.rcp.editors.
DiagramEditor"/>
    <part id="CONTAINMENT_TREE"/>
    <part id="INHERITANCE_TREE"/>
    <part id="DIAGRAMS_TREE"/>
    <part id="EXTENSIONS_TREE"/>
    <part id="SEARCH_RESULTS_TREE"/>
    <part id="DOCUMENTATION"/>
    <part id="PROPERTIES"/>
    <part id="MESSAGES_WINDOW"/>
  </actionSetPartAssociation>
</extension>
```

NOTE: This is a general way of adding a command to the Eclipse main menu.

3. Pack the command class with the Eclipse bundle descriptor to an Eclipse bundle (*.jar* file) and save the file in <MagicDraw installation directory>/plugins/eclipse/plugins.
4. Integrate MagicDraw with Eclipse.
5. Start Eclipse.

The new command will appear on the Eclipse main menu.

<MagicDraw installation directory>/plugins/eclipse/plugins contains MagicDraw plugins that have commands to appear on the Eclipse main menu. Their *plugin.xml* files can be used as examples too.

NEW! DEVELOPING PLUG-INS USING IDE

MagicDraw plug-ins can be effectively developed using popular IDEs (Integrated Development Environment) such as Eclipse, IntelliJ, and others. Developers may use theirs favorite IDE for agile MagicDraw plug-in coding, building, testing, and debugging. This chapter describes the MagicDraw plug-in development in Eclipse (www.eclipse.org) IDE.

MagicDraw Plug-in Development in Eclipse

To configure the Eclipse environment for the MagicDraw plug-in development, you need to perform the following steps:

1. Create Java Eclipse Project for MagicDraw plug-in.
2. Create the plug-in main class.
3. Prepare the plug-in descriptor file.
4. Start MagicDraw from the Eclipse environment.
5. Run MagicDraw test cases from the Eclipse environment.

Step 1: Create Java Eclipse Project for MagicDraw Plug-in

The MagicDraw plug-in development in Eclipse begins with creating a new Java Project. It is recommended to create separate Eclipse Java Project for each MagicDraw plug-in implementation.

In order to access MagicDraw Open API classes, the MagicDraw libraries (jars) must be added to the Eclipse project build path. It is recommended to create a path variable for the MagicDraw installation directory. The path variable should be used to specify MagicDraw libraries in the Eclipse project build path (see Figure 2 on page 21). Variable relative paths simplify switching between different MagicDraw versions, and make the

MagicDraw plug-in project environment independent. If the developed MagicDraw plug-in uses other MagicDraw plug-ins or external libraries, those libraries should be also added to the project build path.

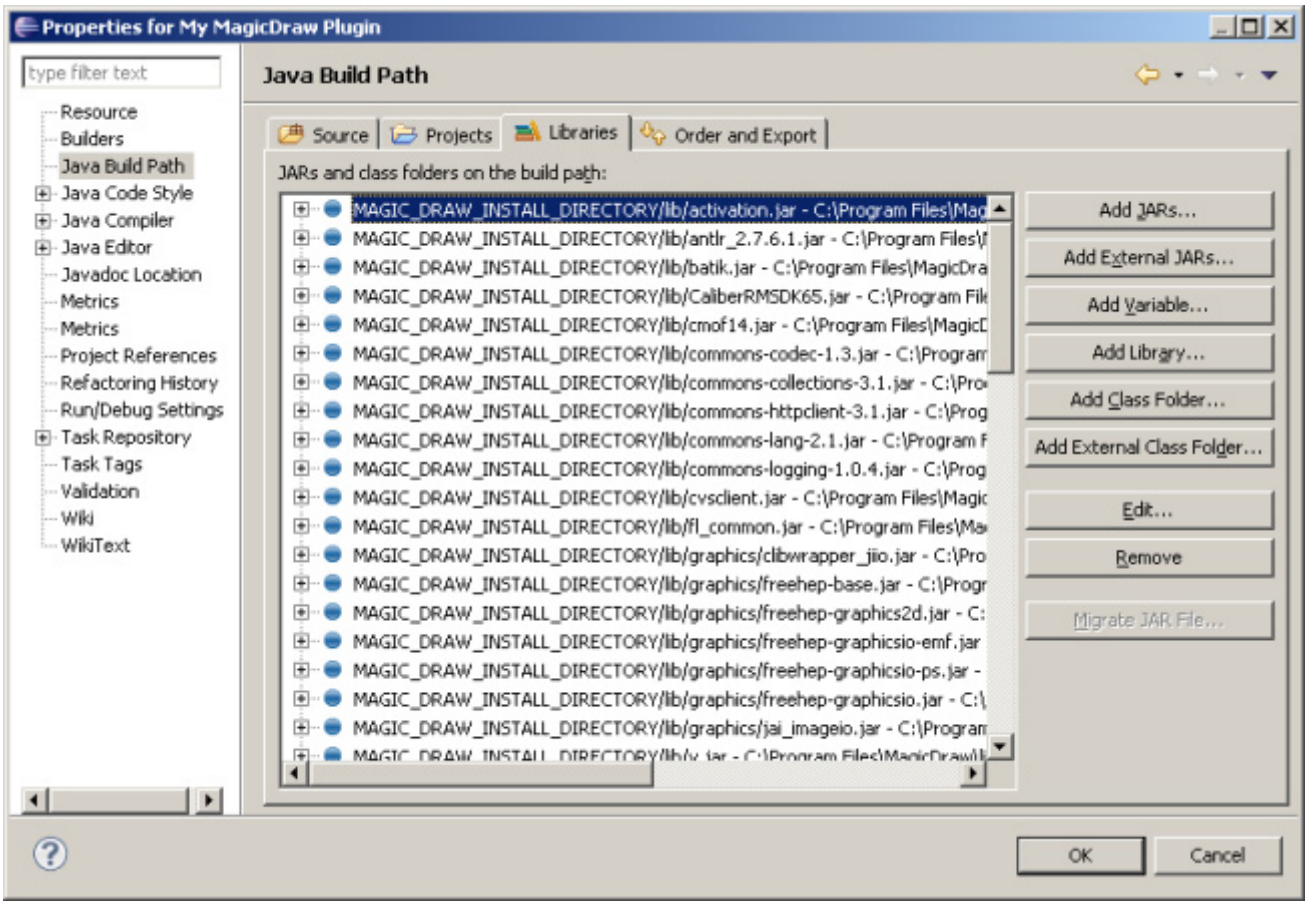


Figure 2 -- Eclipse Java Project build path with specified MagicDraw libraries

For more information how to create path variables, see at http://help.eclipse.org/indigo/topic/org.eclipse.platform.doc.user/concepts/cpathvars.htm.

Step 2: Create Plug-in Main Class

Each MagicDraw plug-in main class must extend the `com.nomagic.magicdraw.plugins.Plugin` class and implement its methods as described in the "Writing plug-in" on page 11 chapter. Eclipse automatically generates a default implementation for abstract Plug-in class methods. However, please remember that the Eclipse generated implementation for `isSupported()` and `close()` methods returns the *false* value which should be changed to *true* for enabling the plug-in initialization and disposing.

Step 3: Prepare Plug-in Descriptor File

The plug-in descriptor XML file should be written as described in "Step 4: Start MagicDraw From Eclipse Environment" on page 22 and placed to the <MagicDraw installation directory>\plugins\my_plugin_name directory.

NOTE	Please note, that even plug-in descriptor file contains information about runtime plug-in jar, it is not necessary to build and deploy this jar to plug-in directory while plug-in is developed under Eclipse IDE.

If the created MagicDraw plug-in uses external libraries which conflict with the same MagicDraw libraries, the ownClassload property value should be set as *true* in the plug-in descriptor as shown in the following example:

```
<?xml version="1.0" encoding="UTF-8"?>
<plugin
     id="com.nomagic.magicdraw.emfuml2xmi.v3"
     name="Eclipse UML2 (v3.x) XMI Export/Import"
     version="1.0"
     ownClassloader="true"
     provider-name="No Magic"
     class="com.nomagic.magicdraw.emfuml2xmi.v3.EmfUml2XmiPlugin">
</plugin>
```

Step 4: Start MagicDraw From Eclipse Environment

The implementation code of the MagicDraw plug-in is directly loaded to MagicDraw (without building plug-in jars) when MagicDraw starts from Eclipse environment. MagicDraw can be started from Eclipse as a regular Java application. To start MagicDraw from Eclipse, configure start-up settings in the Eclipse **Run Configurations** dialog. The `com.nomagic.magicdraw.Main` class should be specified as the main class (see Figure 3 on page 22).

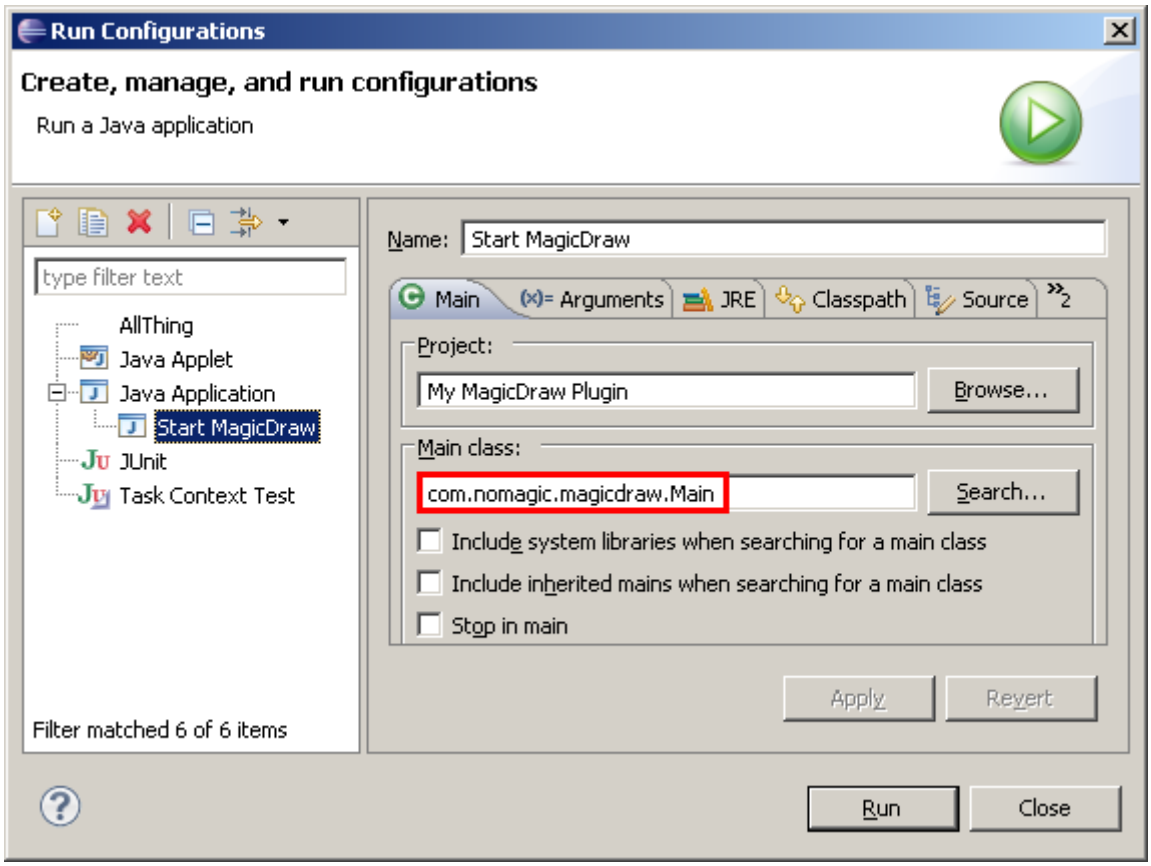


Figure 3 -- Eclipse Run Configuration settings for starting MagicDraw from Eclipse

Moreover, the heap size configuration and the MagicDraw installation directory should be provided as Java Virtual Machine (JVM) arguments in the **Arguments** tab of the **Run Configuration** dialog (see Figure 4 on page 23). MagicDraw output can be redirected to Eclipse Console by specifying the `-verbose` key as the MagicDraw program argument.

Some more MagicDraw environment properties can be added. For instance, if MagicDraw needs to be loaded with custom plug-ins only, the custom directory for MagicDraw plug-ins can be specified as the `md.plugins.dir` property value:

```
-Dmd.plugins.dir=C:\development\plugins
```

MagicDraw can be also started in the debug mode as a regular Java program. To use the standard Eclipse Debug feature, on the Eclipse menu, click **Run** > **Debug**. In this case, the MagicDraw plug-in code can be

debugged using break points, watchers, and other Eclipse debugging features. Moreover, the body of MagicDraw plug-in methods can be changed and reloaded (hot-swapped) while running MagicDraw in the debug mode. It is not need to restart MagicDraw each time the body of plug-in method is changed. It is recommended to run MagicDraw in the debug mode while developing MagicDraw plug-ins.

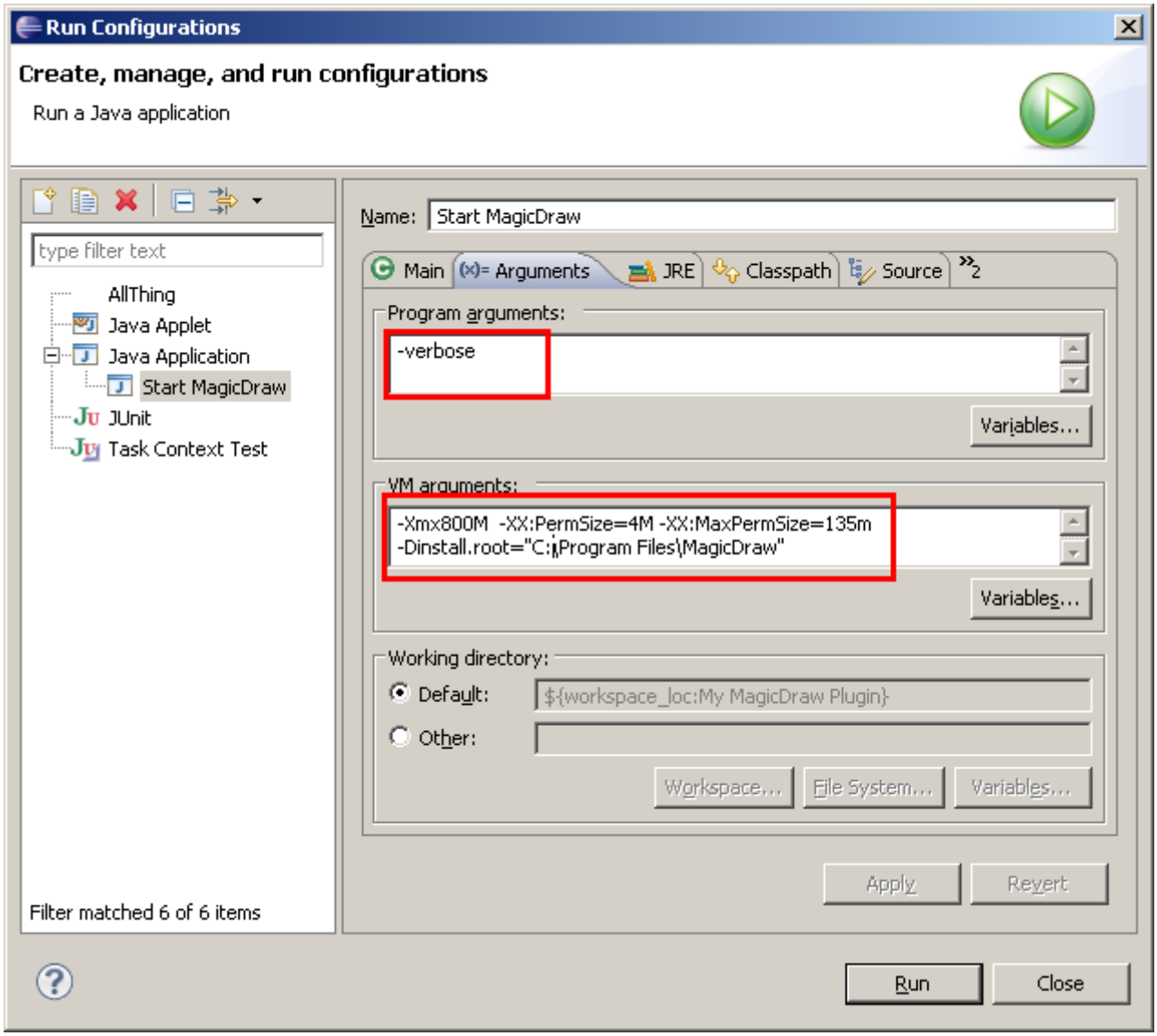


Figure 4 -- MagicDraw heap size and installation directory configuration as JVM arguments

Step 5: Run MagicDraw Tests Cases from Eclipse Environment

Developers may create JUnit 3.x based MagicDraw test cases for MagicDraw plug-in behavior testing. MagicDraw Test Case development is described in "NEW! Creating Magic Draw Test Cases" on page 140. MagicDraw test cases can be executed as regular JUnit test cases in the Eclipse environment. From the Eclipse main menu, select **Run** > **Run As** > **JUnit Test Cases**. However, the MagicDraw installation directory and heap size configuration should be specified as VM arguments in the **Run Configurations** dialog of JUnit (see Figure 5 on page 24).

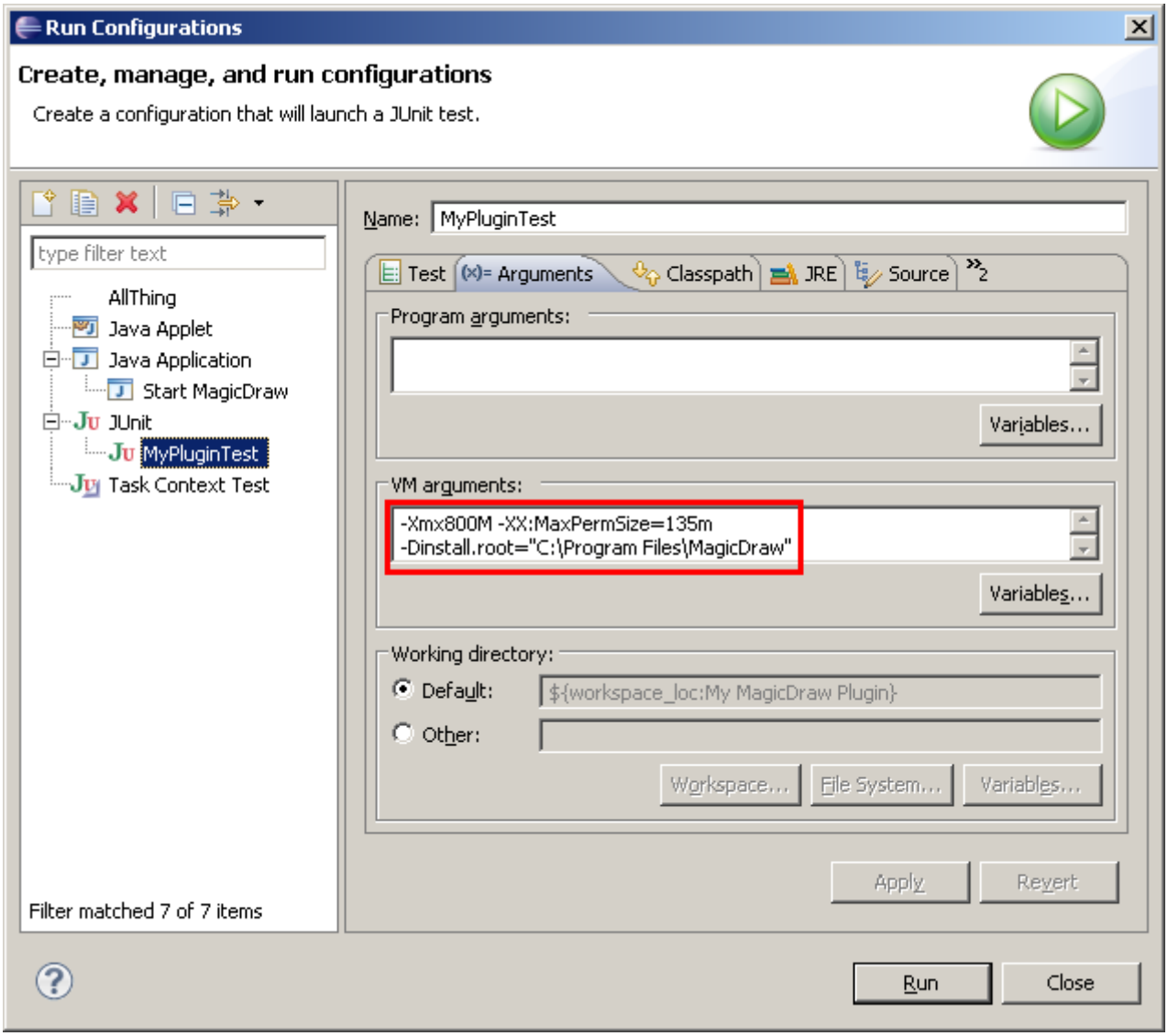


Figure 5 -- MagicDraw Test Case running configuration

PLUGINS MIGRATION TO MAGICDRAW 15.0 AND LATER OPEN API

Open API in MagicDraw version 15.0 and later versions has changed together with changes in UML 2.1.2 (2.2) specification. You should read this chapter if you want to migrate your plugin created for earlier MagicDraw version to MagicDraw version 15.0 and later.

UML specification introduced changes in UML metamodel, so we are forced to make these changes in Open API too. Also it was a good chance to make cleaner UML metamodel implementation API.

There are no big changes in Open API, so migration will not be a long and complicate task for you.

UML metamodel changes

There are two types of changes in UML metamodel API.

UML specification changes

UML 2.1.2 (2.2) specification introduced few changes in UML metamodel itself. Some metamodel classes were added, some of them were removed, some metaclasses properties were changed. Most of these changes are not in core UML, so they will affect you if your plugin is oriented to complex things in UML.

Most changes are made in UML Templates, Simple Time, Interactions.We suggest to look at UML 2.1.2 (2.2) specification for such changes if you see some compile errors.

UML metamodel API implementation changes

Older UML metamodel API used several interfaces layers for every compatibility level described in UML specification. All these layers were merged into one using package merge, this is why old API had so many interfaces for every metamodel element in different package. Such structure was very complicated and hardly understandable for new UML users.

MagicDraw version 15.0 and later UML metamodel API provides just one final merged layer. All intermediate layers were dropped from API. This change reduced UML metamodel API size few times.

Dropped interfaces are from packages:

- com.nomagic.uml2.ext.omg
- com.nomagic.uml2.magicdraw
- com.nomagic.uml2.omg

We left the same package name for merged interfaces like in previous API version - ***com.nomagic.uml2.ext.magicdraw.****. You do not need to make any changes in your code if you was using interfaces from this layer. Otherwise you need simple change import statement in your java source files. For example - *import com.nomagic.uml2.omg.kernel.Element* to *import com.nomagic.uml2.ext.magicdraw.classes.mdkernel.Element*.

UML metamodel interfaces uses Java 5 generics, so it is much easier to understand types of various collections in metamodel.

Removed deprecated methods

Removed deprecated method	Substitution
`BaseElement.getProject()`	`Project.getProject(BaseElement)`
`MainFrame.getDialogParent()`	`MDDialogParentProvider.getProvider().getDialogParent()`
`MainFrame.setDialogParent(Frame)`	`MDDialogParentProvider.getProvider().setDialogParent(Frame)`
`ElementListProperty.setStereotype(Stereotype)`	`ElementListProperty.setSelectableRestrictedElements(Collection)`

Libraries jars changes

MagicDraw Open API classes are packaged into *md_api.jar* and *md_common_api.jar* (was *md.jar* and *md_common.jar*). If your plugin was using API classes from some MagicDraw build-in plugin, plugin jar is also renamed with "*xxxx_api.jar*" pattern.

Package name change for build-in plug-ins

Some build-in plugins in previous MagicDraw version exposed their Open API. For example patterns, transformations, emf and etc. We have changed package name pattern for build-in plugins. Previous API version used ***com.nomagic.magicdraw.plugins.impl.**** pattern, now these plugins are moved to ***com.nomagic.magicdraw.****. For example ***com.nomagic.magicdraw.patterns.*.*** Simple import statement change in your java source will solve this migration issue.

PLUGINS MIGRATION TO MAGICDRAW 17.0.1 AND LATER OPEN API

If you are migrating from earlier than MagicDraw 15.0 version, please read the "Plugins migration to MagicDraw 15.0 and later OPEN API" on page 25 chapter first.

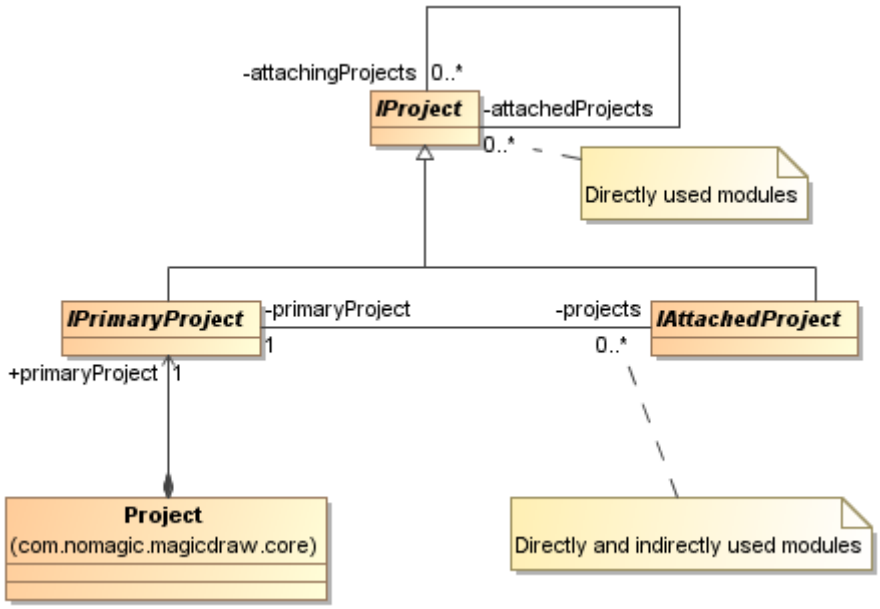
UML Metamodel Changes

UML 2.4.1 specification introduced few changes in UML metamodel itself. Some metamodel classes were added, some of them were removed, some metaclasses properties were changed. Most of these changes are not in core UML, so they will affect you if your plugin is oriented to complex things in UML.

The details of changes can be found at https://www.magicdraw.com/show_content/new_and_noteworthy/?content=UML_specification_changes_from_2.3_to_2.4.

Project (Decomposition) Structure API Changes

The following figure shows the domain model of the project decomposition.



The core change is an introduction of *IProject* - *IPrimaryProject* and *IAttachedProject*. *IPrimaryProject* is a single instance in the scope of a MagicDraw project. *IPrimaryProject* can have attached (used) any number of *IAttachedProject* (modules), while *IAttachedProject* itself can attach other modules (*IAttachedProject*).

Utility *com.nomagic.magicdraw.core.ProjectUtilities* and *com.nomagic.magicdraw.core.modules.ModulesService* classes are introduced to help working with a new project decomposition structure.

The old project structure API made deprecated in 17.0.1.

Other OpenAPI Changes

ProjectOptionsConfigurator

The method *afterLoad(ProjectOptions options)* has been added.

An empty implementation of this method must be added to a custom *ProjectOptionsConfigurator* implementation.

ProjectEventListener

The following methods have been added:

projectActivatedFromGUI (Project)
projectCreated (Project)
projectOpenedFromGUI (Project)
projectPreActivated (Project)
projectPreClosed (Project)
projectPreDeActivated (Project)
projectPreReplaced (Project,Project)
projectPreSaved (Project,boolean)
projectPreClosedFinal (Project)

An empty implementation of these methods must be added to the custom *ProjectEventListener* implementation. The code change is not required, if *ProjectEventListenerAdapter* is extended.

Libraries jars Changes

New jar files have been introduced in the MagicDraw lib folder. Do not forget to update your class path.

NEW! MAGICDRAW UML 17.0.1 FILE FORMAT CHANGES

In earlier versions, a MagicDraw file was a plain xmi file with extensions used to save diagrams information and project structure information (a mount table). A mdzip file was a compressed xmi file. The code engineering information was saved in the different file with extension "mdr".

File Formats in MagicDraw 17.0.1

The inner project structure as well as the file format has been changed in MagicDraw version 17.0.1. An XMI version is upgraded to 2.4 with corresponding changes required by this standard.

A project is collection of xmi, text, and binary resources. A native file format contains all resources saved as separate files. All these files are collected to one zip file.

Zip Based File Format (mdzip, xml.zip)

A zip file (xml.zip, mdzip) contains at least the following entries:

- Meta information about entries records.properties.
- Project identifier starts with PROJECT-, for example, PROJECT-f41072fa-d1aa-4e90-b7d9-fdd8862ed8af.
- Project structure information - *com.nomagic.ci.metamodel.project*.
- Shared and not shared uml model information: *com.nomagic.magicdraw.uml_model.shared_model, com.nomagic.magicdraw.uml_model.model*
- Proxies information backup of other external resources. Starts with proxy.
- Project options ends with *com.nomagic.magicdraw.core.project.options.personalprojectoptions and com.nomagic.magicdraw.core.project.options.commonprojectoptions.*
- Diagrams and other “binary” resources, entry names do not contain any meaningful information, just resource id, like 80a7058a-91b1-41fb-9a3a-cd7a8c6be52d.

Plain Text File Format (xml, mdxml)

Export to non zip file formats like .xml or .mdxml is a combination of all zip file entries into the one plain xmi file. In this file, a uml model is saved, as it was in earlier versions, while other information is saved as xmi:Extension.

Changes Related to Diagrams

Until version 17.0.1, diagrams were saved as an xmi extension. All diagrams were saved under one extension <mdOwnedDiagrams>. Both a diagram model and diagram symbols were saved in this extension. The <mdOwnedDiagrams> extension was saved outside a uml:Model element.

Version 17.0.1 saves the diagram element as a separate element extension named <modelExtension>. This extension is stored in place where the diagram element is serialized (inside a diagram owner). If one owner has more than one diagram, they may be written in the one extension. In this extension, a diagram element is saved as a normal model element, and all its attributes and references are saved according xmi rules. A diagram element contains DiagramRepresentationObject, which contains information about a diagram type, required features, and so on. DiagramRepresentationObject contains DiagramContentsDescriptor, which describes used elements in diagram and contains BinaryObject. BinaryObject has the attribute “streamContentID” which identifies a zip entry for diagram symbols. All information is stored in <mdOwnedViews>. The following schema presents finding diagram symbols entry id:

Diagram > **DiagramRepresentationObject** > **DiagramContentsDescriptor** > **BinaryObject** > **BinaryObject.streamContentID**

Genmodel for DiagramRepresentationObject and DiagramContentsDescriptor

```
<?xml version="1.0" encoding="UTF-8"?>
<genmodel:GenModel xmi:version="2.0"
    xmlns:xmi="http://www.omg.org/XMI" xmlns:ecore="http://www.eclipse.org/emf/
2002/Ecore"
    xmlns:genmodel="http://www.eclipse.org/emf/2002/GenModel" modelDirectory="/
com.nomagic.magicdraw.foundation/src"
    modelPluginID="com.nomagic.magicdraw.foundation" modelName="Diagram"
updateClasspath="false"
    rootExtendsInterface="org.eclipse.emf.cdo.CDOObject"
rootExtendsClass="org.eclipse.emf.internal.cdo.CDOObjectImpl"
    reflectiveDelegation="true" importerID="org.eclipse.emf.importer.ecore"
featureDelegation="Reflective"
    containmentProxies="true" complianceLevel="5.0" copyrightFields="false"
usedGenPackages="../../com.nomagic.ci.metamodel.project/model/binary.genmodel#//
binary"
  classNamePattern="">
 <foreignModel>diagram.ecore</foreignModel>
 <modelPluginVariables>CDO=org.eclipse.emf.cdo</modelPluginVariables>
  <genPackages prefix="Diagram" basePackage="com.nomagic.magicdraw.foundation"
disposableProviderFactory="true"
  ecorePackage="diagram.ecore#/">
    <genClasses image="false" ecoreClass="diagram.ecore#//
AbstractDiagramRepresentationObject">
      <genFeatures createChild="false" ecoreFeature="ecore:EAttribute
diagram.ecore#//AbstractDiagramRepresentationObject/ID"/>
      <genFeatures createChild="false" ecoreFeature="ecore:EAttribute
diagram.ecore#//AbstractDiagramRepresentationObject/type"/>
      <genFeatures createChild="false" ecoreFeature="ecore:EAttribute
diagram.ecore#//AbstractDiagramRepresentationObject/umlType"/>
      <genFeatures createChild="false" ecoreFeature="ecore:EAttribute
diagram.ecore#//AbstractDiagramRepresentationObject/diagramProperties"/>
      <genFeatures createChild="false" ecoreFeature="ecore:EAttribute
diagram.ecore#//AbstractDiagramRepresentationObject/initialFrameSizeSet"/>
      <genFeatures createChild="false" ecoreFeature="ecore:EAttribute
diagram.ecore#//AbstractDiagramRepresentationObject/requiredFeature"/>
      <genFeatures property="None" children="true" createChild="true"
ecoreFeature="ecore:EReference diagram.ecore#//
AbstractDiagramRepresentationObject/diagramContents"/>
      <genFeatures createChild="false" ecoreFeature="ecore:EAttribute
diagram.ecore#//AbstractDiagramRepresentationObject/diagramStyleID"/>
  </genClasses>
 <genClassesecoreClass="diagram.ecore#//DiagramContentsDescriptor">
      <genFeatures property="None" notify="false" createChild="false"
ecoreFeature="ecore:EReference diagram.ecore#//DiagramContentsDescriptor/
representation"/>
      <genFeatures createChild="false" ecoreFeature="ecore:EAttribute
diagram.ecore#//DiagramContentsDescriptor/exporterName"/>
      <genFeatures createChild="false" ecoreFeature="ecore:EAttribute
diagram.ecore#//DiagramContentsDescriptor/exporterVersion"/>
```

```
      <genFeatures createChild="false" ecoreFeature="ecore:EAttribute
diagram.ecore#//DiagramContentsDescriptor/usedElements"/>
      <genFeatures property="None" children="true" createChild="true"
ecoreFeature="ecore:EReference diagram.ecore#//DiagramContentsDescriptor/
binaryObject"/>
      <genFeatures createChild="false" ecoreFeature="ecore:EAttribute
diagram.ecore#//DiagramContentsDescriptor/contentHash"/>
  </genClasses>
 </genPackages>
</genmodel:GenModel>
```

NEW! UML MODEL IMPLEMENTATION USING EMF

UML Model Implementation Using EMF

Starting from MagicDraw version 17.0, UML model is implemented using Eclipse Modeling Framework (EMF). A MagicDraw UML model is an EMF model. All UML model classes implement the *org.eclipse.emf.ecore.EObject* interface. The MagicDraw UML model can be accessed and changed using EMF API. For example:

```
    // get project model
    Model model = project.getModel();
    // create session
    SessionManager.getInstance().createSession("create class");

    // get name attribute
    EAttribute element_name = UMLPackage.eINSTANCE.getNamedElement_Name();
    // get name value (same as model.getName())
    Object name = model.eGet(element_name);
    System.out.println("name = " + name);
    // change name value (same as model.setName(name + "_1");)
    model.eSet(element_name, name + "_1");

    Class aClass = UMLFactory.eINSTANCE.createClass();

    // get packaged element collection
    Collection collection = (Collection)
model.eGet(UMLPackage.eINSTANCE.getPackage_PackagedElement());
    // add new class (same result as model.getPackagedElement().add(aClass))
    collection.add(aClass);

    // close session
    SessionManager.getInstance().closeSession();
```

UML Model Implementation in MagicDraw 17.0 Details

The MagicDraw 17.0 UML metamodel has a nested package structure. UML is a root package that has nested subpackages, for example, classes/mdkernel, components/mdbasiccomponents, mdusecases. Metadata about a specific model element can be found in the package of the element. For example, UML model element *Property* is from package *uml/classes/mdkernel*, so metadata about *Property* can be found in the package *com.nomagic.uml2.ext.magicdraw.classes.mdkernel.metadata.MdkernelPackage*.

```
EAttribute nameAttribute = MdkernelPackage.Literals.NAMED_ELEMENT__NAME;
```

Model elements can be created using the EMF UML factory *com.nomagic.uml2.ext.magicdraw.metadata.UMLFactory*: For example,

```
Component component = UMLFactory.eINSTANCE.createComponent();
```

Element will be created in the repository of the active project.

UML model elements are not contained by any EMF resource.

UML model implementation in MagicDraw 17.0.1 details

In MagicDraw version 17.0.1, the UML metamodel has only one package - UML, and all UML metadata exist in this package. All UML metadata can be found in *com.nomagic.uml2.ext.magicdraw.metadata.UMLPackage*. For example:

```
EAttribute nameAttribute = UMLPackage.Literals.NAMED_ELEMENT__NAME;
```

UML model elements can be created using the EMF factory *com.nomagic.uml2.ext.magicdraw.metadata.UMLFactory*. For example,

```
Component component = UMLFactory.eINSTANCE.createComponent();
```

In MagicDraw 17.0.1, an element created using the EMF factory will be placed in the repository that does not belong to any project. The created object will be automatically added into the project's repository after it will be added into the container that is in the project's repository.

All UML model elements are directly or indirectly contained by EMF resources. Resource of an element can be retrieved in the standard way:

```
Element element;
org.eclipse.emf.ecore.resource.Resource resource = element.eResource();
```

Each MagicDraw project has the one EMF resource for private data (all not shared data) and can have the one resource for shared data (if it has shared data). Project resources can be accessed in the following way:

```
 // get primary project of the active project
IPrimaryProject project =
Application.getInstance().getProject().getPrimaryProject();
// get UML model project feature
        UMLModelProjectFeature feature =
project.getFeature(UMLModelProjectFeature.class);
// get private resource
// NOTE: this method will return shared resource for attached project/module
        Resource privateResource = feature.getUMLModelResource();
//do something with elements directly contained in the resource
        EList<EObject> contents = privateResource.getContents();
        for (EObject element : contents) {
            // do something with the element
        }
```

All UML related resources of the project can be accessed:

```
// returns private and shared (if such exist) resources
Collection<Resource> resources = feature.getResources();
```

DISTRIBUTING RESOURCES

In this section, you will find information about how to share your created resources with other users. The easiest way to distribute data is to store resources to one zip archive and import the files to MagicDraw with the MagicDraw Resource Manager. For more information about Resource Manager, see MagicDraw UserManual.pdf.

You can distribute the following types of resources:

- Custom Diagrams
- Profiles
- Templates
- Samples and Documentation
- Plug-ins.

You can distribute one resource type or you may distribute the whole resources set.

How to distribute resources

You can distribute custom resources in the following two ways:

- Using **Resource Builder**. The recourse can be created using Resource Builder. To download Resource Builder, click **Help** > **Resource/Plugin Manager**. In the Resource Builder, select the package containing all needed files, add it to the recourse file, and specify several tags. The resource file you have created can be distributed to your team members and installed using the Resource/Plugin Manager.
- Distribute manually. Manual distribution consists of the following steps:
    1. Create required files. For information about what files are required for each type of resource, see “Creating required files and folders structure” on page 34.
    2. Create Resource descriptor file. For more information about the Resource descriptor file, see “Resource Manager descriptor file” on page 40.
    3. Archive created files to a zip file. The zip file should include the required files, as well as folders that have structure matching the structure of MagicDraw. For information about folders structure for each type of resource and to see the general view of the file structure, see Figure 11, “Structure of directories and files that could be distributed through the Resource Manager,” on page 40.
    4. Import your prepared data to MagicDraw through the Resource Manager. For more information about the MagicDraw Resource Manager, see *MagicDraw UserManual.pdf*.

NOTE	MagicDraw Resource Manager supports zip archives only!

The following sections describe the manual resource distribution in details.

Creating required files and folders structure

To distribute resources, you must create the required files and folders for a particular resource type. Some of the resource file names should match the standard names.

For each resource files, there should be a created folders structure, which should match the folders structure of the MagicDraw installation folder.

To distribute resources, you must create a resource manager descriptor file, which is described in the section “Resource Manager descriptor file” on page 40.

Distributing Custom Diagrams

Required files for custom diagram distribution are as follows:

- *descriptor.xml* - Custom Diagram descriptor provided by this plugin.

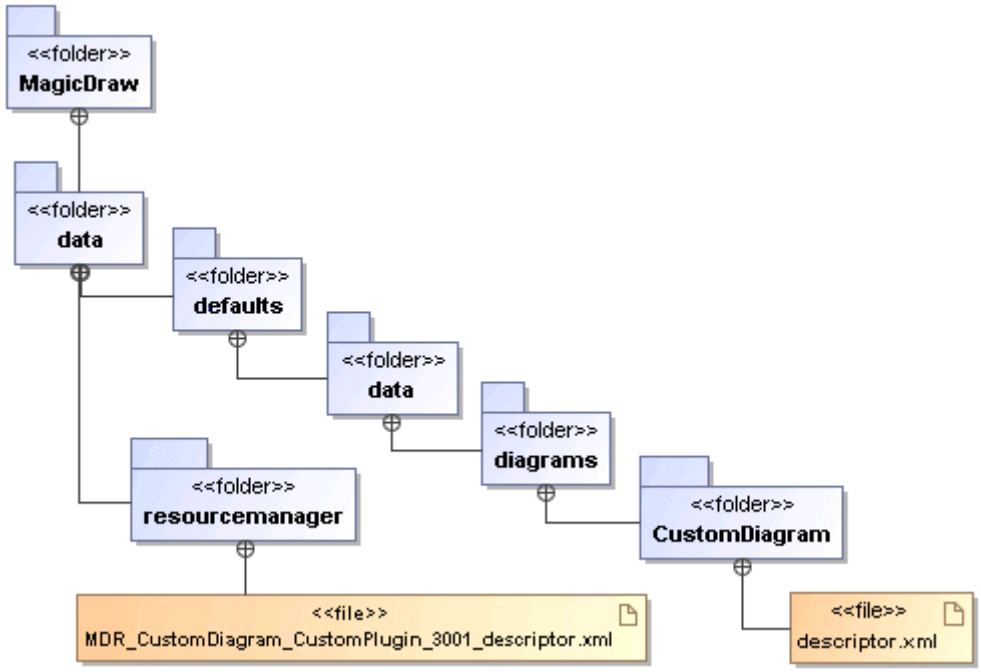


Figure 6 -- Folders and files structure required for custom diagram distribution

For more information about creating new diagram types, see the section “New Diagram Types” on page 88 or see the *UML Profiling and DSL UserGuide.pdf* custom diagrams creation.

Distributing Profiles

Files for profile distribution are as follows:

- *CustomProfile.xml.zip* (required)
- *CustomProfile.htm*

You may choose any name for these files.

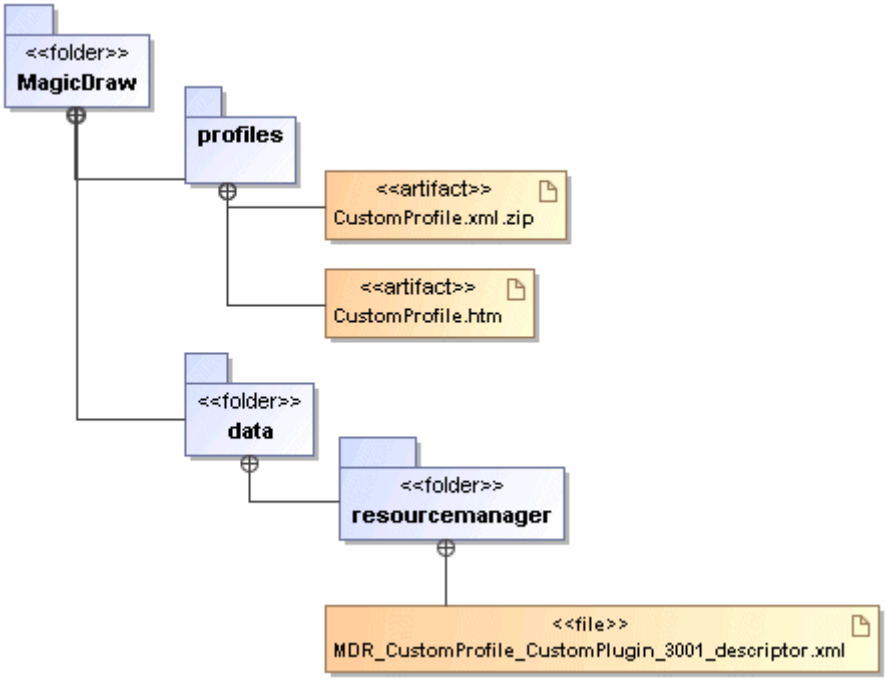


Figure 7 -- Folders and files structure required for profile distribution

For more information about working with Profiles see *MagicDraw UserManual.pdf* and *UML Profiling and DSL UserGuide.pdf*.

Distributing Templates

Files for template distribution are as follows:

- *CustomTemplate.xml.zip* (required)
- *CustomTemplate.html*

- *description.html*.

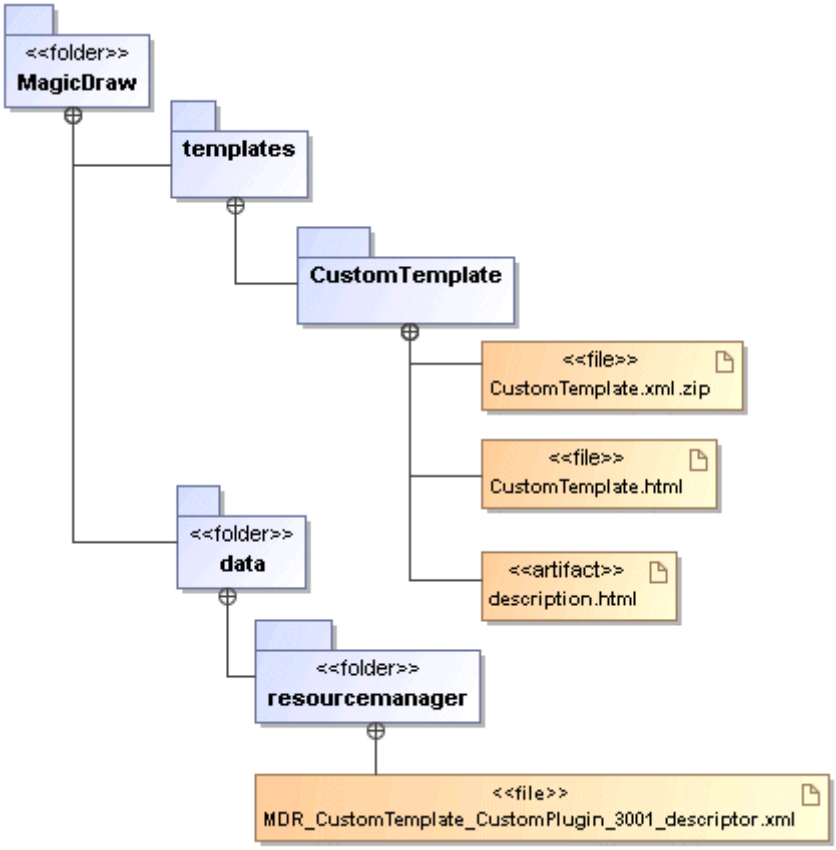


Figure 8 -- Folders and files structure required for template distribution

Distributing Samples and Documentation

You can distribute your created samples and documentation and import into MagicDraw with the Resource Manager.

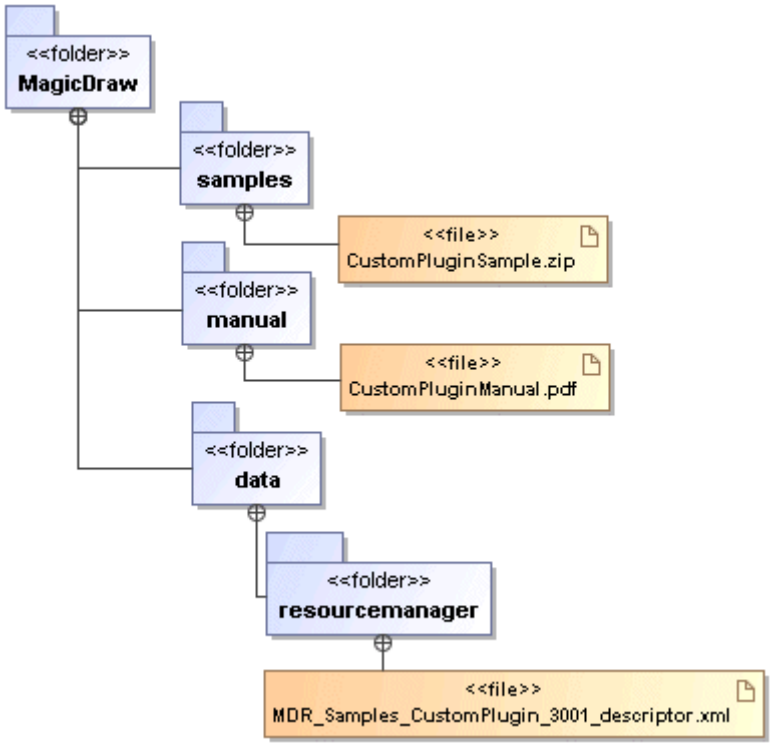


Figure 9 -- Folders and files structure required for samples and documentation distribution

Distributing Plug-ins

Required files for plug-in distribution are as follows:

- *plugins.xml* - Plug-in description. For more information about *plugin.xml* file, see “Plug-in descriptor” on page 13.
- *customPlugin.jar* - jarred plug-in class files. You may select any title for this file.

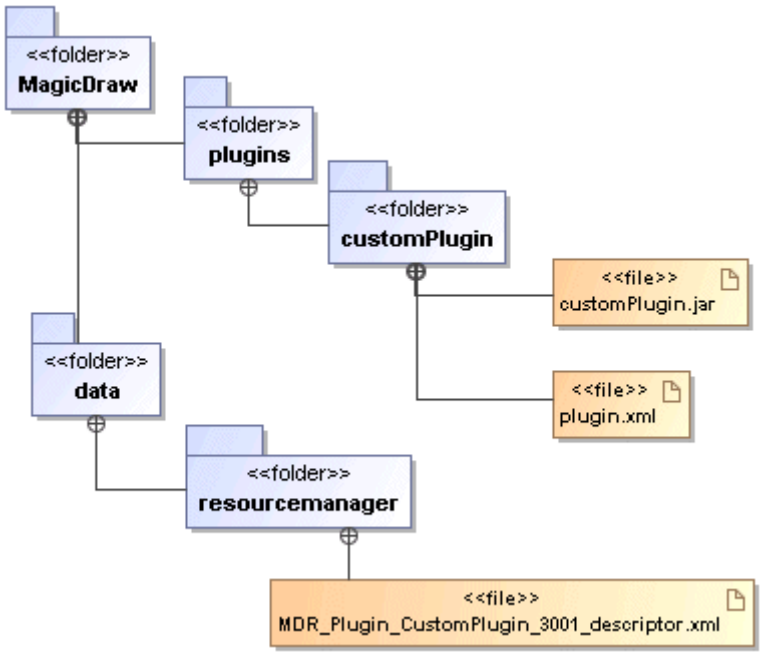


Figure 10 -- Folders and files structure required for plug-in distribution

The plug-in term may include all resources that could be distributed. Such as custom diagrams, profiles, templates, samples, and others.

See the general structure of the resources that could be distributed with the Resource Manager in the image below.

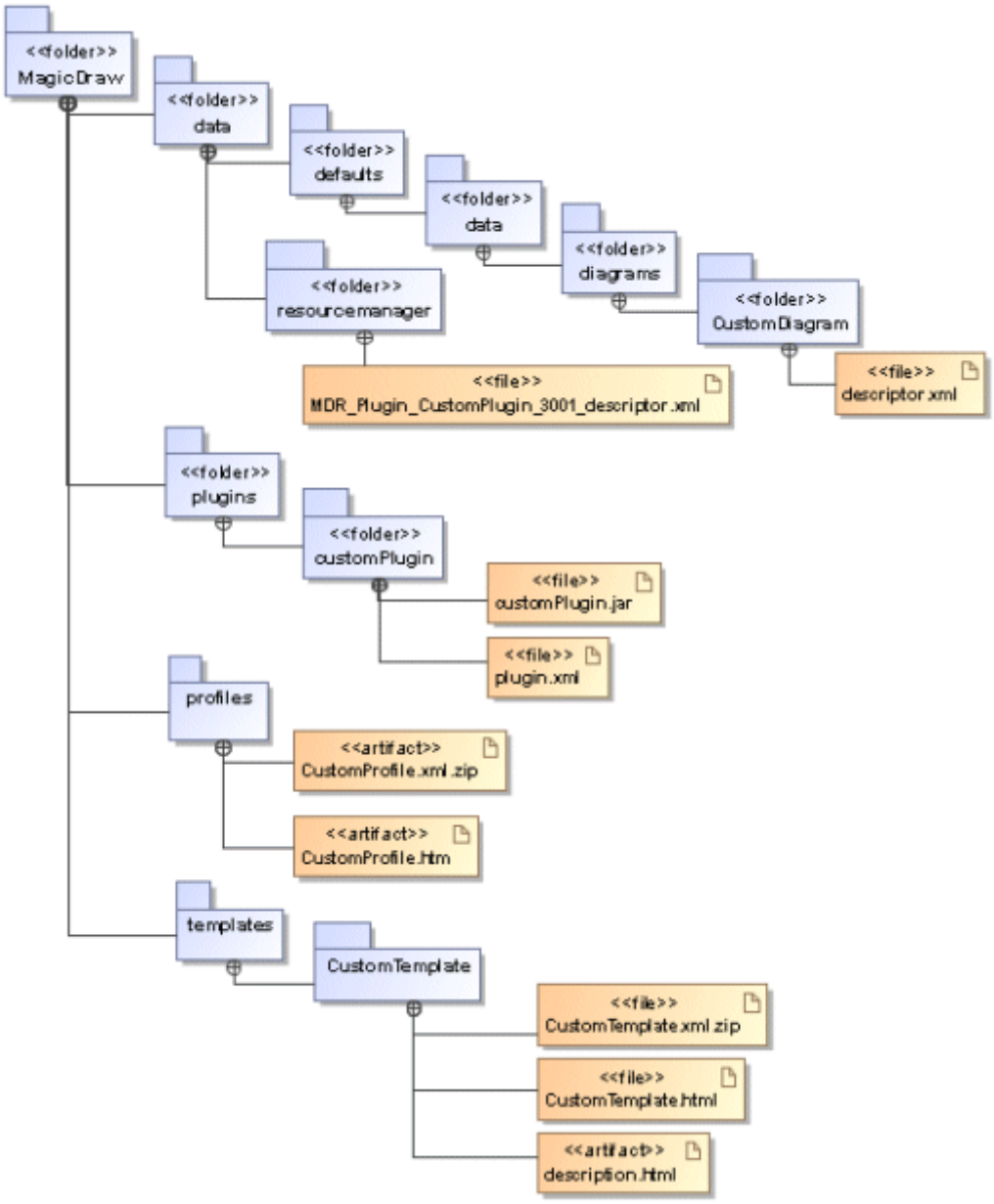


Figure 11 -- Structure of directories and files that could be distributed through the Resource Manager

Resource Manager descriptor file

If you are planning to import and export your resources with the Resource Manager, you should read this section. For importing resources to MagicDraw, the resource manager descriptor file should be created. In this section you will find information about descriptor file naming, location, and a sample of this file.

For more information about importing resources with Resource Manager, see *MagicDraw UserManual.pdf*.

Resource Manager descriptor file naming

The resource Manager descriptor file has specific naming. See the structure of the name:

MDR_<type>_<plugin name>_<plugin id>_descriptor.xml

For example:

MDR_Plugin_CustomPlugin_3001_descriptor.xml.

NOTE All spaces are replaced with the underscore symbol "_".

Resource Manager descriptor file location

The file location is *<MagicDraw installation directory>/data/resourcemanager*.

Resource Manager descriptor file content and sample

In this section you will see a basic sample of the Resource Manager descriptor file structure. This sample represents a plug-in distribution, which also includes custom diagram, profile, template, sample, and documentation.

You can also distribute custom diagrams, profiles, templates, or samples separately, you only need to change the "*type*" value.

```
<resourceDescriptor
   critical="false"
   date="2007-12-24+21:01"
   description="My Plug-in"
   homePage="http://www.magicdraw.com"
   id="3001"
   mdVersionMax="higher"
   mdVersionMin="15.0"
   name="CustomPlugin"
   type="Plugin">


<version human="1.0 beta" internal="1" />
<provider name="No Magic" />


<edition>Enterprise</edition>
<edition>Architect</edition>
<edition>Standard</edition>
<edition>Professional Java</edition>
<edition>Professional C++</edition>
<edition>Professional C#</edition>
<edition>Professional ArcStyler</edition>
<edition>Reader</edition>
<edition>OptimalJ</edition>

<installation>
   <file from="data/defaults/data/diagrams/CustomDiagram/descriptor.xml"
      to="data/defaults/data/diagrams/CustomDiagram/descriptor.xml" />
<file from="profiles/CustomProfile.xml.zip"
      to="profiles/CustomProfile.xml.zip" />
<file from="templates/CustomTemplate.xml.zip"
      to="templates/CustomTemplate.xml.zip" />
   <file from="samples/CustomPluginSample.mdzip"
      to="samples/CustomPluginSample.mdzip" />
   <file from="manual/CustomPluginManual.pdf"
      to="manual/CustomPluginManual.pdf" />
   <file from="plugins/customPlugin/*.*"
      to="plugins/customPlugin/*.*" />
   <file from="data/resourcemanager/MDR_Plugin_CustomPlugin_3001_descriptor.xml"
      to="data/resourcemanager/MDR_Plugin_CustomPlugin_3001_descriptor.xml" />
```

```
</installation>
</resourceDescriptor>
```

See the terms used in the sample description in the table below:

Element	Description
id	Unique plug-in id. *id* is used to form a descriptor file name. To prevent duplicates use a number starting from 3000.
name	Plug-in name. Name is used to form a descriptor file name. Plug-in name must be unique between all MagicDraw resources.
type	Type may be one of the following types: Custom Diagram, Plugin, Profile, Sample, Template.
version internal	*version internal* is an invisible resource number. This version number is not visible to the user and may be used for an internal count. *version internal* may only be a number.
version human	Human readable version number of the resource. This version number is visible to users. *version human* number may use numbers and/or words.
edition	Supported MagicDraw editions.
installation	*installation* includes files, which will be copied from the custom plug-in archive to the MagicDraw folder. **IMPORTANT!** Do not use "*.*" ! If file name includes “*.*“, when uninstalling the plug-in all defined files will be removed. For example if "samples/*.*" is defined, then uninstalling the resource will remove all files from the “samples” folder.

JYTHON SCRIPTING

MagicDraw allows you to access open API using Jython scripting language.

MagicDraw on every startup checks for scripts in plugins/com.nomagic.magicdraw.jpython/scripts/. If there are subdirectories each of them are scanned for the *script.xml* file. This file provides information about script in this directory. File is similar to plug-in descriptor described in plug-ins section (See “Plug-in descriptor” on page 13.). If *script.xml* contains valid information, script file specified in *script.xml* is executed. Script file should contain valid Jython **NEW!** 2.5.2 script.

NOTE	For writing scripts the user should have basics of Jython programming language and be familiar with MagicDraw open API.

Creating script

In the following example we will create script which shows a message on MagicDraw startup.

To create script you need:

Step 1: Create directory

First of all a subdirectory in *plugins/com.nomagic.magicdraw.jpython/scripts/* should be created.

Step 2: Write script descriptor

Script descriptor is a file written in XML and named *script.xml*. Script descriptor provides information about script file to run, version of script, ID, etc.

In the mentioned directory, create *script.xml* file:

```
<?xml version="1.0" encoding="UTF-8"?>
<script
     id="example 1"
     name="Simple menu item"
     version="1.0"
     provider-name="No Magic"
     script-file="main.py"
     requiresApi="1.0">
</script>
```

In the table below, you will find the detailed *script.xml* file structure.

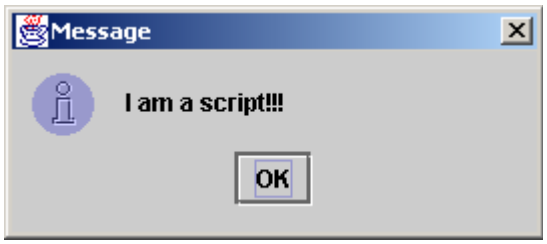
Element	Description	
script	**Attributes**	
	Name	**Description**
	id	Scrip ID, should be unique. Used to identify script. Example: “my.first.script.0”
	name	Script name. No strict rules applied to this attribute. Example: “Example script”
	version	Script version. Allows numbers separated with one dot value. Examples: “1.0”, “0.1”
	provider-name	Script provider name. Company or author name. Example: "No Magic"
	script-file	Relative path to script file. This file will be executed. Example:”main.py”
	requires-api	MagicDraw API version required by script. Example:”1.0”

Step 3: Write script code

Then in the same directory, create *main.py* file:

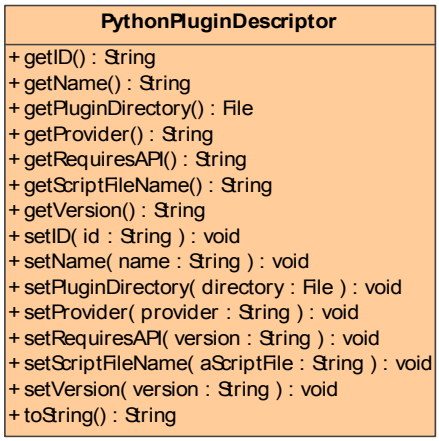
```
from javax.swing import JOptionPane

# Script starts here
print "Starting script, descriptor", pluginDescriptor
JOptionPane.showMessageDialog( None, "I am a script!!!")
```

After saving files, restart MagicDraw. On MagicDraw startup message dialog should appear.



Variables passed to script

MagicDraw passes one variable to script pluginDescriptor. This variable contains information from parsed script.xml file. Variable is instance of PythonPluginDescriptor class.



Script can retrieve script directory and other necessary information from pluginDescriptor variable. There is no need to change any other fields for this variable

Jython

Jython is an implementation of the high-level, dynamic, and object-oriented language Python which is seamlessly integrated with the Java platform.

Using Jython you may access all java API and MagicDraw open API. This allows to avoid compilation and to get the same results without java code. Using scripting you may do everything that you can achieve using java plug-in, and even more: you may change your code without recompiling and restarting an application.

More information about Jython you can find at **http://www.jython.org**

Information about python language you can find at **http://www.python.org/**

ADDING NEW FUNCTIONALITY

MagicDraw actions mechanism enables to add new functionality to MagicDraw and the way to invoke it through GUI.

Invoking Actions

Actions can be invoked from:

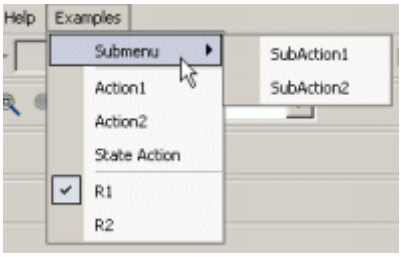
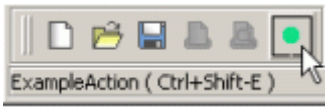
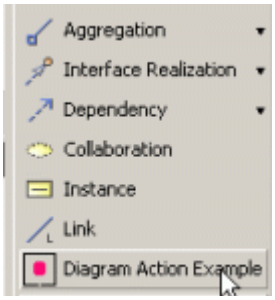
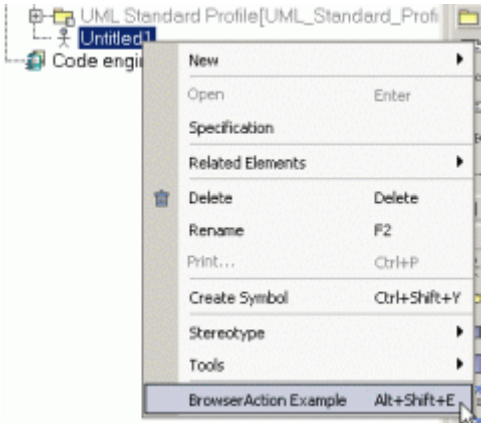
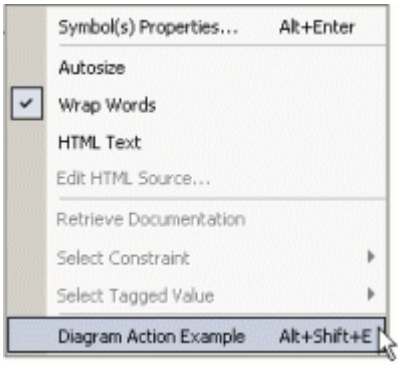
Main menu	
Main toolbar	
Diagram toolbar	
Browser context menu	

Diagram context menu	
Keyboard shortcuts	Action can not be represented in GUI. Create a new action and assign some keyboard shortcut for invoking it.

Creating a new action for MagicDraw

Step 1: Create new action class

All actions used in MagicDraw must be subclasses of MDAction class (see JavaDoc for more details).

The following MDAction subclasses that are used for basic purposes are already created in MagicDraw:

- **DefaultBrowserAction** – action class, used for browser action. Enables to access some browser tree and nodes. Recommended to use for performing some actions with the selected browser nodes.
- **DefaultDiagramAction** – action class for diagram action. Enables to access some diagram elements. Recommended to use when for performing some actions with the selected diagram elements.
- **PropertyAction** – action for changing some element or application property. Can be used for changing properties defined by user.

You must override at least actionPerformed() method and implement in it what this actions is going to do.

Example1: simple action

```
class SimpleAction extends MDAction
{
     public SimpleAction(String id, String name)
     {
           super(id, name, null, null);
     }

     /**
      * Shows message.
      */
     public void actionPerformed(ActionEvent e)
     {
           JOptionPane.showMessageDialog(Application.getInstance().
           getMainFrame().getDialogParent(), "This is:" + getName());
     }
}
```

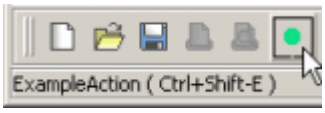
Example2: action for browser

```
public class BrowserAction extends DefaultBrowserAction
{

     /**
      * Creates action with name "ExampleAction"
      */
     public BrowserAction()
     {
           super("", "ExampleAction", null, null);
     }

     public void actionPerformed(ActionEvent e)
     {
           Tree tree = getTree();
           String text="Selected elements:";
           for (int i = 0; i < tree.getSelectedNodes().length; i++)
           {
                 Node node = tree.getSelectedNodes()[i];
                 Object userObject = node.getUserObject();
                 if (userObject instanceof BaseElement)
                 {
                       BaseElement element = (BaseElement) userObject;
                       text += "\n"+element.getHumanName();
                 }
           }

JOptionPane.showMessageDialog(MDDialogParentProvider.getProvider().getDialogParent
(), text);
     }
}
```

Step 2: Specify action properties

Property	Function
ID	ID is a unique String for identifying action. If action ID will be set to *null,* new ID will be generated. Action name can be used as ID. All MagicDraw default actions IDs are defined in ActionsID class (for more details, see JavaDoc). You can use these constants for accessing actions. Do not use it as new actions ID.
Name	Actions name will be visible in all GUI elements.
Shortcut and mnemonic	Every action can have assigned keyboard shortcut. Shortcuts can be customized from the **Environment Options** dialog box (see MagicDraw User Manual, Section “Environment Options”.) **NOTE** Action must have some ID (not null), in other case, shortcuts cannot be restored after restarting an application.
Icon	Every action can have a small and large icon. Small icon is described as javax.swing.Action.SMALL_ICON and can be used in menu items. Large icon is used in toolbar buttons. Action for toolbar must have a large icon, otherwise it will be displayed as a button with an action name.
Description	Action’s description will be shown as tool tip text.


```
// setting icon. Button with icon looks better than
// with text in toolbar.

action.setLargeIcon( new ImageIcon(
getClass().getResource("main_toolbar_icon.gif") ) );
```



Step 3: Describe enabling/disabling logic

There are two ways for controlling the updating of actions state:

1. **Add action to predefined actions group**.
   Actions can be added into one of predefined actions groups (see **Actions groups** below). All actions of one group will be disabled/enabled together.
   Conditions for groups enabling/disabling and status updating are predefined and cannot be changed.
   Example:

```
MDAction action = new MDAction("Example","Example",KeyEvent.VK_E,
      ActionsGroups.PROJECT_OPENED_RELATED);
```

2. **Implement updateState() method for action**.
   Here you may describe all conditions when an action must be enabled and when disabled.
   Example of updateState() method for some browser context menu action:

```
public void updateState()
{
      //action will be enabled only if there are some selected nodes.
      setEnabled(getTree().getSelectedNode() != null );
}
```

If action is not added to any group, **updateState()** method for all such actions will be invoked after executing any command and after closing/opening project or window.

When some actions need to refresh their state, all actions without group can be updated manually:

```
ActionsStateUpdater.updateActionsState();
```

Step 4: Configure actions

Every action must be added into some ActionsCategory.
ActionsCategory is a small group for actions. It can be represented as a separator or submenu (nested category).
Categories are added into ActionsManager which is some kind of actions container.
One ActionsManager represents one GUI element – menu bar, context menu, or toolbar.

Table below explains how MagicDraw classes maps into GUI elements.

	ActionsManager	**Category**	**Action**
Menu	Menu bar	Menu	Menu item
Toolbar	All toolbars	One toolbar	Button
Context Menu	Context menu	Submenu	Menu item

Actions in ActionsManagers are configured by many Configurators.
Configurator is responsible for adding or removing action into some strictly defined place and position between other actions.

There are three types of configurators:

- **AMConfigurator**
  The configurator for general purpose. Used for menus, toolbars, browser, and diagrams shortcuts.
- **BrowserContexAMConfigurator**
  Configurator for configuring managers for browser context (popup) menu. Can access browser tree and nodes.
- **DiagramContextAMConfigurator**
  This configurator for configuring context menus in a diagram.
  Can access diagram, selected diagram elements and element that requests context menu.

ActionsManagers for the main menu and all toolbars are created and configured once, so later actions can be only disabled but not removed.

Context menus are created on every invoking, so ActionsManagers are created and configured every time and actions can be added or removed every time.

Example 1: add some action into browser's context menu

```
final DefaultBrowserAction browserAction = …
```

```
BrowserContextAMConfigurator brCfg = new BrowserContextAMConfigurator()
{

     // implement configuration.
     // Add or remove some actions in ActionsManager.
     // tree is passed as argument, provides ability to access nodes.
     public void configure(ActionsManager mngr, Tree browser)
     {
           // actions must be added into some category.
           // so create the new one, or add action into existing category.
           MDActionsCategory category = new MDActionsCategory("", "");
           category.addAction(browserAction);

           // add category into manager.
           // Category isn't displayed in context menu.
           mngr.addCategory(category);
}
     /**
      * Returns priority of this configurator.
      * All configurators are sorted by priority before configuration.
      * This is very important if one configurator expects actions from
      * other configurators.
      * In such case configurator must have lower priority than others.
      * @return priority of this configurator.
      * @see AMConfigurator.HIGH_PRIORITY
      * @see AMConfigurator.MEDIUM_PRIORITY
      * @see AMConfigurator.LOW_PRIORITY
      */
     public int getPriority()
     {
           return AMConfigurator.MEDIUM_PRIORITY;
     }
};
```

Example 2: add some action into main menu, after creating a new project

```
// create some action.
final MDAction someAction = …

AMConfigurator conf = new AMConfigurator()
{
     public void configure(ActionsManager mngr)
     {
           // searching for action after which insert should be done.
           NMAction found= mngr.getActionFor(ActionsID.NEW_PROJECT);

           // action found, inserting
           if( found != null )
           {
                 // find category of "New Project" action.
                 ActionsCategory category =
                       (ActionsCategory)mngr.getActionParent(found);


                 // get all actions from this category (menu).
                 List actionsInCategory = category.getActions();

                 //add action after "New Project" action.
                 int indexOfFound = actionsInCategory.indexOf(found);
                 actionsInCategory.add(indexOfFound+1, someAction);

                 // set all actions.
                 category.setActions(actionsInCategory);
           }
     }

     public int getPriority()
```

```
        {
                return AMConfigurator.MEDIUM_PRIORITY;
        }
}
```

Step 5: Register configurator

All configurators are registered in ActionsConfiguratorManager.
ActionsConfiguratorsManager enables to add or remove many configurators to every MagicDraw predefined configuration (see **Predefined actions configurations** table below.)

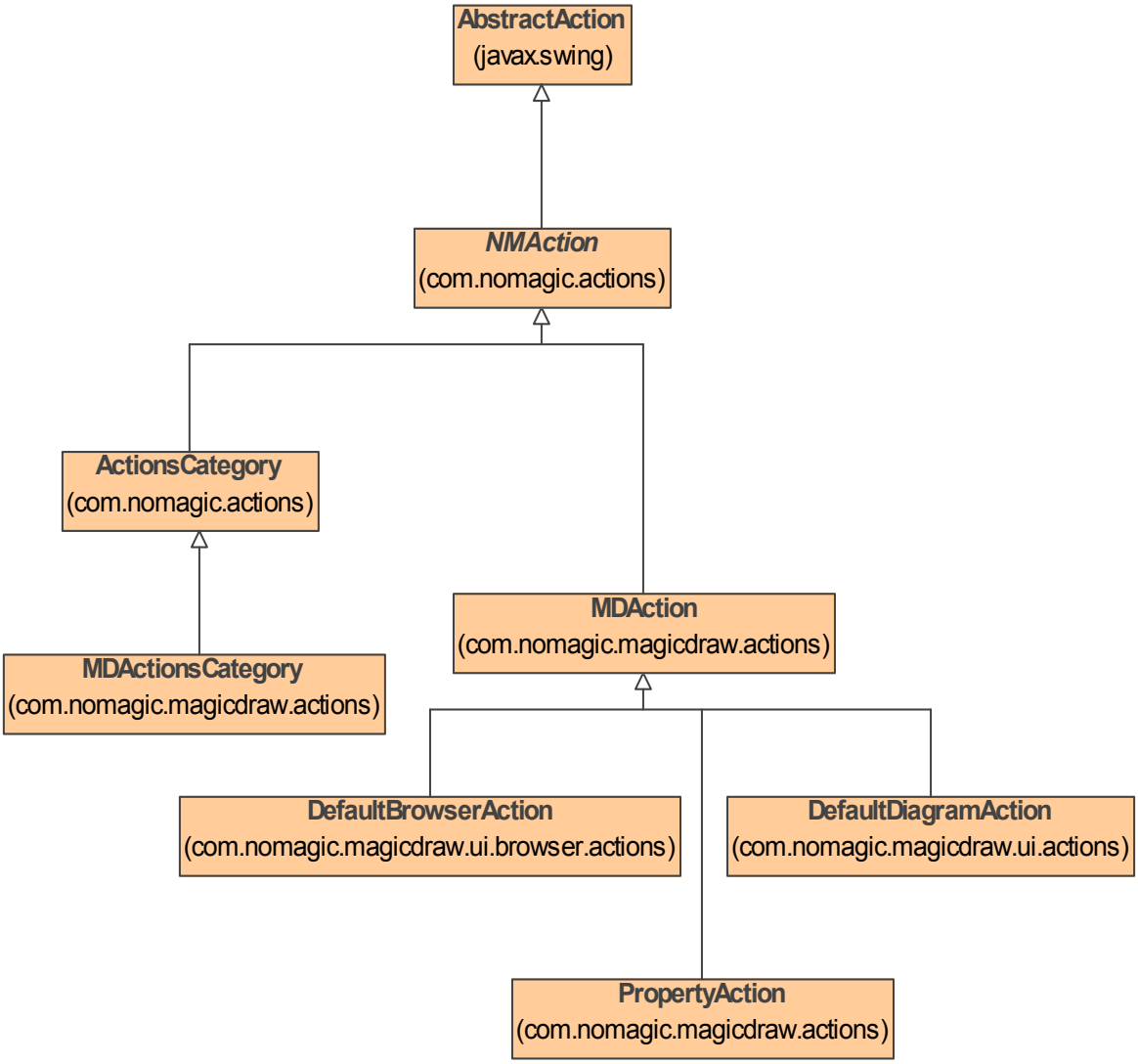
All available configurations are accessible in such a way:

```
ActionsConfiguratorsManager.getInstance().
add<configuration_name>Configurator(configurator);
```

Example: Add new configurator for CONTAINMENT_BROWSER_CONTEXT configuration.

```
//see examples above, how to create configurator for browser actions.
//add configurator into ActionsConfiguratorsManager.
ActionsConfiguratorsManager.getInstance().
addContainmentBrowserContextConfigurator(brCfg);
```

Actions hierarchy



Predefined actions configurations

MAIN_MENU
MAIN_TOOLBAR
MAIN_SHORTCUTS
CUSTOMIZABLE_SHORTCUTS
CONTAINMENT_BROWSER_CONTEXT
CONTAINMENT_BROWSER_SHORTCUTS
CONTAINMENT_BROWSER_TOOLBAR
INHERITANCE_BROWSER_CONTEXT
INHERITANCE_BROWSER_SHORTCUTS
INHERITANCE_BROWSER_TOOLBAR
DIAGRAMS_BROWSER_SHORTCUTS
DIAGRAMS_BROWSER_TOOLBAR
EXTENSIONS_BROWSER_CONTEXT
EXTENSIONS_BROWSER_SHORTCUTS
EXTENSIONS_BROWSER_TOOLBAR
SEARCH_BROWSER_CONTEXT
SEARCH_BROWSER_SHORTCUTS
SEARCH_BROWSER_TOOLBAR

NEW! Selecting elements via element Selection dialog

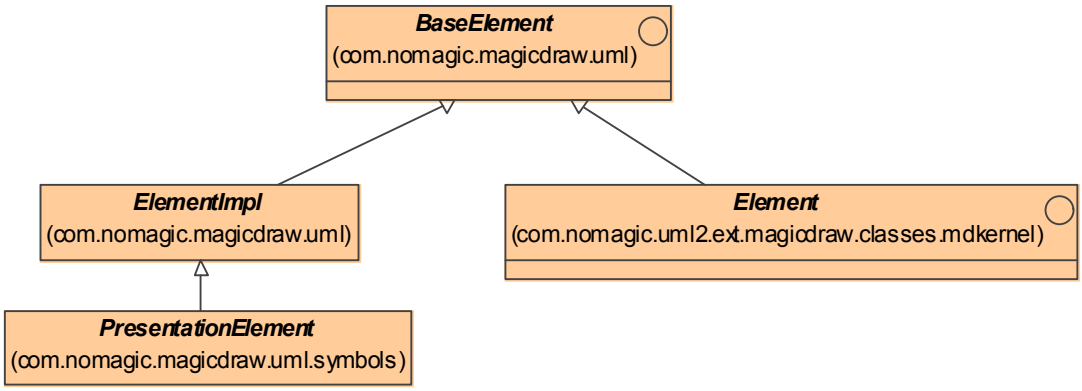
```
// Use ElementSelectionDlgFactory.create(...) methods to create element selection
dialog.
Frame dialogParent = MDDialogParentProvider.getProvider().getDialogParent();
ElementSelectionDlg dlg = ElementSelectionDlgFactory.create(dialogParent);

// Use ElementSelectionDlgFactory.initSingle(...) methods to initialize the dialog
with single element selection mode.
ElementSelectionDlgFactory.initSingle(....);

// Use ElementSelectionDlgFactory.initMultiple(...) methods to initialize the
dialog with multiple element selection mode.
ElementSelectionDlgFactory.initMultiple(....);

// Display dialog for the user to select elements.
dlg.show();

// Check if the user has clicked "Ok".
if (dlg.isOkClicked())
{
     // Get selected element in single selection mode.
     BaseElement selected = dlg.getSelectedElement();

     // Get selected elements in multiple selection mode.
     BaseElement selected = dlg.getSelectedElements();
}
```

UML MODEL

MagicDraw UML model is an implementation of OMG UML 2.4.1 metamodel. We do not provide very detail description of all UML metamodel elements and their properties in this documentation or javadoc. You can find all this information in UML 2.4.1 superstructure specification on the Object Management Group official Web site at http://www.omg.org/spec/UML/.

You should use UML model interfaces from package com.nomagic.uml2.ext.magicdraw.**

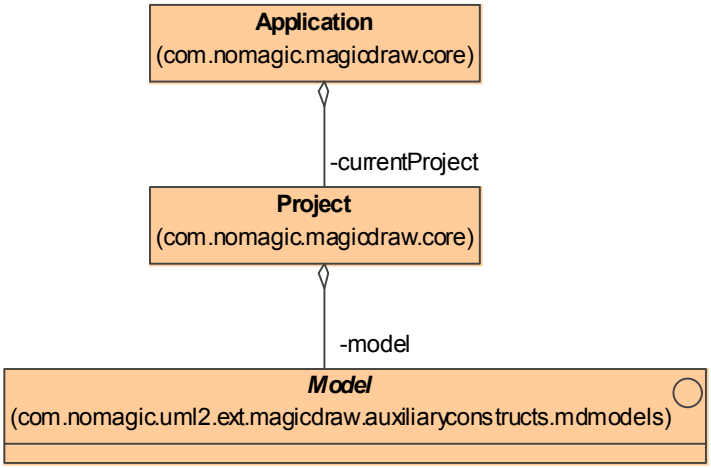
The base interface of all model classes is Element, implements BaseElement inteface.



All structure, derived from Element you can see in OMG-UML2.3 Superstructure Specification.

All attributes described in UML specification are implemented and accessible through setters and getters.

Project



Project represents main storage of all project data like: main Package (Model) and all diagrams.

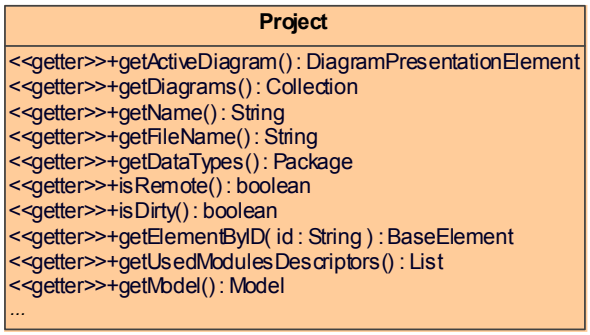
Multiple projects can be opened at the same time.

Active (current) project can be accessible in the following way:

```
Project project = Application.getInstance().getProject();
```

Also Project is accessible for any other Element:

```
Project project = Project.getProject(element);
```



Project keeps references to root Model, also has references to all diagrams.

Root Model

The whole model of one project is contained in a Model instance, accessible in the following way:

```
Model root = Application.getInstance().getProject().getModel();
```

Accessing Model Element properties

Model element properties can be accessed with simple setters, getters:

```
com.nomagic.uml2.ext.magicdraw.classes.mdkernel.NamedElement el = …;
String name = el.getName();
el.setName("new name");
```

Container properties

MagicDraw uses composite structure of the model.

Every model element is a container and contains its own children and knows about its own parent.

Model element parent can be accessed with Element.getOwner() method. Owned children can be received with method Element.getOwnedElement()

Different types of children are stored in separate container properties.

You can access these container properties by names that are described in UML specification.

Method getOwnedElement() collects all children from all inner container properties.

Container properties modification and iteration is straightforward using java.util.Collection interface.

Property change events are fired automatically when container properties are modified.

Containers implement subsets and unions constraints from UML metamodel specification. This explains how modification of one container can affect other containers. Make sure you understand subsets and unions in UML metamodel.

Some containers are read-only. This is true for all DERIVED UML metamodel properties. For example Element.getOwnedElement() is read-only. If you want to add some inner Element you need to add it into subset of ownedElement - for example for Package.getOwnedPackageMember().

It is enough to set one UML meta-association property value and opposite property will be set too. For example, Class adding into Package can be done in two ways:

```
Class myclass = …;
Package myPackage …;
myClass.setOwner(myPackage);
```

or

```
myPackage.getOwnedPackageMember().add(myClass);
```

Accessing elements in container properties

Example: retrieving child model elements.

```
Element el = …;
if (el.hasOwnedElement())
{
     for (Iterator it = el.getOwnedElement().iterator(); it.hasNext();)
     {
           Element ownedElement = (Element) it.next();

     }
}
```

NOTE: *get<property name>()* method call for empty container property instantiates empty collection. This leads to increased memory usage.

So before iterating check if container property is not empty with method has *<property name>()*.

Adding elements into container

```
modelElement.get<SomeContainer>().add(child);

modelElement.get<SomeContainer>().remove(child);
```

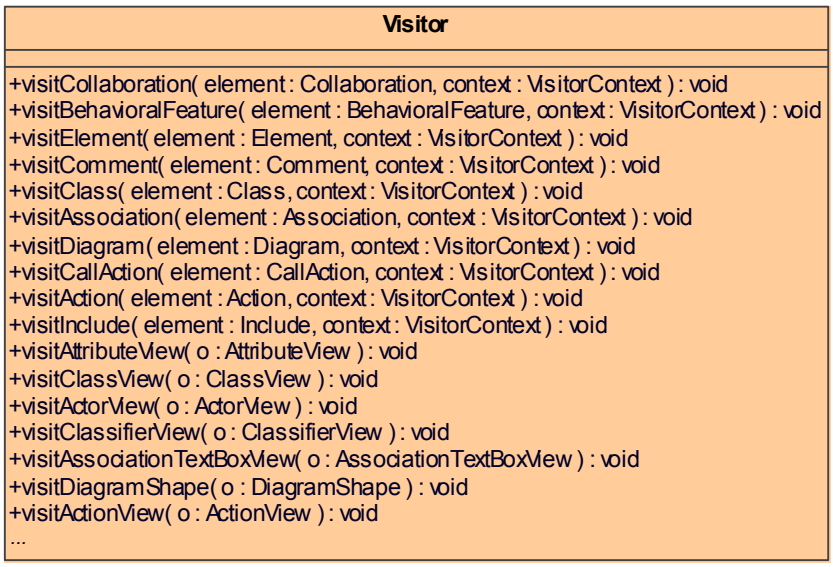
Collecting all children from all hierarchy levels

Here is an example of how to collect all children from Element and avoid recursion, using simple *for* cycle:

```
ArrayList children = new ArrayList();
Element current = …
children.add(current);

// if current element has children, list will be increased.
for (int i = 0; i < children.size(); i++)
{
     current = (Element) children.get(i);

      // add all children into end of this list, so it emulates recursion.
       children.addAll(current.getOwnedElement());
 }
```

Visitors

Every Element has accept() method for visiting it in Visitors (for more details about this mechanism, see Visitor pattern.)



Visitor has *visit..* method for all types of model elements and presentation elements.

This is very useful when you are working with large collection of ModelElements and need to perform actions, specific for every type of Element (for example save/load, copy/paste, or specific properties setting).

Just derive your class from InheritanceVisitor and override some *visit..* methods.

Example of how to visit a group of ModelElements:

```
Visitor myVisitor = new Visitor()
{
     // override some visit methods ...
};

Model root = Application.getInstance().getProject().getModel();
Iterator it = root.getOwnedElement().iterator();
while (it.hasNext())
{
     ((Element)it.next()).accept(myVisitor);
}
```

InheritanceVisitor

InheritanceVisitor is an enhanced implementation of Visitor pattern and a subclass of Visitor, used for visiting model elements and presentation elements.

Every *visit..* method calls *visit..* method for super type.

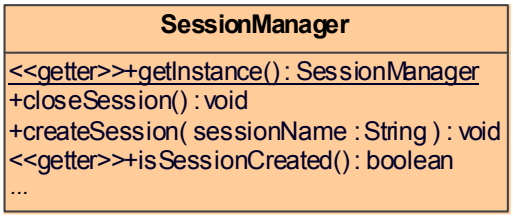
For example you can put some code into *visitClassifier()* and it will be executed for all subclasses of a Classifier.

Model elements *visit…* methods has additional context parameter of type VisitorContext. Visitor context is used to track what super type *visit…* methods were already visited (to avoid, multiple visits because some model ele-

ments have multiple inheritance). Open API users should not work with visitor context. All tracking is done in InheritanceVisitor and Visitor classes.

Changing UML model

SessionManager



SessionManager is the singleton manager used for editing model Elements.

All modifications to model elements should be performed between createSession(sessionName) and closeSession() method calls.

To edit some Element, a session with this manager must be created.

After editing model element, a session must be closed. After that all changes will be applied to the model and registered in command history (for undo/redo) as one command with a session name.

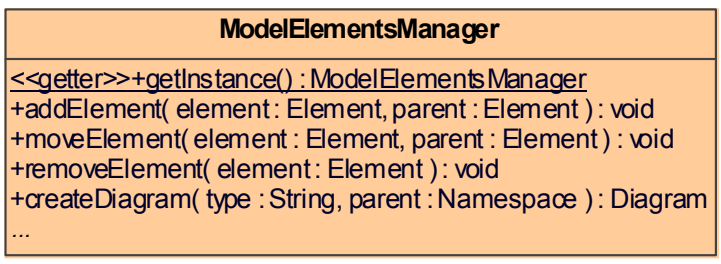
Only one session can be active.

The following code can be used for accessing, checking and creating the session:

```
// access singleton instance by using getInstance()
// only one session can be active, so check this.
if (!SessionManager.getInstance().isSessionCreated())
{
     // create new session.
     SessionManager.getInstance().createSession();
}
```

If other session is already created and not closed, *createSession* method throws *IllegalStateException* runtime exception.

ModelElementsManager



ModelElementsManager is the singleton utility class for adding and removing *model* or moving them to other parents.

Also it helps to create different types of diagrams.

This manager can be used only if some session was created with SessionManager.

ModelElementsManager performs additional checks before modification if element is not read only. Also check if element can be added to parent is performed. If ModelElementsManager is not used programmer must perform these checks in code explicitly.

Creating new model element

For creation of model element instances use ElementsFactory class.

create<model element type>Instance() method creates new model element instance.

To create model element, a session with SessionManager must be created.

All changes in UML model be registered and on session closing will be added into command history.

```
// creating new session
SessionManager.getInstance().createSession("Edit package A");

ElementsFactory f = Application.getInstance().getProject().getElementsFactory();

Package packageA = f.createPackageInstance();
…
// apply changes and add command into command history.
SessionManager.getInstance().closeSession();
```

Editing model element

To edit some ModelElement, a session with SessionManager must be created.

All changes in UML model will be registered and on session closing will be added into command history.

```
// creating new session
SessionManager.getInstance().createSession("Edit class A");

if (classA.isEditable())
{
     classA.setName(newName);
}
...

// apply changes and add command into command history.
SessionManager.getInstance().closeSession();
```

It is programmer responsibility to ensure that modified model element is not read only. To check if model element is read only use Element.isEditable() method.

Adding new model element or moving it to another parent

For adding new model Element into a model, use *addModelElement(child, parent)* method provided by ModelElementsManager.

This manager can be used only if some session was created with SessionManager

```
ElementsFactory f = Application.getInstance().getProject().getElementsFactory();

Class classA = f.createClassInstance();
```

```
// create new session
SessionManager.getInstance().createSession("Add class into package");
try
{
     // add class into package
     ModelElementsManager.getInstance().addElement(classA, package);
}
catch (ReadOnlyElementException e)
{
}

// apply changes and add command into command history.
SessionManager.getInstance().closeSession();
```

If given model element cannot be added into a given parent, *IllegalArgumentException* is thrown.

For example *Operation* cannot be added into Package or *Operation* cannot be added into not locked for editing *Class* (in the teamwork project).

If element or parent is null, *IllegalArgumentException* also is thrown.

If given element is not editable (read-only), *ReadOnlyElementException* is thrown.

Alternative way to add new model element without using ModelElementsManager:

```
Element parent = …;
ElementsFactory f = Application.getInstance().getProject().getElementsFactory();

Class classA = f.createClassInstance();

// create new session
SessionManager.getInstance().createSession("Add class into parent");
if (parent.canAdd(classA))
{
     classA.setOwner(parent);
}

// apply changes and add command into command history.
SessionManager.getInstance().closeSession();
```

Removing model element

```
Class classA = …;

// create new session
SessionManager.getInstance().createSession("Remove class");
try
{
     // remove class
     ModelElementsManager.getInstance().removeElement(classA);
}
catch (ReadOnlyElementException e)
{
}

// apply changes and add command into command history.
SessionManager.getInstance().closeSession();
```

Alternative way to remove model element without using ModelElementsManager:

```
Class classA = …;

// create new session
```

```
SessionManager.getInstance().createSession("Remove class");
if (classA.isEditable()))
{
     classA.dispose();
}

// apply changes and add command into command history.
SessionManager.getInstance().closeSession();
```

NEW! Refactoring model elements

To refactor an element in a model, use the Refactoring class.

Example 1: Converting an element to an interface

```
Element elementToConvert = ...;
SessionManager sessionManager = SessionManager.getInstance();
sessionManager.createSession("Convert");

// Converts the element to an interface.
ConvertElementInfo info = new ConvertElementInfo(Interface.class);

// Preserves the old element ID for the new element.
info.setPreserveElementID(true);

Element conversionTarget = Refactoring.Converting.convert(elementToConvert, info);

sessionManager.closeSession();
```

Example 2: Replacing an element with another element

```
Element elementToReplace = ...;

SessionManager sessionManager = SessionManager.getInstance();
sessionManager.createSession("Replace");

ConvertElementInfo info = new ConvertElementInfo(elementToReplace.getClassType());
info.setConvertOnlyIncomingReferences(true);

Refactoring.Replacing.replace(element, elementToReplace, info);

sessionManager.closeSession();
```

Creating Diagram

Example how to create and add to parent element:

```
Project project = Application.getInstance().getProject();
Namespace parent = project.getModel();

// create new session
SessionManager.getInstance().createSession("Create and add diagram");

try
{
     //class diagram is created and added to parent model element
     Diagram diagram = ModelElementsManager.getInstance().
createDiagram(DiagramTypeConstants.UML_CLASS_DIAGRAM, parent);

     //open diagram
     project.getDiagram(diagram).open();
}
catch (ReadOnlyElementException e)
{
}
```

```
// apply changes and add command into command history.
SessionManager.getInstance().closeSession();
```

Creating new Relationship object

Model element is relationship if it implements one of the following interfaces: Relationship, ActivityEdge, Transition, ExceptionHandler, Connector.

For checking if model element is relationship call ModelHelper.isRelationship(element) method.

For getting supplier and client elements of relationship use ModelHelper.getSupplierElement(), ModelHelper.getClientElement() methods.

Use ModelHelper.setSupplierElement(), ModelHelper.setClientElement() methods to set supplier and client elements of relationship.

Steps to create a new Relationship

1. Create a new relationship model element.
2. Set client and supplier ModelElements by using ModelHelper.setSupplierElement(), ModelHelper.setClientElement() methods.
3. Add new relationship into some parent by using ModelElementsManager.addElement().

NEW! Copying elements and symbols

You can copy model elements and symbols either to another location in the same project or to another project. This must be done in the same session.

There are two modes of making copies:

- Deep copying (with new data)
- Shallow copying (with reused data)

Example 1: Copying an element

```
Element element = ...; // Element to copy/paste.
Element parent = ...;  // Parent to which the element has to be pasted: either the
same project or another project.

SessionManager sessionManager = SessionManager.getInstance();
sessionManager.createSession("Clone");

// 3rd parameter indicates whether element name uniqueness should be preserved in
the parent.
CopyPasting.copyPasteElement(element, parent, true);

sessionManager.closeSession();
```

Example 2: Copying multiple elements and symbols

```
List elements = ...; // Elements to copy/paste.
List views = ...; // Symbols to copy/paste.
Element parent = ...;  // Parent to which elements should be pasted: either the same
project or another project.

BaseElement symbolParent = ...; // Parent to which symbols should be pasted.

SessionManager sessionManager = SessionManager.getInstance();
sessionManager.createSession("Clone");
```

```
// 4th parameter indicates whether deep or shallow copy is applied.
// 5th parameter indicates whether element name uniqueness should be preserved in
the parent.
List baseElements = CopyPasting.copyPasteElements(views, parent, symbolParent,
true, true);

sessionManager.closeSession();
```

Working with Stereotypes and Tagged Values

UML metamodel implementation itself does not provide a way to assign stereotypes and tags directly to Elements. UML metamodel implementation in MagicDraw provides pretty complex mapping - every UML Element can have an Instance of assigned Stereotypes. It is stored as Element.appliedStereotypeInstance property. Slots of this instance are TaggedValues.

We provide a helper class StereotypesHelper for hiding this mapping complexity . It has set of useful methods for assigning, unassigning stereotypes and creating TaggedValues. Keep in mind that TaggedValues in this helper class are called Slots.

StereotypesHelper hase a lot methods for working with stereotypes.

Example: Creating stereotype, applying to element and then setting tag

```
ElementsFactory elementsFactory = project.getElementsFactory();

// create profile
Profile profile = elementsFactory.createProfileInstance();
profile.setName("myProfile");
ModelElementsManager.getInstance().addElement(profile, project.getModel());

// get metaclass "Class"
com.nomagic.uml2.ext.magicdraw.classes.mdkernel.Class metaClass =
                    StereotypesHelper.getMetaClassByName(project, "Class");

// create stereotype, stereotypes will be applicable to classes
Stereotype stereotype = StereotypesHelper.createStereotype(profile,
                                  "myStereotype", Arrays.asList(metaClass));

// create tag definition
Property property = elementsFactory.createPropertyInstance();
ModelElementsManager.getInstance().addElement(property, stereotype);
// tag name
property.setName("myTag");
// tag type is String
Classifier typeString = ModelHelper.findDataTypeFor(project, "String");
property.setType(typeString);

if (StereotypesHelper.canApplyStereotype(element, stereotype))
{
    // apply stereotype
    StereotypesHelper.addStereotype(element, stereotype);
    // set tag value
    StereotypesHelper.setStereotypePropertyValue(element, stereotype,
                                                  "myTag", "myTagValue");
}
```

Example: Retrieving tag values

```
// find profile
```

```
Profile profile = StereotypesHelper.getProfile(project, "myProfile");
// find stereotype
Stereotype stereotype = StereotypesHelper.getStereotype(project,
                                                "myStereotype", profile);
// get stereotyped elements
List stereotypedElements =
                    StereotypesHelper.getExtendedElements(stereotype);
for (int i = stereotypedElements.size() - 1; i >= 0; --i)
{
    // stereotyped element
    Element element = (Element) stereotypedElements.get(i);
    if (stereotype.hasOwnedAttribute())
    {
        // get tags - stereotype attributes
        List<Property> attributes = stereotype.getOwnedAttribute();
        for (int j = 0; j < attributes.size(); ++j)
        {
            Property tagDef = attributes.get(j);
            // get tag value
            List value = StereotypesHelper.getStereotypePropertyValue(
                                element, stereotype, tagDef.getName());
            for (int k = 0; k < value.size(); ++k)
            {
                // tag value
                Object tagValue = (Object) value.get(j);
            }
        }
    }
}
```

For more information, see javadoc of StereotypesHelper class.

Hyperlinks

Hyperlinks are implemented using stereotypes and tag values. Stereotype "HyperlinkOwner" and the following its properties (tags):

- hyperlinkText - all simple hyperlinks
- hyperlinkTextActive - active simple hyperlink
- hyperlinkModel - all hyperlinks to model element
- hyperlinkModelActive - active hyperlink to model element

Example: Retrieving hyperlinks

```
// get stereotype
Stereotype stereotype = StereotypesHelper.getStereotype(
                              Project.getProject(element), "HyperlinkOwner");
// get hyperlinked elements
List modelValues = StereotypesHelper.getStereotypePropertyValue(element,
                                                  stereotype, "hyperlinkModel");
for (int i = modelValues.size() - 1; i >= 0; --i)
{
    Element linkedElement = (Element) modelValues.get(i);
}

// active hyperlink
Object activeLinkedElement = StereotypesHelper.getStereotypePropertyFirst(
                                element, stereotype, "hyperlinkModelActive");

// get hyperlinked elements
List textValues = StereotypesHelper.getStereotypePropertyValue(element,
                                                    stereotype, "hyperlinkText");
for (int i = textValues.size() - 1; i >= 0; --i)
```

```
{
    String link = (String) textValues.get(i);
}

// active hyperlink
Object activeLink = StereotypesHelper.getStereotypePropertyFirst(element,
                                        stereotype, "hyperlinkTextActive");
```

Example: Setting hyperlinks

```
Project project = Project.getProject(element);

// get stereotype
Stereotype stereotype = StereotypesHelper.getStereotype(project,
                                                        "HyperlinkOwner");
// apply stereotype
StereotypesHelper.addStereotype(element, stereotype);

// add hyperlinks
StereotypesHelper.setStereotypePropertyValue(element, stereotype,
                                     "hyperlinkModel", linkedElement, true);
StereotypesHelper.setStereotypePropertyValue(element, stereotype,
                                "hyperlinkModel", activeLinkedElement, true);
String activeHttpLink = "http://www.magicdraw.com";
StereotypesHelper.setStereotypePropertyValue(element, stereotype,
                            "hyperlinkText", "http://www.nomagic.com", true);
StereotypesHelper.setStereotypePropertyValue(element, stereotype,
                                     "hyperlinkText", activeHttpLink, true);

// add active hyperlink - only one hyperlink can be active
if (modelActive)
{
    StereotypesHelper.setStereotypePropertyValue(element, stereotype,
                        "hyperlinkModelActive", activeLinkedElement, false);
}
else
{
    StereotypesHelper.setStereotypePropertyValue(element, stereotype,
                              "hyperlinkTextActive", activeHttpLink, false);
}
```

PRESENTATION ELEMENTS

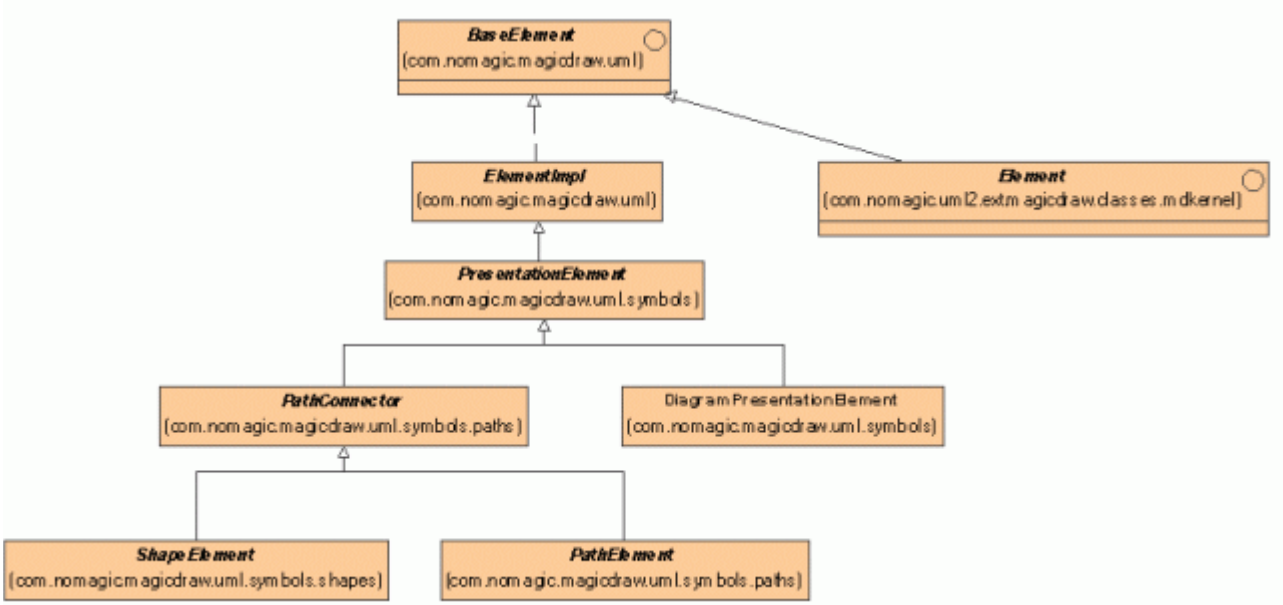
Presentation Element

UML semantic defines only UML metamodel. MagicDraw application has its own structure of classes for UML elements representation in the diagram. Base class of this structure is **PresentationElement**.

A presentation element is a textual or graphical presentation of one or more model elements.

In the metamodel, a PresentationElement is the BaseElement that presents a set of model elements to a user. It is the base for all metaclasses used for presentation. All other metaclasses with this purpose are indirect subclasses of PresentationElement.

Current version of MagicDraw Open API provides just a basic structure of presentation elements.



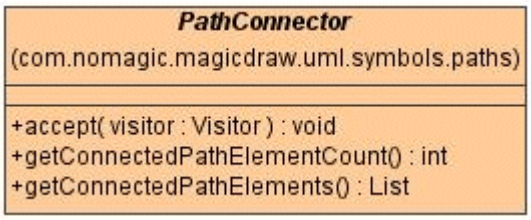
Every presentation element can have children. For example DiagramPresentationElement has a collection of inner presentation elements. PresentationElement of some Package can have a collection of presentation elements for inner Package elements.

Use PresentationElementsManager to create/modify/delete inner presentation elements of the diagram.

Current version PresentationElement API allows you to:

- Access element bounds *PresentationElement.getBounds* method).
- Access children of the element (*PresentationElement.getPresentationElements* method).
- Access properties of the element (*PresentationElement.getProperty* and *PresentationElement.getPropertyManager* methods). The sample of properties would be **Suppress Operations** property for class presentation element, **Autosize** property for any ShapeElement.
- Access model Element of presentation element (*PresentationElement.getElement* method). Presentation element can have no ModelElement, for example TextBox.

- Select/unselect or access selection state of the presentation element.



A subclass of presentation elements PathConnector provides information about connected paths to the presentation element. To get a collection of connected paths to the presentation element, use method *PathConnector.getConnectedPathElements()*.

Using set and sSet

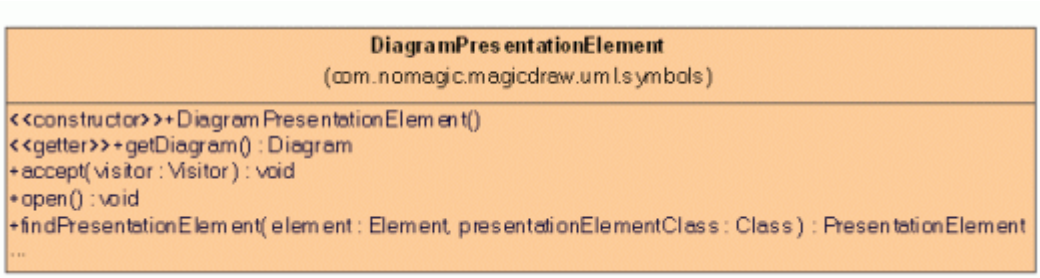
There are two types of setters for **PresentationElement** properties:

1. *set…* setters set some value and fire *PropertyChangeEvent*.Use *set…* only if you need that **PresentationElement** of this data in diagrams must be updated immediately.
2. Setters with *sSet…* name are "simple setters" used for silent property changing. Use "simple setters" when you edit a group of properties. All changes will be applied and dependent elements will be notified on session close.

The same rules are for *add, sAddPresentationElement* and *remove*, *sRemovePresentationElement* accessories. The same naming rules are used in all MagicDraw.

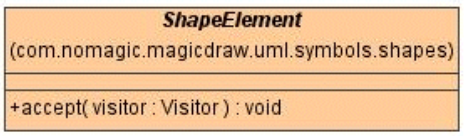
Diagram Presentation Element

The purpose of this presentation element is to encapsulate all other presentation elements used in some Diagram.



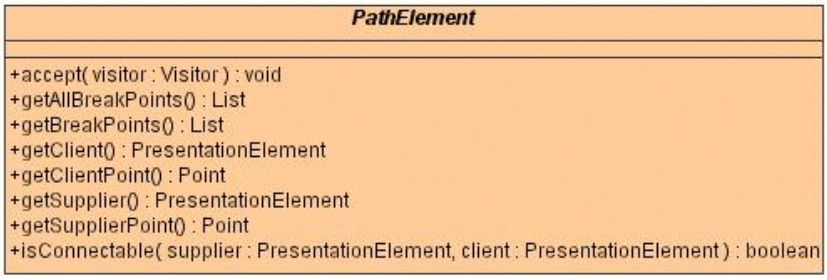
- To get a collection of inner presentation elements, use PresentationElement.getPresentationElements method. This method will return only direct children of the diagram.
- To open a diagram in the MagicDraw UI, call *DiagramPresentationElement.open*.
- To create/modify/delete inner presentation elements of the diagram, use *PresentationElementsManager*.
- To layout diagram, use: *DiagramPresentationElement.layout*
  NOTE: make sure diagram is opened before doing layout.

Shapes



Shapes are presentation elements created for such model elements as classes, packages, models, subsystems and others.

Paths



Paths are presentation elements created for such model elements as Relationships.

Path has the following attributes:

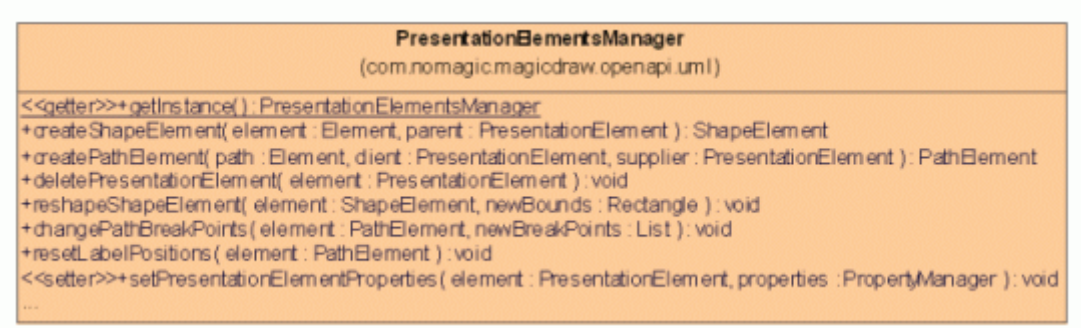
- **Supplier** – the presentation element of Relationship supplier. Use method *PathElement.getSupplier* to access this element.
- **Client** – the presentation element of Relationship client. Use method *PathElement.getClient* to access this element.
- **Supplier point** - the connection point of path and supplier element. Use method *PathElement.getSupplierPoint* to access this point.
- **Client point** – the connection point of path and client element. Use method *PathElement.getClientPoint* to access this point.
- **Break points** – a list of path breaking points between supplier and client points. This list can be empty if path is straight. Use method *PathElement.getBreakPoints* to access this list.

Presentation Elements Manager

Presentation elements' classes provides just getters for properties. You need to use PresentationElementsManager if you want to change the properties/attributes of the presentation element. The same manager is used for creating presentation elements and adding them into diagrams.

PresentationElementsManager can be used only inside the created session with SessionsManager. If session is not created, IllegalStateExceptions is thrown.

PresentationElementsManager can be used only in already loaded and active project. In other cases, results can be unpredictable.



PresentationElementsManager is implemented as a singleton. Use method PresentationElementsManager.getInstance to get a shared instance of this manager.

Creating shape element

To create a ShapeElement for given ModelElement in the given DiagramPresentationElement, use method *PresentationElementsManager.createShapeElement*. The location of the created shape will be (0,0).

The following code snippet shows how to do this:

```
com.nomagic.uml2.ext.magicdraw.classes.mdkernel.Class clazz =  …;
DiagramPresentationElement diagram = …;
SessionManager.getInstance().createSession("Test");
ShapeElement shape =
PresentationsElementsManager.getInstance().createShapeElement(clazz, diagram);
SessionManager.getInstance().closeSession();
```

Creating path element

To create a PathElement for given ModelLink between given client and supplier elements, use method *PresentationElementsManager.createPathElement*:

```
com.nomagic.uml2.ext.magicdraw.classes.mddependencies.Dependency link =  …;
PresentationElement clientPE = …;
PresentationElement supplierPE = …;
SessionManager.getInstance().createSession("Test");
PathElement path =
PresentationsElementsManager.getInstance().createPathElement(link, clientPE,
supplierPE);
SessionManager.getInstance().closeSession();
```

The diagram is not passed into *createPathElement* method. A new path element is created in the same diagram as client or supplier presentation elements.

Reshaping shape element

To change bounds for the existing ShapeElement, use method *PresentationElementsManager.reshapeShapeElement*:

```
ShapeElement element =  …;
Rectangle newBounds = new Rectangle(100,100,80,50);
SessionsManager.getInstance().createSession(“Test”);
```

```
PresentationsElementsManager.getInstance().reshapeShapeElement(element,
newBounds);
SessionsManager.getInstance().closeSession();
```

Every shape element has a preferred size. Shape size cannot be smaller than the preferred size. If you will try to set smaller bounds, these bounds will be increased to the preferred size.

If shape has **Autosize** property set to TRUE, bounds will be reduced to the preferred size.

Changing path break points

To change a break points list for the given path element, use method *PresentationElementsManager.changeBreakPoints*. The same method must be used if you want to change client or supplier connection point.

The following code snippet shows how to do this:

```
PathElement element =  …;
ArrayList points = new ArrayList();
points.add(new Point(100, 100));
points.add(new Point(100, 150));
SessionsManager.getInstance().createSession("Test");
PresentationsElementsManager.getInstance().changePathBreakPoints(element, points);
SessionsManager.getInstance().closeSession();
```

The order of points in the list must be from the supplier to client connection point. The list may or may not include the client and supplier connection points.

At first the given points list will be adopted for the current path style (Rectilinear, Bezier. or Oblique) and only then applied for the path.

Deleting presentation element

To remove the given PresentationElement from the diagram, use method *PresentationElementsManager.deletePresentationElement*:

```
PresentationElement element =  …;
SessionsManager.getInstance().createSession("Test");
PresentationsElementsManager.getInstance().removePresentationElement(element);
SessionsManager.getInstance().closeSession();
```

All related presentation elements - all children and connected paths - will be removed too.

Changing properties of presentation element

Most of presentation elements can have properties (for example **Autosize** for shapes or **Path Style** for paths).

- To check if element has some properties (or uses properties from its parent), use method *PresentationElement.useParentProperties*.
- To get all properties of this element, use method *PresentationElement.getPropertyManager*.
- To get property of this element with given ID, use method *PresentationElement.getProperty*.
- To change element properties, use method *PresentationElementsManager.setPresentationElementProperties*. The given PropertyManager can have only few element's properties (for example just properties you want to change).

The following code snippet shows how to change element properties:

```
ShapeElement element =  …;
PropertyManager  properties = new PropertyManager();
properties.addProperty(new BooleanProperty(PropertyID.AUTOSIZE, true));
SessionsManager.getInstance().createSession("Test");
PresentationsElementsManager.getInstance().setPresentationElementProperties(elemen
t, properties);
SessionsManager.getInstance().closeSession();
```

The properties must be new instances. You cannot do something like this:

```
ShapeElement element =  …;
PropertyManager  properties = element.getPropertyManager().
properties.getProperty(PropertyID.AUTOSIZE).setValue(new Boolean(true);
SessionsManager.getInstance().createSession("Test");
PresentationsElementsManager.getInstance().setPresentationElementProperties(elemen
t, properties);
SessionsManager.getInstance().closeSession();
```

The Ids of all used properties are defined in class PropertyID.

Notification of Presentation Element draw

SymbolDrawNotification notifies when presentation element is drawn (added to diagram):

```
// element removal listener
final PropertyChangeListener removeListener = new PropertyChangeListener()
{
    public void propertyChange(PropertyChangeEvent evt)
    {
        if (ExtendedPropertyNames.REMOVE.equals(evt.getPropertyName()))
        {
            // symbol removed
        }
    }
};

// element drawing listener
SymbolDrawListener symbolDrawListener = new SymbolDrawListener()
{
    public void symbolAdded(DiagramPresentationElement diagram,
                            PresentationElement symbol,
                            String actionID)
    {
        // sybmbol added
        // register listener
        symbol.addPropertyChangeListener(removeListener);
    }
};

// register draw listener
SymbolDrawNotification symbolDrawNotification =
                    SymbolDrawNotification.getSymbolDrawNotification(project);
symbolDrawNotification.addSymbolDrawListener(symbolDrawListener);
```

NEW! Displaying Related Symbols

MagicDraw allows displaying symbols that are related to a given symbol via relationships. The DisplayRelatedSymbols class provides API methods for this. Using this class you can control any of the following behaviors for displaying related symbols logic:

- What relationship types should be included.
- Depth of a relationship tree.
- Whether or not existing symbols should be reused.

Example: Displaying related generalizations and interface realizations

```
SessionManager sessionManager = SessionManager.getInstance();
sessionManager.createSession("Display related");

Set linkTypes = new HashSet();
linkTypes.add(new LinkType(Generalization.class));
linkTypes.add(new LinkType(InterfaceRealization.class));

DisplayRelatedSymbolsInfo info = new DisplayRelatedSymbolsInfo(linkTypes);
info.setDepthLimited(true);
info.setDepthLimit(3);

PresentationElement view = ...; // A symbol for which you need to invoke the
displaying related symbols action.

DisplayRelatedSymbols.displayRelatedSymbols(view, info);

sessionManager.closeSession();
```

SYMBOLS RENDERING

The custom symbol rendering API allows modifying the default symbol view. This API includes:

1. Renderer provider API, which allows to provide a custom renderer for the specific symbol.
2. Renderers, which can modify the default symbol appearance.

In this chapter, we will review, how to register the specific symbol views provider and give the example covering the custom renderers for the package, slots, and dependency link symbols.

TIP!	You can find the code examples in <MagicDraw installation directory>\openapi\examples\symbolrendering folder.

Custom Renderer Provider

A PresentationElementRendererProvider class is an object, which provides custom symbol renderer for a given presentation element. This provider must be registered into the PresentationElementRendererManager.

Figure 12 -- Abstract interface of the PresentationElementRendererProvider

The main method of the PresentationElementRendererProvider is “getRenderer(presentationElement)”. This method provides a specific renderer for the given presentationElement (Symbol) or null.

Registering Provider

To make your provider start working, you must register it into the PresentationElementRendererManager. To add your provider into the custom providers list, use the following method:

```
PresentationElementRendererManager.getInstance().addProvider(new
RendererProvider());
```

Custom Symbol Renderer

The PresentationElementRenderer class provides API methods, which can be customized to a provide custom symbol view for the specific presentation elements.

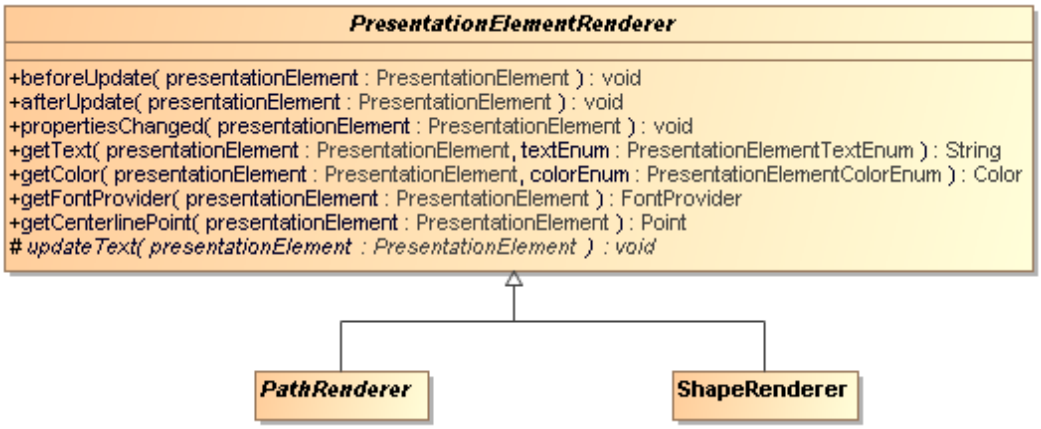


Figure 13 -- Abstract class of the Presentation Element Renderer Class, by default extended with specific renderers for path symbols (PathRenderer) and for shape symbols (ShapeRenderer)

Custom Renderers Sample

This example will cover:

- **A custom renderer for the package.**
  The package without inner elements is filled with green color.
- **A custom renderer for the slot.**
  The slot values are rounded.
- **A custom renderer for the dependency link.**
  The dependency link is a blue thicker line with custom line ends.

Creating Custom Renderers

This example shows, how to create custom renderers for the above described symbols.

The custom package renderer - the empty package (i.e., without inner elements) is filled with green color:

```
class PackageRenderer extends ShapeRenderer
{
    public Color getColor(PresentationElement presentationElement,
PresentationElementColorEnum colorEnum)
    {
        if (PresentationElementColorEnum.FILL.equals(colorEnum))
        {
            // color to fill
            Element element = presentationElement.getElement();
            if (element instanceof
com.nomagic.uml2.ext.magicdraw.classes.mdkernel.Package &&
                !((com.nomagic.uml2.ext.magicdraw.classes.mdkernel.Package)
element).hasOwnedElement())
            {
                // package has no elements - use green color to fill
                return Color.GREEN;
            }
        }
        return super.getColor(presentationElement, colorEnum);
    }
```

```
}
```

The custom slot renderer (used in instance specification symbol) - the slot values are rounded:

```
class SlotRenderer extends ShapeRenderer
{
    public String getText(PresentationElement presentationElement,
PresentationElementTextEnum textEnum)
    {
          if (PresentationElementTextEnum.NAME.equals(textEnum))
          {
                // the slot text is shown as name
                Element element = presentationElement.getElement();
                if (element instanceof Slot)
                {
                      Slot slot = (Slot) element;
                      if (slot.hasValue())
                      {
                            String string = "";
                            List<ValueSpecification> values = slot.getValue();
                            for (ValueSpecification value : values)
                            {
                                  if (value instanceof LiteralString)
                                  {
                                        LiteralString literalString =
(LiteralString) value;
                                        if (string.length() > 0)
                                        {
                                              string += "; ";
                                        }
                                        String literalValue =
literalString.getValue();
                                        try
                                        {
                                              // round value
                                              double doubleValue =
Double.parseDouble(literalValue);
                                              double rounded =
Math.round(doubleValue * 100) / 100;
                                              literalValue =
Double.toString(rounded);
                                        }
                                        catch (NumberFormatException e)
                                        {
                                        }
                                        string += literalValue;
                                  }
                            }

                            return slot.getDefiningFeature().getName() + "=" +
string;
                      }
                }
          }
          return super.getText(presentationElement, textEnum);
    }
}
```

The custom dependency link renderer - the dependency link is a blue thicker line with custom line ends:

```
class DependencyRenderer extends PathRenderer
{
    private PathEndRenderer mClientEndRenderer;

    DependencyRenderer()
```

```
    {
          // custom client end renderer - use filled circle at the end
          mClientEndRenderer = new PathEndRenderer(PathEndAdornment.CIRCLE,
PathEndAdornmentModifier.FILLED);
    }

    public Color getColor(PresentationElement presentationElement,
PresentationElementColorEnum colorEnum)
    {
          if (PresentationElementColorEnum.LINE.equals(colorEnum))
          {
                // use blue color for line
                return Color.BLUE;
          }
          return super.getColor(presentationElement, colorEnum);
    }

    protected PathEndRenderer getClientEndRenderer(PathElement pathElement)
    {
          // use custom end renderer
          return mClientEndRenderer;
    }

    public int getLineWidth(PresentationElement presentationElement)
    {
          // line with is 2
          return 2;
    }

    protected void drawPathAdornment(Graphics g, PathElement pathElement)
    {
          super.drawPathAdornment(g, pathElement);

          // draw circle at the middle of the dependency line
          Color background = Color.WHITE;
          Property property = pathElement.getDiagramPresentationElement()
                      .getProperty(PropertyID.DIAGRAM_BACKGROUND_COLOR);
          if (property != null)
          {
                Object value = property.getValue();
                if (value instanceof Color)
                {
                      background = (Color) value;
                }
          }
          Point middlePoint = pathElement.getMiddlePoint();
          int diameter = 10;
          int radius = diameter / 2;
          int x = middlePoint.x - radius;
          int y = middlePoint.y - radius;

          Color color = g.getColor();
          g.setColor(background);
          g.fillOval(x, y, diameter, diameter);
          g.setColor(color);
          g.drawOval(x, y, diameter, diameter);
    }
}
```

Registering Custom Symbol Renderer Provider

The example below shows the custom symbol renderer provider, which provides the SlotRenderer for slot, the PackageRenderer for package, and the DependencyRenderer for dependency link symbols. The created renderer provider must be registered into the PresentationElementRendererManager.

Step 1. Creating the RendererProvider class

```
/**
 * Custom renderers provider.
 */
class RendererProvider implements PresentationElementRendererProvider
{
     private SlotRenderer mSlotRenderer;
     private DependencyRenderer mDependencyRenderer;
     private PackageRenderer mPackageRenderer;

     RendererProvider()
     {
            mSlotRenderer = new SlotRenderer();
            mDependencyRenderer = new DependencyRenderer();
            mPackageRenderer = new PackageRenderer();
     }

     public PresentationElementRenderer getRenderer(PresentationElement
presentationElement)
     {
            if (presentationElement instanceof SlotView || presentationElement
instanceof SlotListElementView)
            {
                  // slot renderer
                  return mSlotRenderer;
            }

            if (presentationElement instanceof DependencyView)
            {
                  // dependency renderer
                  return mDependencyRenderer;
            }

            if (presentationElement instanceof PackageView)
            {
                  // package renderer
                  return mPackageRenderer;
            }

            return null;
     }

};
```

Step 2. Registering RendererProvider

```
PresentationElementRendererManager.getInstance().addProvider(new
RendererProvider());
```

DIAGRAM EVENTS

NEW! Diagram Listener Adapter

MagicDraw provides an API to listen to all diagram changes in a single adapter that works in the following order:

1. Receives events from all *opened* diagrams.
2. Delegates these events to your own listener.

NOTE	The adapter works in a project scope.

To listen to diagram change events, you need to create the DiagramListenerAdapter object, i.e., pass the property change listener as a delegator, which will receive all events.

To create the DiagramListenerAdapter object, call:

```
new DiagramListenerAdapter(propertyChangeListener)
```

The DiagramListenerAdapter object is registered for a project on its creation.

To start using the adapter, install it. Uninstall it when it is no longer necessary, i.e., you do not need to receive any events about diagram changes anymore.

Example: Listening to symbol creation / removal

```
DiagramListenerAdapter adapter = new DiagramListenerAdapter(new
PropertyChangeListener()
{
     public void propertyChange(PropertyChangeEvent evt)
     {
            String propertyName = evt.getPropertyName();
            if (ExtendedPropertyNames.VIEW_ADDED.equals(propertyName) ||
                  ExtendedPropertyNames.VIEW_REMOVED.equals(propertyName))
            {
                  // added / removed symbol
                  PresentationElement presentationElement = (PresentationElement)
evt.getNewValue();
            }
     }
});

adapter.install(project);

// When the adapter is no longer needed, uninstall it.
adapter.uninstall(project);
```

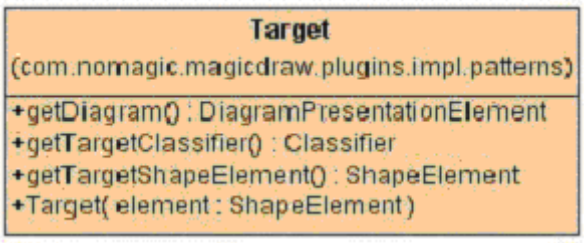
PATTERNS

MagicDraw provides API for applying some design pattern for the selected classifier (pattern's target). Pattern can modify a target classifier or even the whole model. It also can create presentation elements in the target diagram.

Pattern's functionality is implemented in a separate MagicDraw plug-in. ID of this plug-in is *com.nomagic.magicdraw.plugins.impl.patterns*. Usually specific patterns must be added into MagicDraw application as separate plugins.

Target concept

Pattern's target encapsulates information about classifier you want to apply pattern for.



Target owns:

- classifier
- classifier's presentation element
- diagram of presentation element

Target is passed to pattern's method *AbstractPattern.applyPattern*. It is also accessible from pattern's properties AbstractPatternProperties.

Using PatternHelper

Open API provides a helper class PatternHelper with useful methods for patterns.

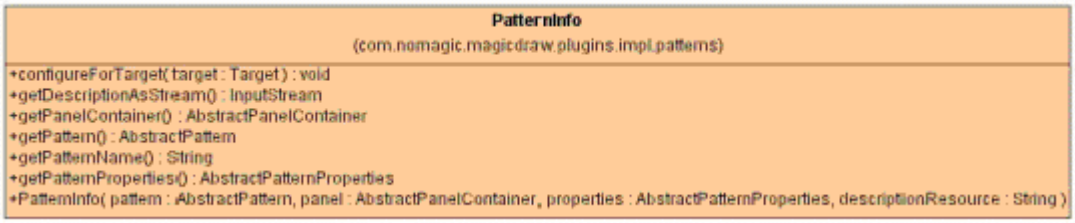
For more details about methods of this class, see *javadoc*.

Abstract Pattern

Every implementation of specific pattern must provide:

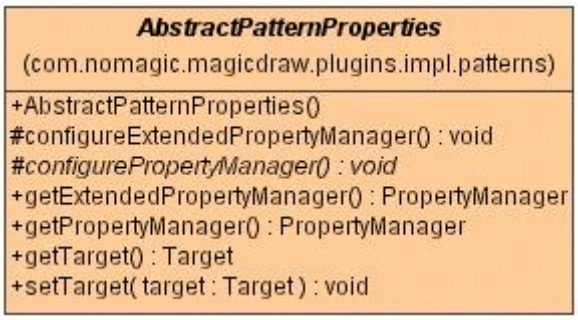
- Pattern properties
- Pattern panels
- Pattern implementation

This information is encapsulated in PatternInfo class.



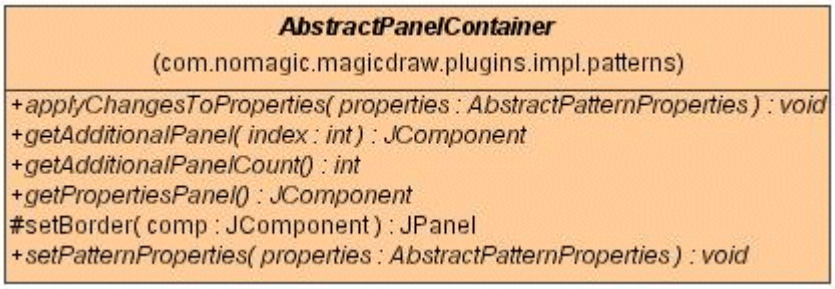
PatternInfo is used only for pattern registration in the PatternsManager. Other usages are internal and do not impact specific patterns.

Every pattern must provide main properties and optionally can have extended properties. Main properties are used for user input from the first pattern wizard page. Extended properties may be used for storing user input from other wizard pages.

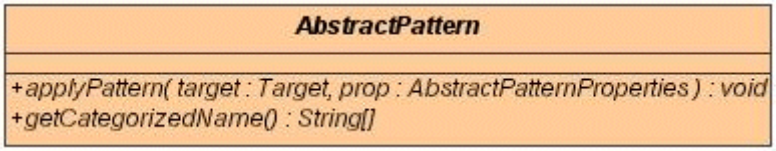


Specific pattern must provide implementation of this abstract class and override *AbstractPatternProperties.configurePropertyManager* method. If specific pattern has some extended properties, it must override *AbstractPatternProperties .configureExtendedPropertyManager* method. Both these methods must configure some property manager – add or remove properties from it.

Every pattern must provide one or more panels for the patterns wizard. First wizard page is always used for displaying main pattern properties. Other pages are optional and may be pattern specific. AbstractPanelContainer class is used for providing the following information:



Specific pattern must provide pattern implementation class. This class must extend AbstractPattern and implement *AbstractPattern.applyPattern* and *AbstractPattern.getCategorizedName* methods.



How to create my own pattern

This chapter will give an example of a simple pattern for adding method into the target classifier. The pattern will allow to edit method name in the **Pattern Wizard**. Pattern will be added as a plug-in into MagicDraw.

Step 1: Create pattern properties class

MyPattern will have only two main properties for displaying not editable target classifier name and for entering the method name.

```
package com.nomagic.magicdraw.plugins.impl.examples.mypatterns;

import com.nomagic.magicdraw.plugins.impl.patterns.AbstractPatternProperties;
import com.nomagic.magicdraw.properties.StringProperty;
import com.nomagic.magicdraw.properties.PropertyManager;

public class MyPatternProperties extends AbstractPatternProperties
{
     public static final String TARGET_CLASS = "TARGET_CLASS";
     public static final String METHOD_NAME = " METHOD_NAME ";

     /**
      * Add two properties into main properties manager.
      */
     protected void configurePropertyManager()
     {
            StringProperty p = new StringProperty(TARGET_CLASS,
getTarget().getTargetClassifier().getName());
            p.setResourceProvider(MyResourceProvider.getInstance());
            p.setEditable(false);
            PropertyManager properties = getPropertyManager();
            properties.addProperty(p);

            p = new StringProperty(METHOD_NAME, "method");
            p.setResourceProvider(MyResourceProvider.getInstance());
            properties.addProperty(p);
     }
}
```

MyPattern does not have extended properties, so we do not override *configureExtendedPropertyManager* method.

Names of MagicDraw properties can be translated into other languages, so they are not hard coded inside the properties. To get property name from property ID, PropertyResourceProvider is used.

We will write a simple PropertyResourceProvider for our pattern's properties.

```
package com.nomagic.magicdraw.plugins.impl.examples.mypatterns;
import com.nomagic.magicdraw.properties.PropertyResourceProvider;
public class MyResourceProvider implements PropertyResourceProvider
{
     /**
      * Instance of this provider.
      */
     private static MyResourceProvider mInstance;

     /**
      * Returns shared instance of this provider.
      * @return shared instance.
      */
     public static MyResourceProvider getInstance()
     {
            if(mInstance == null)
            {
```

```
                mInstance = new MyResourceProvider();
            }
            return mInstance;
        }

        /**
         * Returns resource for given key.
         * @param key a resource key.
         * @return the resource for given key.
         */
        public String getString(String key)
        {
            if(key.equals(MyPatternProperties.METHOD_NAME))
            {
                return "Method Name";
            }
            else
            if(key.equals(MyPatternProperties.TARGET_CLASS))
            {
                return "Target Class";
            }
            return null;
        }
    }
```

Step 2: Create pattern panels class

MagicDraw API provides the default implementation of AbstractPanelContainer for patterns without extended properties (just with the main properties panel). This is the PatternPropertiesPanel class. MyPattern will use this class. Other patterns may extend AbstractPanelContainer and implement/override corresponding methods.

Step 3: Create pattern class

Now we have MyPattern properties and panels. We need just pattern implementation:

```
package com.nomagic.magicdraw.plugins.impl.examples.mypatterns;

import com.nomagic.magicdraw.core.Application;
import com.nomagic.magicdraw.openapi.uml.ReadOnlyElementException;
import com.nomagic.magicdraw.plugins.impl.patterns.AbstractPattern;
import com.nomagic.magicdraw.plugins.impl.patterns.AbstractPatternProperties;
import com.nomagic.magicdraw.plugins.impl.patterns.PatternHelper;
import com.nomagic.magicdraw.plugins.impl.patterns.Target;
import com.nomagic.magicdraw.properties.PropertyManager;
import com.nomagic.uml2.ext.magicdraw.classes.mdkernel.Operation;
import com.nomagic.uml2.impl.ElementsFactory;

public class MyPattern extends AbstractPattern
{
    /**
     * Returns the categorized name of the pattern.
     * @return name of the pattern {"Common", "MyPattern"}.
     */
    public String[] getCategorizedName()
    {
        return new String[]{"Common", "My Pattern"};
    }

    /**
     * Applies design pattern to the target, using properties, passed as an
argument.
     * @param target  Target, the pattern is applied for.
     * @param prop  the pattern properties.
```

```
     */
    public void applyPattern(Target target, AbstractPatternProperties prop) throws
ReadOnlyElementException
    {
          PropertyManager propManager = prop.getPropertyManager();
          String methodName =
propManager.getProperty(MyPatternProperties.METHOD_NAME).getValue().toString();
        ElementsFactory ef =
Application.getInstance().getProject().getElementsFactory();
          Operation op = ef.createOperationInstance();
          op.setName(methodName);
          PatternHelper.addDistinctOperation(target.getTargetClassifier(), op);
    }
}
```

Step 4: Create Description.html

Every pattern may provide some html file with pattern description. We will provide such Description.html:

```
<h2>MyPatern</h2>
<h3>Intent</h3>
```

Add method into a classifier.

Description.html file must be in the same package as MyPattern class.

Step 5: Create plug-in

Create class MyPatternPlugin.

```
package com.nomagic.magicdraw.plugins.impl.examples.mypatterns;

import com.nomagic.magicdraw.plugins.Plugin;
import
com.nomagic.magicdraw.plugins.impl.patterns.impl.common.PatternPropertiesPanel;
import com.nomagic.magicdraw.plugins.impl.patterns.PatternInfo;
import com.nomagic.magicdraw.plugins.impl.patterns.PatternsManager;

public class MyPatternPlugin extends Plugin
{
    /**
     * Init this plugin.
     * Register MyPlugin in PluginsManager here.
     */
    public void init()
    {
          PatternsManager.getInstance().addPattern(new PatternInfo(new
MyPattern(),
                                                                    new
PatternPropertiesPanel(),
                                                                    new
MyPatternProperties(),

"Description.html"));
    }

    /**
     * Close this plugin always.
     * @return false always
     */
    public boolean close()
    {
          return true;
    }
```

```
	/**
	 * @see com.nomagic.magicdraw.plugins.Plugin#isSupported()
	 */
	public boolean isSupported()
	{
		return true;
	}
}
```

Pattern must be registered in the PatternsManager with *PatternsManager .addPattern* method.

Also we need to provide plugin.xml for this plug-in.

```
<?xml version="1.0" encoding="UTF-8"?>
<plugin
	id="mypatterns.MyPattern"
	name="My Pattern"
	version="1.0"
	provider-name="No Magic"

class="com.nomagic.magicdraw.plugins.impl.examples.mypatterns.MyPatternPlugin">

	<requires>
		<api version="1.0"/>
		<required-plugin id="com.nomagic.magicdraw.plugins.impl.patterns"/>
	</requires>

	<runtime>
	   <library name="mypatterns.jar"/>
	</runtime>
</plugin>
```

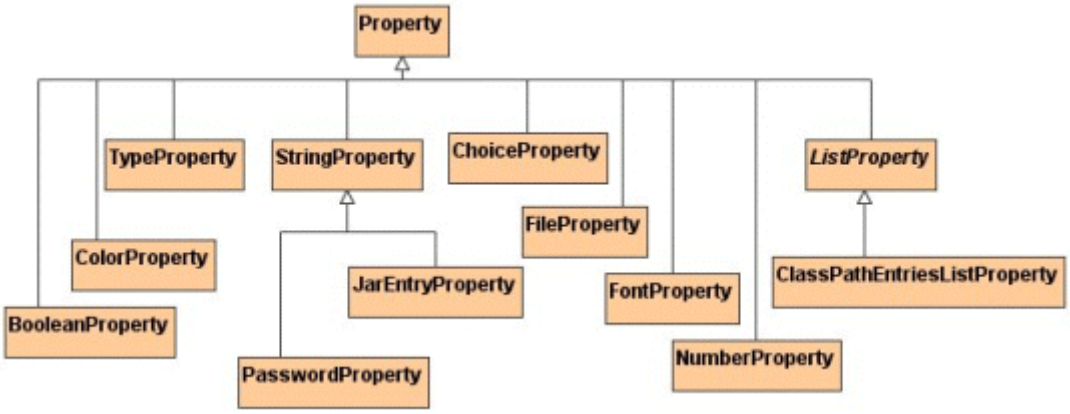
Compile all classes and bundle them into mypatterns.jar file. Also add Description.html into this jar file.

Create subfolder *mypatterns* in the *<MagicDraw install>/plugins* directory and copy *mypatterns.jar* and *plugin.xml* into it.

For more details how to deploy plug-in, see Plugins chapter.

PROPERTIES

MagicDraw Open API provides a set of classes used as properties for diagrams' symbols and design patterns.

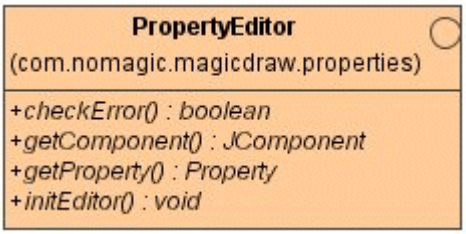


Every property has two major attributes – ID and value. Property has value of type java.lang.Object. Every specific property has value of specific type. For example value of BooleanProperty is java.lang.Boolean, value of String property is java.lang.String.

Property ID identifies specific property in the properties set.

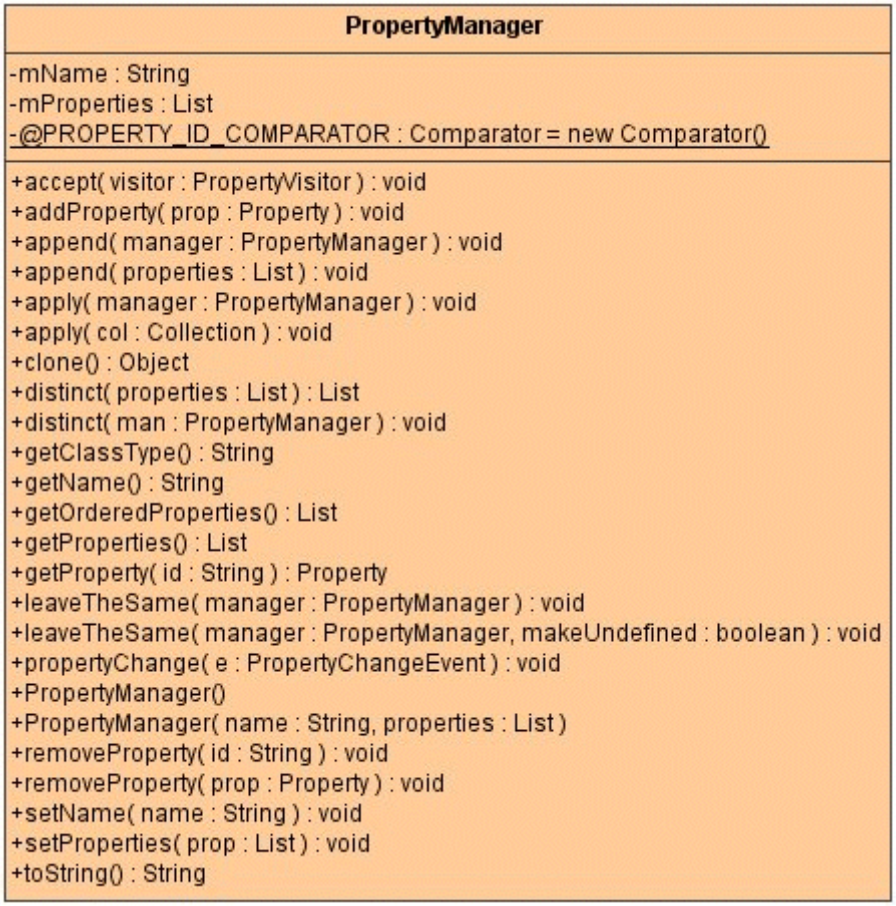
Every property has specific editor for editing value of the property. For example BooleanProperty is edited with javax.swing.JCheckBox component, ChoiceProperty with javax.swing.JComboBox, StringProperty with javax.swing.JTextField.

You may provide your own PropertyEditor for some specific property editing. In order to do this you need to override *Property.createEditor* method.



You must set some PropertyResourceProvider to your property instance in order to display normal name, not id of the property in the MagicDraw UI. PropertyResourceProvider has just one method *PropertyResourceProvider.getString(key)*, where key is id of your property.

The collections of properties are grouped by PropertyManagers. Every PropertyManager has name and list of properties. It can return property by id, properties with the same value, properties whose values are different.



For more details about every specific kind of property see javadoc.

NEW DIAGRAM TYPES

There are two groups of the diagrams in MagicDraw – creatable and not creatable. Only the diagrams of creatable type can be created (instantiated). Not creatable diagram serves as the base for other types of diagrams.

MagicDraw has 13 predefined types of diagrams (9 creatable and 4 not).

Creatable diagrams are:

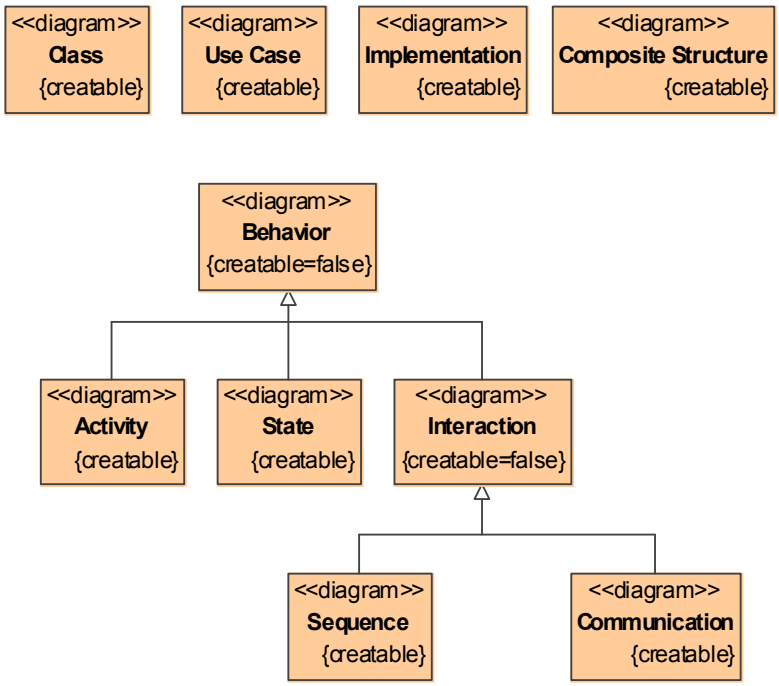
- Class
- Use Case
- Communication
- Sequence
- State Machine
- Protocol State Machine
- Activity
- Implementation
- Composite Structure

Not creatable diagram:

- Interaction
- Behavior
- Any
- Static

Communication and Sequence diagrams are subdiagrams of the Interaction diagram. Activity, Interaction, State Machine and Protocol State Machine diagram are subdiagram of the Behavior diagram.

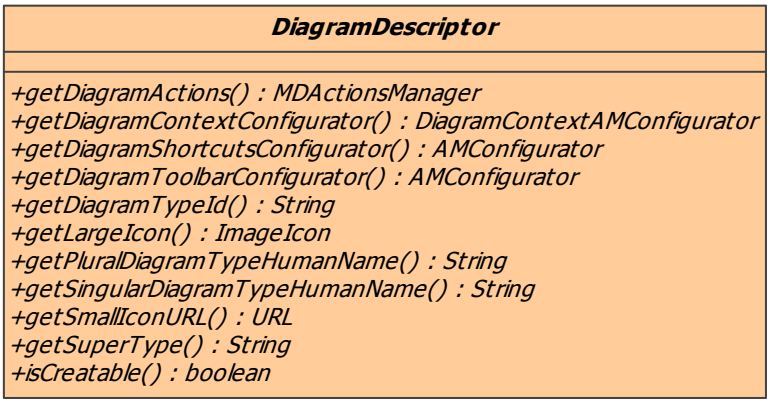
Diagram Types hierarchy



The only way to add a new diagram type in MagicDraw is to extend one of the already existing diagram types and register it. This mechanism is described below.

Adding a new diagram type for MagicDraw

Step 1. Override abstract DiagramDescriptor class



Override abstract class DiagramDescriptor and implement abstract methods:

- getDiagramTypeId() – this method must return a diagram type id, which is used to identify the diagram,
- getSingularDiagramTypeHumanName() – method returns diagram type human name.
- getPluralDiagramTypeHumanName() – method returns diagram type human name in plural form.
- getSuperType() – this method must return a super type (super diagram) of this diagram type.

- isCreatable() – returns flag indicating if this diagram type will be creatable.
- getLargeIcon() – returns a large icon for this type of the diagram (see "Adding New Functionality").
- getSmallIconURL() – returns a small icon URL for this type of the diagram (see "Adding New Functionality").
- getDiagramActions() – returns manager of actions used in the diagram.
- getDiagramToolbarConfigurator() – returns action manager configurator which configures described diagram toolbar (see "Adding New Functionality").
- getDiagramShortcutsConfigurator() – returns action manager configurator which configures described diagram shortcuts (see "Adding New Functionality").
- getDiagramContextConfigurator() – returns action manager configurator which configures described diagram context menu actions (see "Adding New Functionality").

Example 1: example diagram descriptor (see OpenAPI examples for the full source code)

```
/**
 * Descriptor of specific diagram.
*/
public class SpecificDiagramDescriptor extends DiagramDescriptor
{
     public static final String SPECIFIC_DIAGRAM = "Specific Diagram";

     /**
      * Let this diagram type be a sub type of class diagram type.
      */
     public String getSuperType()
     {
           return DiagramType.UML_CLASS_DIAGRAM;
     }

     /**
      * This is creatable diagram.
      */
     public boolean isCreatable()
     {
           return true;
     }

     /**
      * Actions used in this diagram.
      */
     public MDActionsManager getDiagramActions()
     {
           return SpecificDiagramActions.ACTIONS;
     }

     /**
      * Configurator for diagram toolbar.
      */
     public AMConfigurator getDiagramToolbarConfigurator()
     {
           return new SpecificDiagramToolbarConfigurator();
     }

     /**
      * Configurator for diagram shortcuts.
      */
     public AMConfigurator getDiagramShortcutsConfigurator()
     {
           return new ClassDiagramShortcutsConfigurator();
     }
```

```
	/**
	 * Configurator for diagram context menu.
	 */
	public DiagramContextAMConfigurator getDiagramContextConfigurator()
	{
		return new BaseDiagramContextAMConfigurator();
	}

	/**
	 * Id of the diagram type.
	 */
	public String getDiagramTypeId()
	{
		return SPECIFIC_DIAGRAM;
	}

	/**
	 * Diagram type human name.
	 */
	public String getSingularDiagramTypeHumanName()
	{
		return "Specific Diagram";
	}

	/**
	 * Diagram type human name in plural form.
	 */
	public String getPluralDiagramTypeHumanName()
	{
		return "Specific Diagrams";
	}

	/**
	 * Large icon for diagram.
	 */
	public ImageIcon getLargeIcon()
	{
		return new ImageIconProxy(new VectorImageIconControler(getClass(),
"icons/specificdiagram.svg", VectorImageIconControler.SVG));
	}

	/**
	 * URL to small icon for diagram.
	 */
	public URL getSmallIconURL()
	{
		return getClass().getResource("icons/specificdiagram.svg");
	}
}
```

Step 2. Register new diagram type in the application

The new diagram descriptor should be registered in MagicDraw using addNewDiagramType(DiagramDescriptor) method of the Application. This method can be invoked when plug-in is initialized (see Chapter "Plug-Ins").

Example 1: example diagram descriptor registration (see OpenAPI examples for the full source code)

```
class SpecificDiagramPlugin extends Plugin
{
	/**
	 * Initializing the plugin.
	 */
	public void init()
	{
		// registering new diagram type
```

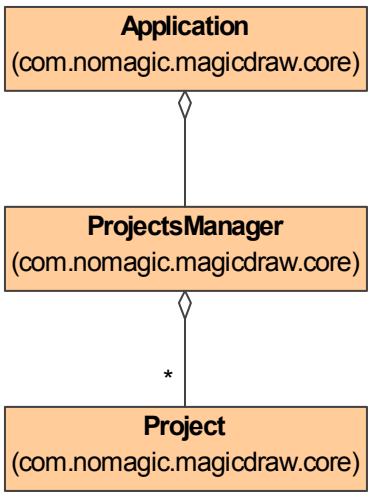
```
            Application.getInstance().addNewDiagramType(new
SpecificDiagramDescriptor());
      }

      /**
      * Return true always,
        * because this plugin does not have any close specific actions.
        */
      public boolean close()
      {
            return true;
      }

      /**
      * Return true always,
        * because this plugin does not
        * have any specific suportability conditions.
        */
      public boolean isSupported()
      {
            return true;
      }
}
```

PROJECTS MANAGEMENT

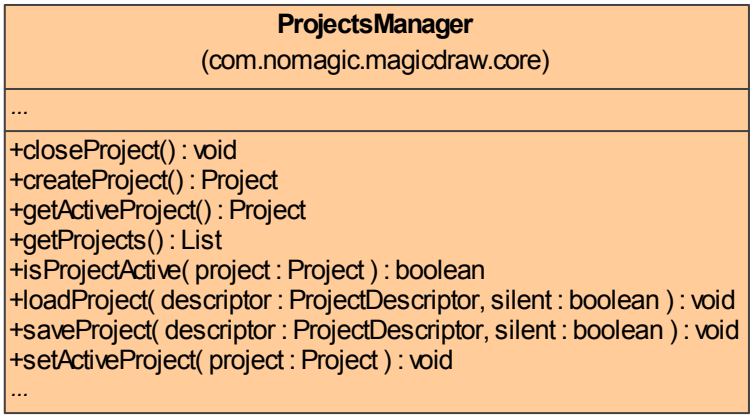
ProjectsManager

A project is the fundamental MagicDraw data structure. Project includes all UML model and diagrams.

ProjectsManager class is responsible for containment and management of projects.




```
ProjectsManager projectsManager = Application.getInstance().getProjectsManager();
```



ProjectsManager provides API for Project creating, closing, saving, loading, and activating.

MagicDraw can have multiple opened projects, but only one project can be active.

```
//gets all projects
List projects = projectsManager.getProjects();

//gets active project
Project activeProject = projectsManager.getActiveProject();
```

Active project can also be accessed directly from Application:

```
//gets active project
Project project = Application.getInstance().getProject();
```

ProjectDescriptor

ProjectDescriptor represents a project (and module) as a resource for storing and loading.

The same project can have multiple ProjectDescriptors.

There are two types of **ProjectDescriptors**:

- **Local project descriptor**
  Represents a local ordinary project. A descriptor can be created for a project or file object.
- **Remote project descriptor**
  Represents a project stored in the Teamwork Server.

NOTE. Teamwork Project has both descriptors (local and remote) because it can be saved locally.

Every ProjectDescriptor provides properties:

- **URI**
  Location is some specific String value that holds all information that is needed to access a project.
- **Representation String**
  Representation String is used for a project identification in user interface (GUI).
- **Remote flag**
  Remote flag indicates if the project descriptor represents teamwork project.

ProjectDescriptorsFactory and TeamworkUtils

ProjectDescriptorsFactory can create appropriate ProjectDescriptor object, TeamworkUtils helps to find an existing teamwork (remote) project descriptors.

Project management

Projects are saved and loaded by using two methods in ProjectsManager class.

- saveProject(ProjectDescriptor descriptor, boolean silent)
- loadProject(ProjectDescriptor descriptor, boolean silent)

NOTES “Save” and “Load” means “Commit” and “Update” for the Teamwork Project.

A project cannot be saved using descriptor, if project isn’t specified and a project cannot be loaded, if file isn’t specified. In such cases IllegalStateException is thrown.

Silent mode means that during save or load process no GUI interruptions for user input will be used, e.g. no **Commit Project** dialog box while committing a teamwork project or no **Save** dialog box while saving a new project (project will be saved into the last used directory).

Example: Saving active project

```
ProjectsManager projectsManager = Application.getInstance().getProjectsManager();
// active project
Project project = projectsManager.getActiveProject();
// get project descriptor
```

```
ProjectDescriptor projectDescriptor =
ProjectDescriptorsFactory.getDescriptorForProject(project);
// save project
projectsManager.saveProject(projectDescriptor, true);
```

Example: Loading project from file

Project can be loaded, if project's file name is known:

```
ProjectsManager projectsManager = Application.getInstance().getProjectsManager();
File file = new File(projectFilePath);
// create project descriptor
ProjectDescriptor projectDescriptor =
ProjectDescriptorsFactory.createProjectDescriptor(file.toURI());
projectsManager.loadProject(projectDescriptor, true);
```

Example: Importing another MagicDraw project file

Project can be imported, if project's file name is known:

```
ProjectsManager projectsManager = Application.getInstance().getProjectsManager();
File file = new File(projectFilePath);
// create project descriptor
ProjectDescriptor projectDescriptor =
ProjectDescriptorsFactory.createProjectDescriptor(file.toURI());
projectsManager.importProject(projectDescriptor);
```

Example: Loading teamwork project

Project can be loaded, if project's qualified name is known:

```
ProjectsManager projectsManager = Application.getInstance().getProjectsManager();
// create project descriptor
ProjectDescriptor projectDescriptor = TeamworkUtils

.getRemoteProjectDescriptorByQualifiedName(remoteProjectQualifiedName);
if (projectDescriptor != null)
{
    projectsManager.loadProject(projectDescriptor, true);
}
```

Module management

ProjectsManager also provides module management (module usage, export, import, reload, and package sharing) methods.

Example: Exporting local module

Collection of project packages can be exported as module.

```
ProjectsManager projectsManager = Application.getInstance().getProjectsManager();
File file = new File(moduleFilePath);
ProjectDescriptor projectDescriptor =
ProjectDescriptorsFactory.createProjectDescriptor(file.toURI());
// export collection of packages as module
projectsManager.exportModule(project, packages, "My local module",
projectDescriptor);
```

Example: Exporting teamwork module

TeamworkUtils class is used to export teamwork module.

```
TeamworkUtils.exportTeamworkModule(project, packages, "My remote module",
remoteProjectQualifiedName);
```

Example: Using module

Local and teamwork module usage does not differs. Just appropriate project descriptor must be used:

```
ProjectsManager projectsManager = Application.getInstance().getProjectsManager();
File file = new File(moduleFilePath);
ProjectDescriptor projectDescriptor =
ProjectDescriptorsFactory.createProjectDescriptor(file.toURI());
// use module
projectsManager.useModule(project, projectDescriptor);
```

Example: Importing module

Local and teamwork module import does not differs. Just appropriate project descriptor must be used:

```
ProjectsManager projectsManager = Application.getInstance().getProjectsManager();
File file = new File(moduleFilePath);
ProjectDescriptor projectDescriptor =
ProjectDescriptorsFactory.createProjectDescriptor(file.toURI());
projectsManager.importModule(project, projectDescriptor);
```

Example: Reloading module

Local and teamwork module reload does not differs. Just appropriate project descriptor must be used:

```
   ProjectsManager projectsManager =
Application.getInstance().getProjectsManager();
   File file = new File(moduleFilePath);
   ProjectDescriptor projectDescriptor =
ProjectDescriptorsFactory.createProjectDescriptor(file.toURI());
   projectsManager.reloadModule(project, projectDescriptor);
```

Example: Package sharing

```
       ProjectsManager projectsManager =
Application.getInstance().getProjectsManager();
       SessionManager.getInstance().createSession("Create shared package");

       // create package to share
       Package aPackage =
project.getElementsFactory().createPackageInstance();
       aPackage.setOwner(project.getModel());
       aPackage.setName("myShare");
       SessionManager.getInstance().closeSession();

       // share package
       projectsManager.sharePackage(project, Arrays.asList(aPackage), "my
module");

       // save project
       ProjectDescriptor projectDescriptor =
ProjectDescriptorsFactory.getDescriptorForProject(project);
       projectsManager.saveProject(projectDescriptor, true);
```

Example: Editing module within project

```
final String moduleFileName = new File(moduleFilePath).getName();
// find module (attached project) directly used by project (primary project)
final IAttachedProject attachedProject =
       ProjectUtilities.findAttachedProjectByName(project, moduleFileName, false);
if (attachedProject != null)
{
  final ModuleUsage moduleUsage = new ModuleUsage(project.getPrimaryProject(),
                                                  attachedProject);
  final Set<ModuleUsage> moduleUsages = Collections.singleton(moduleUsage);

  final boolean readOnly = attachedProject.isReadOnly();
  if (readOnly)
  {
    // make module editable (read-write accessibility mode)
    ModulesService.setReadOnlyOnTask(moduleUsages, false);
  }
  // get first shared module package
  final Collection<Package> sharedPackages =
    ProjectUtilities.getSharedPackages(attachedProject);
  final Package aPackage = sharedPackages.iterator().next();
  // create class in module
  SessionManager.getInstance().createSession("Create use case in module");
  final Class aCase = project.getElementsFactory().createClassInstance();
  aCase.setOwner(aPackage);
  aCase.setName("myClass");
  SessionManager.getInstance().closeSession();
  // save module
  Application.getInstance().getProjectsManager().saveModule(project,
                                                  attachedProject, true, false);
  if (readOnly)
  {
    // make module not editable (read-only accessibility mode)
    ModulesService.setReadOnlyOnTask(moduleUsages, true);
  }
}
```

NEW! Merging and Differencing

MagicDraw provides the API for project merging (and differencing).

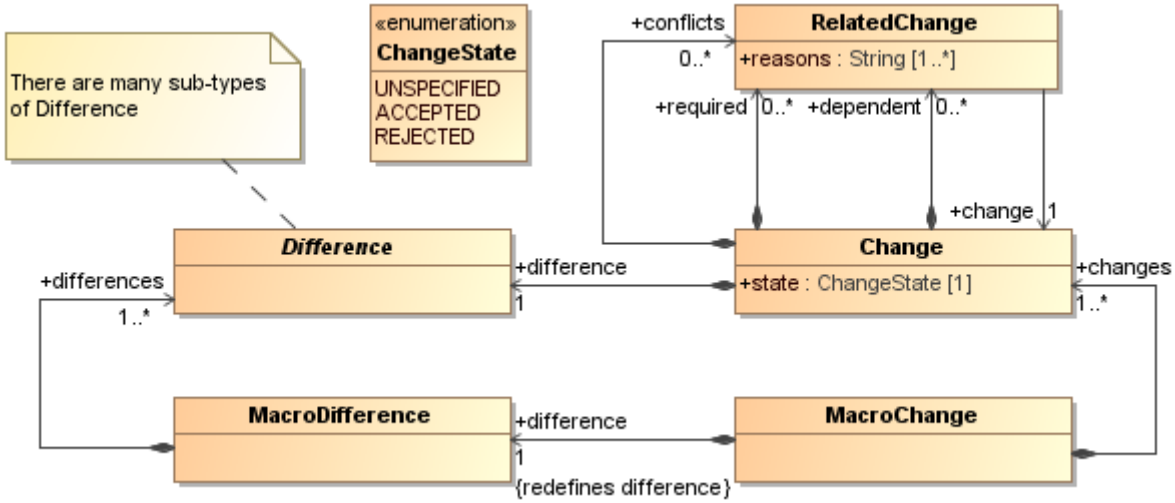
The project merging consists of three steps:

1. Discovering project changes (differences). Ancestor (in a 3-way merge only) and source projects are loaded (if they are not loaded yet) for comparing.
2. Accepting / rejecting changes. All target changes that do not conflict source changes are applied (source changes conflicting with target changes are rejected). A 2-way merge produces source changes only.
3. Applying accepted changes. Changes are applied on the ancestor project (target and ancestor projects are the same in a 2-way merge).

There are API for standard and advanced project merging. Standard API encapsulates all three steps into a single call, while advanced merge API allows for accessing the project differences and controlling what changes are accepted or rejected.

See the sample API usage code in the `<MagicDraw install>\openapi\examples\merge` folder.

The following figure shows the domain model of the merging.



PROJECT OPTIONS

MagicDraw UML provides the API for adding the custom project options. These options are project related and saved together with project data. In this chapter, we will describe how to add a new property and how to retrieve its value.

Adding Own Project Options

A project contains options with the ability to add new properties.

The following example shows, how to add the above mentioned project option's configurator at the plug-in's init() method in order to have the additional project option "Test Property" for every project.

```
ProjectOptions.addConfigurator(new ProjectOptionsConfigurator()
{
     public void configure(ProjectOptions projectOptions)
     {
           com.nomagic.magicdraw.properties.Property property =
projectOptions.getProperty(ProjectOptions.PROJECT_GENERAL_PROPERTIES,
                                       "TEST_PROPERTY_ID");
           if (property == null)
           {
                 // create property, if does not exist
                 property = new StringProperty("TEST_PROPERTY_ID", "description");
                 // group
                 property.setGroup("MY_GROUP");
                 // custom resource provider
                 property.setResourceProvider(new PropertyResourceProvider()
                 {
                       public String getString(String string, Property property)
                       {
                             if ("TEST_PROPERTY_ID".equals(string))
                             {
                                   // translate ID
                                   return "Test Property";
                             }
                             if ("TEST_PROPERTY_ID_DESCRIPTION".equals(string))
                             {
                                   // translate description
                                   return "Test Property in My Group";
                             }
                             if ("MY_GROUP".equals(string))
                             {
                                   // translate group
                                   return "My Group";
                             }
                             return string;
                       }
                 });
                 // add property

projectOptions.addProperty(ProjectOptions.PROJECT_GENERAL_PROPERTIES, property);
           }
     }
});
```

Retrieving Project Option Value

The following example shows how to access project option's value:

```
Property property =
project.getOptions().getProperty(ProjectOptions.PROJECT_GENERAL_PROPERTIES,
"TEST_PROPERTY_ID");
   if (property != null)
   {
    Object value = property.getValue();
   }
```

NEW! ENVIRONMENT OPTIONS

Adding Custom Environment Options

Application-related options are referred to as environment options. They are saved in the *global.opt* file that is located in <user home directory>\.magicdraw\<version number>\data.

You can add custom environment options for MagicDraw.

To add your own environment options

1. Extend the AbstractPropertyOptionsGroup class.
2. Add the extending class to application environment options.

Example: Adding custom environment options

```
class MyOptionsGroup extends AbstractPropertyOptionsGroup
{
     ...
}

Application application = Application.getInstance();
EnvironmentOptions options = application.getEnvironmentOptions();
options.addGroup(new ExampleOptionsGroup());
```

EVENT SUPPORT

MagicDraw UML provides the API for listening to the events, while changing a model. There is a possibility either to get an event immediately after the property has been changed, or get the event about all the changes in the transaction, after this transaction has been executed.

There are four different listener registration types:

- **Whole repository listener.** You will get events about the changes in all the elements.
- **Specific element listener.** You will get events about the changes in any property of this element.
- **Element's specific property listener.** You will get events about the changes of this property.
- **Specific element type listener.** You will get events about the changes in all the elements of the specific type.

The transaction listener is notified, when all the changes within the transaction are done and the transaction is closed.

TIP!	You can find the code examples in <MagicDraw installation directory>\\openapi\examples\events.

Property Change Events

Each PropertyChangeListener receives the PropertyChangeEvent.

In order to understand, which property has been changed and how it was done, let's review a short explanation of the PropertyChangeEvent.

The main properties of the PropertyChangeEvent:

- **Property name.** The changed property name.
- **New value.** The changed property value.
- **Old value.** The old property value, which was before the property change.

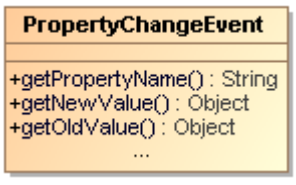


Figure 14 -- Class of the PropertyChangeEvent

Property Names in MagicDraw

All UML property names are stored in the **com.nomagic.uml2.impl.PropertyNames** class. Use this class, when you need to listen for UML specific elements' properties.

The **com.nomagic.magicdraw.uml.ExtendedPropertyNames** class has additional property names, mostly dedicated for diagrams/ symbols.

The events' names related with model creation/ deletion are listed in the **com.nomagic.uml2.ext.jmi.UML2MetamodelConstants** class.

An example of the element's name change event:

```
PropertyChangeEvent.getPropertyName() == PropertyNames.NAME;
PropertyChangeEvent.getNewValue() will be new name of element;
PropertyChangeEvent.getOldValue() will be name of element before change.
```

An example of the new element creation event:

```
PropertyChangeEvent.getPropertyName() == UML2MetamodelConstants.INSTANCE_CREATED;
PropertyChangeEvent.getNewValue() will be new created element;
PropertyChangeEvent.getOldValue() will be null.
```

Listening to Property Change Events

The PropertyChangeEvents support provides the ability to listen to the event by different scopes. The scope depends on how the listener is registered:

- If the listener is registered at the whole repository, it receives events about the changes in all the elements.
- If the listener is registered at the specific element, it receives events about the changes in any property of this element.
- If the listener registered with the specific property at the element, it receives events about the changes in this property.
- If the listener is registered with the specific property for the element type, it receives events about the changes in all the elements of the specific type.

The PropertyChangeListener should be registered to receive these events.

There are several different ways to register a listener:

To listen for the whole repository, use:

```
project.getRepositoryListenerRegistry().addPropertyChangeListener(listener,
(RefObject)null);
```

This listener will get all the property change events from any element.

To listen for any delete operation in the repository and get notified before the delete action is performed, use:

```
project.getRepositoryListenerRegistry().addPropertyChangeListener(listener,
UML2MetamodelConstants.BEFORE_DELETE);
```

This listener will be notified, when any model element is set to be deleted.

To listen for any property changes of the specific element, use:

```
element.addPropertyChangeListener(listener);
```

This listener will be notified when any element property is changed.

To listen for any property changes of the specific element type, use:

```
project.getSmartEventSupport().registerConfig(aClass, configs, listener);
```

This listener will be notified, when any property of any element in the project with this type is changed. If “configs” is NULL, the listener will get all property change events.

NOTE	**EventSupport could be disabled from event firing**
	To check if it is enabled, use:
	`project.getRepository().getEventSupport().isEnableEventFiring()`
	To stop/ start event firing, use:
	`project.getRepository().getEventSupport().setEnableEventFiring(...)`

Listening to Related Elements in Hierarchy Events

There is a possibility to listen for changes of the elements, which are somehow related with the given element. For example, we want to be notified, when element’s owner name is changed. The **SmartPropertyChangeListener** class is dedicated for the situations like this. The main idea of the solution is to provide the SmartListenerConfig, which will provide the chain of the property names to listen to.

The **SmartListenerConfig** class provides static methods for default configuration of property chains. This is useful, when listening for common property change events.

Use the **SmartPropertyChangeListener.createSmartPropertyListener**(...) to create and register such listener for the particular element, which will be notified with events provided by the SmartListenerConfig.

NOTE	If the listener is not needed anymore, unregister it using the **removePropertyChangeListener(...)** method.

Listening to Transaction Commit Events

The TransactionCommitListener is a special listener, which is notified when all changes inside a transaction are done and the transaction is closed.

Figure 15 -- Interface of TransactionCommitListener

The listener contains **transactionCommited()** method, which provides a collection of all PropertyChangeEvents that were executed in a transaction.

Event Listening Sample

Element’s Property Change Listening

These examples show, how to create the property change listeners to listen to the different kind of properties.

Listener for listening to the specific element’s any property changes:

```
element.addPropertyChangeListener(new PropertyChangeListener()
{
     public void propertyChange(PropertyChangeEvent evt)
     {
           // evt.getPropertyName() is Changed
     }
});
```

Listener for listening to the specific property (NAME) of the specific element:

```
element.addPropertyChangeListener(new PropertyChangeListener()
{
     public void propertyChange(PropertyChangeEvent evt)
     {
           if (PropertyNames.NAME.equals(evt.getPropertyName()))
           {
                 // name is Changed
           }
     }
});
```

Listener for listening the specific property (NAME) of the specific element type (Classifier):

```
// create smartListenerConfig for Name property
SmartListenerConfig cfg = new SmartListenerConfig(PropertyNames.NAME);
List<SmartListenerConfig> configs = Collections.singletonList(cfg);

// create listener which will get notified of events.
PropertyChangeListener listener = new PropertyChangeListener()
{
     public void propertyChange(PropertyChangeEvent evt)
     {
           // evt.getPropertyName() is Changed
     }
};

// register everything into project's event support.
project.getSmartEventSupport().registerConfig(Classifier.class, configs,listener);
```

TransactionCommitListener

This example shows, how to create a transaction commit listener:

Create a custom transaction commit listener:

```
public class MyTransactionListener implements TransactionCommitListener
{
     public Runnable transactionCommited(final Collection<PropertyChangeEvent>
events)
     {
           return new Runnable()
           {
                 public void run()
                 {
                       for (PropertyChangeEvent event : events)
                       {
                             if
(UML2MetamodelConstants.INSTANCE_CREATED.equals(event.getPropertyName()))
                             {
                                   Object source = event.getSource();
                                   if (source instanceof Property)
                                   {
                                         Property property = (Property) source;
                                         Element owner = property.getOwner();
                                         if (owner instanceof Classifier)
                                         {
```

```
                                                    Classifier propertyOwner =
(Classifier) owner;
                                                    propertyOwner
                                                            .setName("Contains ("
+ propertyOwner.getAttribute().size() + ") attributes");
                                                }

                                                // additionally for this Property we
register listener to listen for any property changes in this Element properties.
                                                property.addPropertyChangeListener(new
DerivedValuePropertyChangeListener());

                                        }
                                }
                        }
                }
        };
    }
}
```

This “transaction commit listener” checks, if new property is created in classifier and updates classifier’s (property owner) name. All changes are done in the same session.

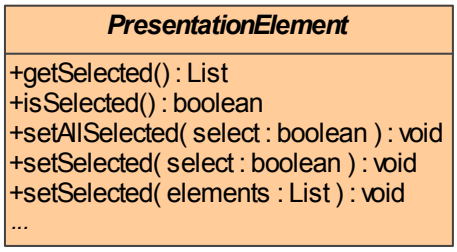
Register the custom “transaction commit listener” into the project

```
MyTransactionListener transactionListener = new MyTransactionListener();

TransactionManager transactionManager = project.getRepository().getTransactionMan-
ager();

transactionManager.addTransactionCommitListener(transactionListener);
```

SELECTIONS MANAGEMENT

Selection in diagrams

Every PresentationElement can access selected elements or change their own selection status.



Collecting selected elements

```
Project project = Application.getInstance().getProject();
DiagramPresentationElement diagram = project.getActiveDiagram();
List selected = diagram.getSelected();
```

Selection events

Selection changes fire PropertyChangeEvent.

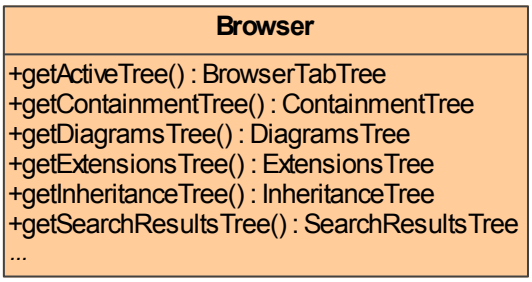
To listen selection change events, PropertyChangeListener must be registered to Project:

```
Project prj = Application.getInstance().getProject();
prj.addPropertyChangeListener(new PropertyChangeListener()
     {
            public void propertyChange(PropertyChangeEvent evt)
            {
                  if (evt.getPropertyName().
equals(Project.SELECTION_CHANGED))
{
     // was selected
List old = (List)evt.getOldValue();

//now selected
List news = (List)evt.getNewValue();

//do something
}
            }
     });
```

Selection in model browser

Model browser is based GUI part for displaying various model trees.

```
Browser browser = Application.getInstance().getMainFrame().getBrowser();
```



Browser has five trees:

- containment
- diagrams
- inheritance
- extensions
- search results

Only one tree can be active:

```
Tree activeTree = browser.getActiveTree();
```

Every tree is based on Swing JTree and all manipulations can be done by using API provided by Swing:

```
JTree tree = activeTree.getTree();
```

Selected nodes are accessible in the following way:

```
Node[] nodes = activeTree.getSelectedNodes();
```

Node is derived from *DefaultMutableTreeNode* from *javax.swing.tree*

CREATING IMAGES

MagicDraw Open API provides class com.nomagic.magicdraw.export.image.ImageExporter for creating images from whole diagram or just part of it.

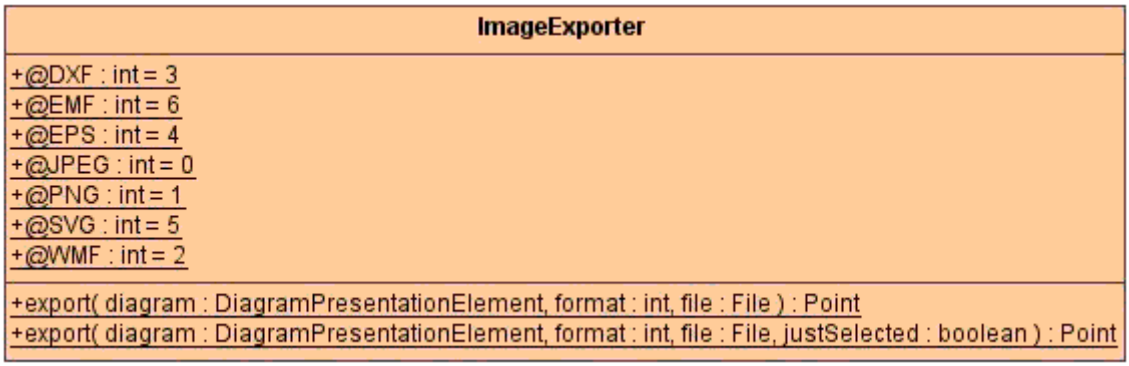


Image formats are predefined as constants in ImageExporter.

To create image from the whole diagram, use method *export(DiagramPresentationElement, int, File)*.

To create image from selected symbols in the diagram, use method *export(DiagramPresentationElement, int, File, boolean)*.

Creating New Metric

In order to add new metrics you need to extend the Metric class and implement the following methods:

```
- MetricResult calculateLocalMetricValue(ModelElement target);
- boolean acceptModelElement(BaseElement element);
```

Implementing calculateLocalMetricValue(ModelElement target)

```
protected MetricResult calculateLocalMetricValue(BaseElement target)
{
     Collection stereotypes = StereotypesHelper.getStereotypes((Element) target);
     MetricResult result =
new MetricResult(MetricResult.create(stereotypes.size()));

   return result;
}
```

In calculateMetricValue you should put the code that will calculate the local value for your metric. In the example it is calculating the number of stereotypes of the elements. This value can be used while calculating other modes than Local mode.

Implementing acceptModelElement(BaseElement element)

Example: Making the metric be calculated for elements of type Class.

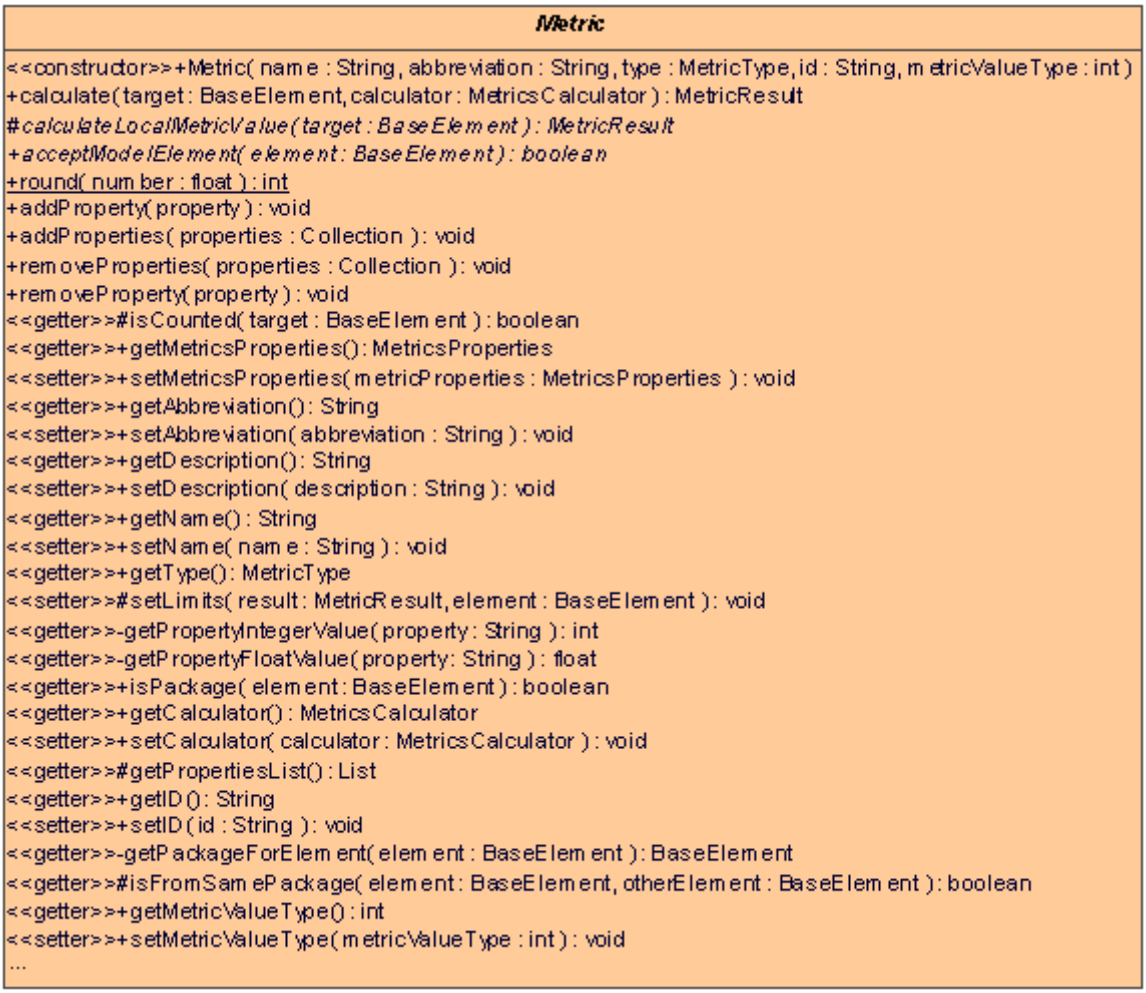
```
public boolean acceptModelElement(BaseElement element)
{
     return element instanceof
com.nomagic.uml2.ext.magicdraw.classes.mdkernel.Class;
}
```

While implementing acceptModelElement(BaseElement element) method, you have to check the type of elements you want your metrics to be calculated for. However you should restrict it to types of elements that can be shown in metrics results windows. Elements that can be displayed are Class, Interfaces, Diagrams, Packages, or Model packages.

You may check if the element is eligible to be show, using the method **acceptElement(BaseElement element)** from MetricsManager class.

MetricsManager class also has a **acceptDiagramElement (BaseElement element)** that verifies if the given element is a diagram element.

Metric class:



Constructor

The next example will create a metric with the given data about the metrics and put it into the Other group.

```
public MyMetric()
{
        super("My Metric", "MM", MetricType.OTHER, "MY_METRIC",
MetricValue.INTEGER_VALUE);
        setDescription("This is my metric.");
 }
```

You have also to provide a constructor for your metrics that must call the following super constructor:

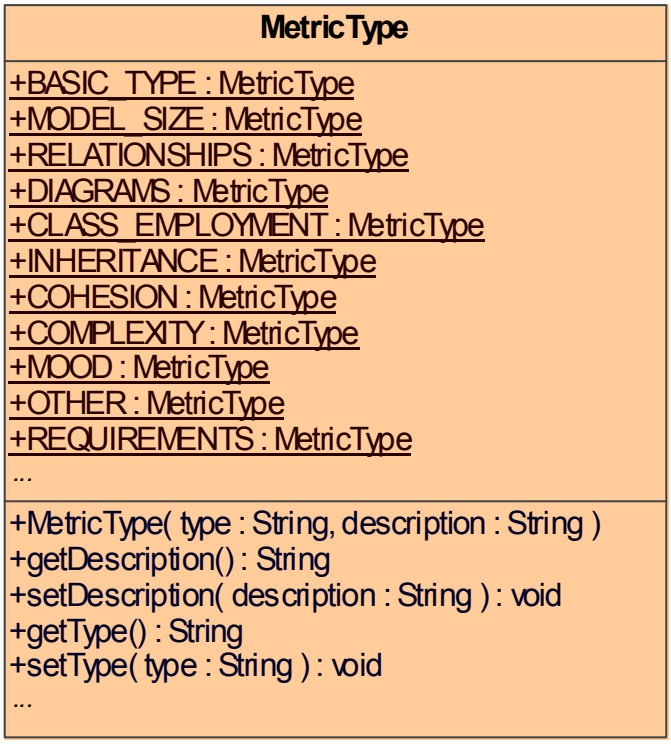
```
public Metric(String name, String abbreviation, MetricType type, String id,  int
metricValueType)
```

You will have to provide unique name, abbreviation, and ID for your metric.

The value return type can be integer or real, the constants are on MetricValue class.

There are already some predefined types in MetricType class that can be used.

MetricType class:

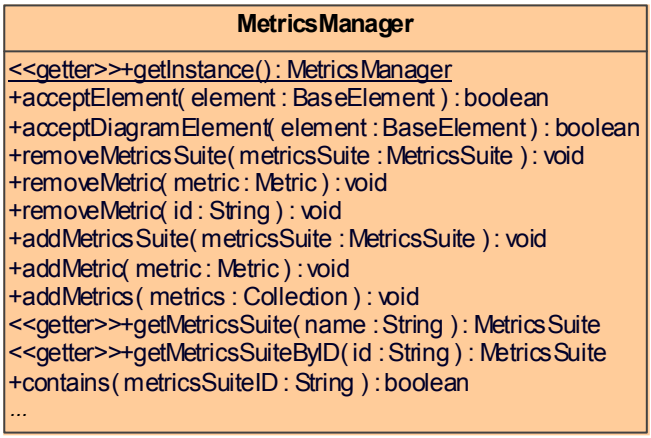


Adding new metrics to MagicDraw

You have to create a Plugin for MagicDraw and make sure that your plugin descriptor file has in its requires section the following line:

```
<required-plugin id="com.nomagic.magicdraw.plugins.impl.metrics"/>
```

In your plugin class you must use then the MetricsManager **addMetric(Metric metric)** method to add the new metric to MagicDraw. Now your metric will be available for using as any predefined metric.



Full example source code

Plugin descriptor file

```
<?xml version="1.0" encoding="UTF-8"?>
<plugin
    id="com.nomagic.magicdraw.examples.mymetrics"
    name="MyMetrics"
    version="1.0"
    provider-name="No Magic"
 class="com.nomagic.magicdraw.examples.mymetrics.MyMetricsPlugin">

    <requires>
        <api version="1.0"/>
        <required-plugin id="com.nomagic.magicdraw.metrics"/>
    </requires>

    <runtime>
        <library name="mymetrics.jar"/>
    </runtime>
</plugin>
```

MyMetricsPlugin class

```
public class MyMetricsPlugin extends Plugin
{
    public void init()
    {
        MyMetric myMetric = new MyMetric();
        MetricsManager.getInstance().addMetric(myMetric);
    }

    public boolean close()
    {
        return true;
    }

    public boolean isSupported()
    {
        return true;
    }
}
```

MyMetric class

```
public class MyMetric extends Metric
{
    public MyMetric()
    {
        super("My Metric", "MM", MetricType.OTHER, "MY_METRIC",
MetricValue.INTEGER_VALUE);
       setDescription("This is my metric. This metric will calculate the number of
stereotypes for classes.");
    }

    protected MetricResult calculateLocalMetricValue(BaseElement target)
    {
     Collection stereotypes = StereotypesHelper. getStereotypes((Element) target);
     MetricResult result =
new MetricResult(MetricResult.create(stereotypes.size()));

        return result;
```

```
    }

    public boolean acceptModelElement(BaseElement element)
    {
     return element instanceof
com.nomagic.uml2.ext.magicdraw.classes.mdkernel.Class;
    }
}

}
```

Metric framework structure

CONFIGURING ELEMENT SPECIFICATION

Adding Configuration

Open API provides a way to configure Elements' specification windows. With your own configurator you can create new Nodes or remove already existing Nodes. Nodes are items of Tree visible on the left side in every Specification window.

com.nomagic.magicdraw.ui.dialogs.specifications.SpecificationDialogManager class should be used for registering specification dialog configurator ISpecificationNodeConfigurator.

More information is available in javadoc.

CUSTOM DIAGRAM PAINTERS

MagicDraw API provides a way to add your own custom diagram painters for painting some additional stuff on the diagram canvas. A good sample would be some highlighting in the diagram.

NOTE! Painter can be added only into opened diagram's DiagramSurface. BTW, only opened diagram has DiagramSurface. Closed diagram will return null.

Code sniplet:

```
Application.getInstance().addProjectEventListener(new
ProjectEventListenerAdapter()
        {
            public void projectOpened(Project project)
            {
                project.addPropertyChangeListener(new PropertyChangeListener()
                {
                    public void propertyChange(PropertyChangeEvent evt)
                    {
                        if(evt.getPropertyName().equals(Project.DIAGRAM_OPENED))
                        {
                            DiagramPresentationElement diagram =
Application.getInstance().getProject().getActiveDiagram();
                            diagram.getDiagramSurface().addPainter(new
DiagramSurfacePainter()
                            {
                                public void paint(Graphics g,
DiagramPresentationElement diagram)
                                {
                                    g.setColor(Color.BLUE);
                                  List symbols = diagram.getPresentationElements();
                                    for (int i = 0; i < symbols.size(); i++)
                                    {
                                     PresentationElement o = (PresentationElement)
symbols.get(i);
                                        if( o instanceof ShapeElement)
                                        {
                                            Rectangle bounds = o.getBounds();
                                            bounds.grow(5,5);
                                            ((Graphics2D)g).draw(bounds);
}
                                    }
                                }
                            });
                        }
                    }
                });
            }
        });
```

Full running sample is provided in Open API examples with name CustomDiagramPainter.

ANNOTATIONS

Using MagicDraw API you can add an annotation to any base element (model element or symbol in a diagram).

Annotations are shown in the Containment tree and in the diagrams.

Annotation has the following properties:

- severity - like error, warning, info, debug, fatal.
- kind - string representing annotation short name.
- text - string representing annotation text.
- target - target base element.
- actions - optional list of actions. They are shown in a diagram on a symbol's smart manipulator.

To add or remove annotations, use com.nomagic.magicdraw.annotation.AnnotationManager.

IMPORTANT!	Do not forget to call AnnotationManager.update(), when you are done with adding or removing in order to refresh MagicDraw UI.

TIP!	Find the sample plugin named "annotations" in MagicDraw Open API examples directory.

VALIDATION

Basic concepts

Validation rules and validation suites specify what will be validating and how. They also specify how problem found by validation rule can be solved.

Validation rule is a constraint with applied stereotype **«UML Standard Profile::Validation Profile::validationRule»**. Validation rules can validate model elements and non model elements (e.g. presentation elements) as well. UML metaclass specified as a constrained element defines that a validation rule validates elements of the specified metaclass. Stereotype specified as a constrained element specifies that a validation rule validates elements that have the stereotype applied. Classifier specified as a constrained element specifies that a validation rule validates instances of the specified classifier. Validation rule's implementation can be OCL2.0 based or binary. Binary validation rules can be implemented in Java. OCL2.0 based validation rules are described using OCL2.0 language. Validation rule can be global or local. Global validation rules will be executed only once per validation session. Local validation rules will executed for each model element. Validation rule will be treated as global if:

- it is a OCL2.0 based validation rule, OCL2.0 specification is valid and OCL2.0 specification does not use "self" variable (explicitly or implicitly by using only a property of constrained element).
- it is binary based, has specified implementation class name and it has no specified constrained elements.

Local validation rule will be executed on each model element.

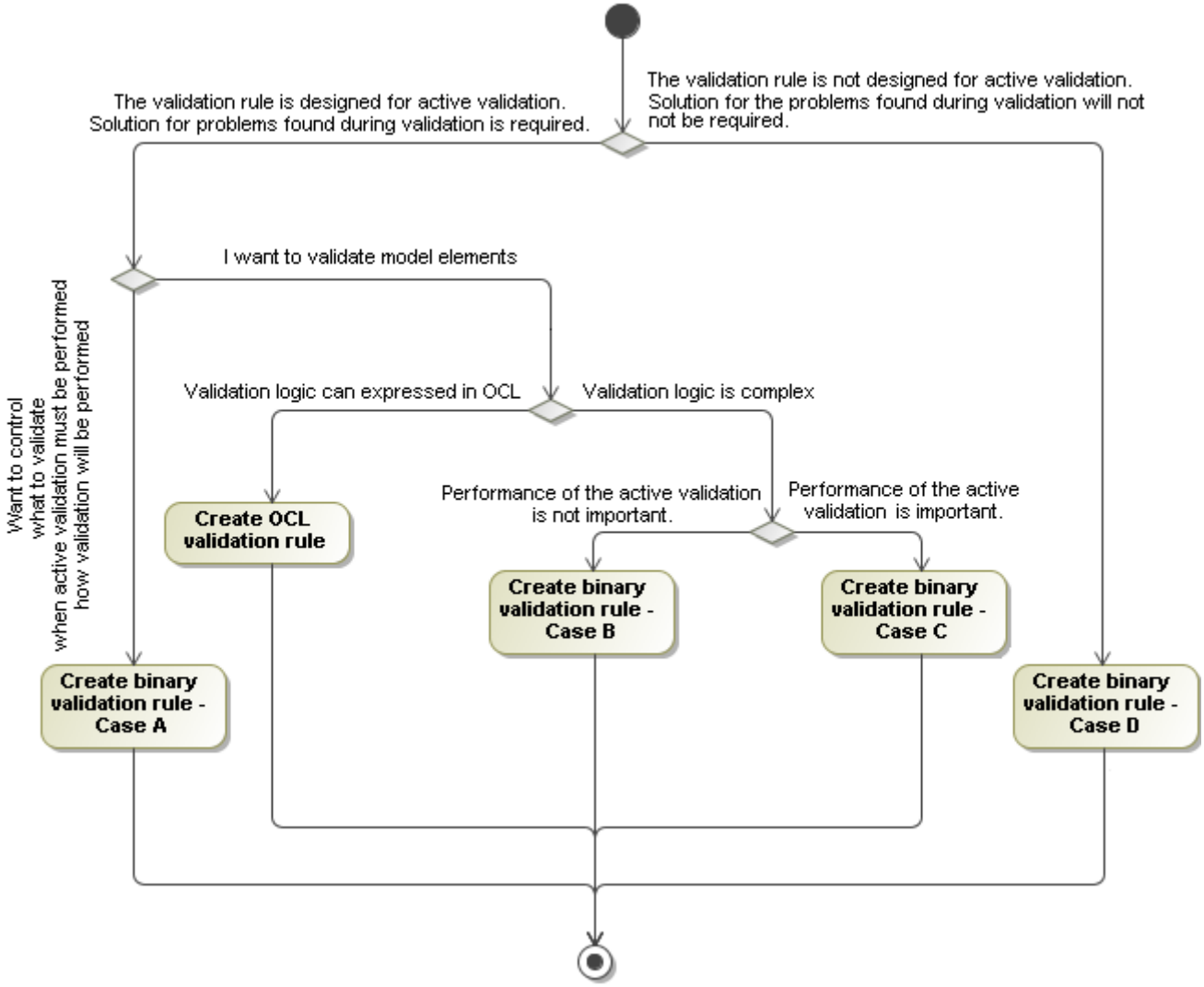
Validation suite is a package with stereotype «UML Standard Profile::Validation Profile::validationSuite». Validation suite organizes several validation rules into a unit that can be used for performing validation. Validation rules can be added or imported into validation suite.

Active validation suite is a package with stereotype «UML Standard Profile::Validation Profile::activeValidationSuite». Active validation rules can be checked constantly or on model elements change. OCL2.0 or Binary validation rules can be used in the active validation. We suggest to prefer binary, because they give better performance.

Annotation defines validation result. It contains information about what is incorrect, severity of the problem, and possible actions that can be used to solve the problem.

Validation rule developer's roadmap

Validation rule developer's roadmap allows faster understanding of steps required for creating a validation rule.



Each case is described later in detail.

Create OCL2.0 Validation Rule

OCL2.0 validation rule describes validation logic using OCL2.0. How to create OCL2.0 validation rule:

1. Create a constraint
2. Set stereotype «UML Standard Profile::Validation Profile::validationRule» for the validation rule
3. Set severity level, error message, and abbreviation
4. Specify constrained element(s)
5. Specify specification language OCL2.0
6. Enter OCL2.0 expression as a body of specification
7. Add/import the created validation rule to a validation suite

OCL2.0 validation rule can be used in an active validation suite. In this case validation rule will be executed on any change of constrained elements that are from the validation scope. Executing of the validation rule might be triggered even if no properties important to the validation rule actually changed and this can slow down active validating speed. In order to avoid degradation of performance you can create a binary validation rule that uses OCL2.0 expression to validate model elements but also provides additional information for the MagicDraw that allows to optimize triggering of executing after model elements change. E.g. we want to check whether all classes have names. This can be done by creating OCL2.0 validation rule and specifying OLC2.0 expression:

```
name <> ''
```

The problem is that such a validation rule actually is interested in a class property name value change but it will be executed on every property value of a class change. How we can fix this problem and inform MagicDraw to execute the validation rule only on class property name change:

1. Create a constraint.
2. Set stereotype «UML Standard Profile::Validation Profile::validationRule» for the validation rule.
3. Set severity level, error message, and abbreviation.
4. Specify constrained element(s).
5. Specify specification language OCL2.0
6. Enter OCL2.0 expression as a body of specification
7. Create a Java class that extends com.nomagic.magicdraw.validation.DefaultValidation-RuleImpl class
8. Override method public Map<Class<? extends Element>, Collection<SmartListenerConfig>> getListenerConfigurations()

```
    public Map<Class<? extends Element>, Collection<SmartListenerConfig>>
getListenerConfigurations()
    {
        Map<Class<? extends Element>, Collection<SmartListenerConfig>> configs =
                new HashMap<Class<? extends Element>,
Collection<SmartListenerConfig>>();
        Collection<SmartListenerConfig> configsForClass = new
ArrayList<SmartListenerConfig>();
        configsForClass.add(SmartListenerConfig.NAME_CONFIG);
        configs.put(com.nomagic.uml2.ext.magicdraw.classes.mdkernel.Class.class,
configsForClass);
        return configs;
    }
```

9. Specify the validation rule's implementation property value - qualified name of the class
10. Add/import the created validation rule to a validation suite

See the MyOCLBasedValidationRuleImpl.java example in the <MagicDraw_install_dir>\openapi\examples\validation directory.

NOTE	The implementation class must be in the classpath of the MagicDraw application or if the implementation class is in a plugin then the plugin's classloader must be registered to the validation system (see "Binary validation rule in plugin.").

Binary Validation Rule

Sometimes it is hard to specify the rule for some advanced concepts in OCL. For example, string manipulation is rather weak in OCL2.0, hence the writing rule for string formats, parsing strings is very hard in OCL. In such cases MagicDraw offers possibility to write rules in Java language and invoke them when validating.

Common steps for creating a binary validation rule:

1. Create a constraint
2. Set stereotype «UML Standard Profile::Validation Profile::validationRule» for the validation rule
3. Set severity level, error message, and abbreviation.
4. Specify constrained element(s)
5. Specify specification language binary
6. Create Java implementation class (see all possible cases below)
7. Compile Java code, resulting in one or several classes.
8. Ensure that MagicDraw can find & load these classes. You can place them in the MagicDraw classpath or use the MagicDraw plugins mechanism. The same rules as writing the code for open API are used here.

These steps are common to all possible binary validation cases and will not be repeated in each case description.

See the MyBinaryValidationRuleImpl.java example in the <MagicDraw_install_dir>\openapi\examples\validation directory.

NOTE	The implementation class must be in the classpath of the MagicDraw application or if the implementation class is in a plugin then the plugin's classloader must be registered to the validation system (see "Binary validation rule in plugin.").

Create Binary Validation Rule - Case A

If you want to control when validation rule has to be executed and you want to control what must be validated and how, then you have to create Java class and implement interface `com.nomagic.magicdraw.validation.ValidationRule`. The class must have public no-arg constructor. Value of implementation property of the validation rule must be qualified name of the implemented class.

This case is not recommended for validating model elements because validation rule provider must implement not only validating of model elements but also other details that are provided by MagicDraw validation engine. In this case, validation rule provider must correctly implement validating of model elements that are from validation scope defined in project options, should take care that implementation would respect project property Exclude element from read-only modules and is responsible for implementing when validation has to be executed.

Create Binary Validation Rule - Case B

If you want to concentrate on implementation of validating model elements and delegate task of detecting model element changes and project property changes to active validation engine then you have to create Java class and implement `com.nomagic.magicdraw.validation.ElementValidationRuleImpl` and interface. The class must have public no-arg constructor. Value of implementation property of the validation rule must be qualified name of the implemented class.

Create Binary Validation Rule - Case C

If the a validation rule is designed for active validation then validation performance becomes very important. In this case we want that validation rule would be executed only then it is actually required, so implementation of validation rule must somehow inform the active validation engine which model element property changes are important to the validation rule. In order to create such a validation rule you have implement `com.nomagic.magicdraw.validation.ElementValidationRuleImpl` and `com.nomagic.magicdraw.validation.SmartListenerConfigurationProvider` interfaces. The class must have public no-arg constructor. Value of implementation property of the validation rule must be qualified name of the implemented class.

The `com.nomagic.magicdraw.validation.SmartListenerConfigurationProvider` interface defines a single method:

```
Map<Class<? extends Element>, Collection<SmartListenerConfig>>
getListenerConfigurations()
```

Implementation of this method should return a map of classes derived from `com.nomagic.uml2.ext.magicdraw.classes.mdkernel.Element` class to collection(s) of `com.nomagic.uml2.ext.jmi.smartlistener.SmartListenerConfig` objects.

Another way would be to extend `com.nomagic.magicdraw.validation.DefaultValidationRuleImpl` class and override the following method:

```
Map<Class<? extends Element>, Collection<SmartListenerConfig>>
getListenerConfigurations()
```

NOTES	In the **Constraint** Specification dialog box, **Constrained Element** property should be specified. Constrained element is element for which validation rule is created.

Validation rule that is interested in model class and interface names changes example

```
public Map<Class<? extends Element>, Collection<SmartListenerConfig>>
getListenerConfigurations() {
        Map<Class<? extends Element>, Collection<SmartListenerConfig>> configMap =
                new HashMap<Class<? extends Element>,
Collection<SmartListenerConfig>>();
        Collection<SmartListenerConfig> configs = new
ArrayList<SmartListenerConfig>();
        configs.add(SmartListenerConfig.NAME_CONFIG);
       configMap.put(com.nomagic.uml2.ext.magicdraw.classes.mdkernel.Class.class,
configs);

configMap.put(com.nomagic.uml2.ext.magicdraw.classes.mdinterfaces.Interface.class,
configs);
        return configMap;-
    }
```

NOTE In the **Constraint** Specification dialog box, the **Constrained Element** property should be Class and Interface from the UML Standard Profile.

Validation rule that is interested in Activity parameters and Activity parameter node changes example:

```
public Map<Class<? extends Element>, Collection<SmartListenerConfig>>
getListenerConfigurations()
    {
           Map<Class<? extends Element>, Collection<SmartListenerConfig>> configMap
= new HashMap<Class<? extends Element>, Collection<SmartListenerConfig>>();
```

```
            Collection<SmartListenerConfig> configs = new
ArrayList<SmartListenerConfig>();
            SmartListenerConfig parameterConfig = new SmartListenerConfig();
            Collection<String> parameterPropertiesList = new ArrayList<String>();
            parameterPropertiesList.add(PropertyNames.DIRECTION);
            parameterPropertiesList.add(PropertyNames.TYPE);
            parameterPropertiesList.add(PropertyNames.OWNED_TYPE);

parameterConfig.listenToNested(PropertyNames.OWNED_PARAMETER).listenTo(parameterPr
opertiesList);
            SmartListenerConfig cfg = new SmartListenerConfig();
            Collection<String> argumentCftList = new ArrayList<String>();
            argumentCftList.add(PropertyNames.PARAMETER);
            argumentCftList.add(PropertyNames.TYPE);
            argumentCftList.add(PropertyNames.OWNED_TYPE);
            cfg.listenTo(argumentCftList);
            SmartListenerConfig argumentConfig = new SmartListenerConfig();
            argumentConfig.listenTo(PropertyNames.NODE, cfg);
            configs.add(parameterConfig);
            configs.add(argumentConfig);
            configMap.put(Activity.class, configs);
            return configMap;
    }
```

See `JavaConstantNameValidationRuleImpl.java` example in `<MagicDraw_install_dir>/openapi/examples/validation` directory.

Create Binary Validation Rule - Case D

If you want to create a validation rule that will not be used in active validation and you do not need to provide solving actions then you can create a Java class that contains static method with signature:

public static Boolean <method_name>(<Element_type> param)

and specify <qualifiedClassName>.<method_name> as a body value of validation rule's specification.

The referred java method must be a static method and it must take exactly one parameter. Several validating methods can be placed into one Java class or use one class per validating method – this is irrelevant.

The type of the parameter MUST match the type of the constrained element of the validation rule. For validation rules on metaclasses, use the appropriate class from the `com.nomagic.uml2.ext.magicdraw.*` package.

For example, to write the rule for metaclass *DataType*, use *`com.nomagic.uml2.ext.magicdraw.classes.mdkernel.DataType`* as a type of the parameter.

For the validation rules on stereotypes, use the same class as you would use when specifying the validation rule for metaclass of that stereotype. For validation rules on the classifiers of the model, use the `com.nomagic.uml2.ext.magicdraw.classes.mdkernel.InstanceSpecification` as the type of the parameter.

The following is an example of a trivial validation rule, which always returns true (i.e. all elements are valid):

Java code:

```
package com.nomagic.magicdraw.validation;

import com.nomagic.uml2.ext.magicdraw.classes.mdkernel.DataType;

public class TestRule
```

```
{
     public static Boolean testMeta(DataType exp)
     {
           return Boolean.TRUE;
     }
}
```

Compile such code into Java bytecode and locate it where MagicDraw can load it (classpath, plugin), and then you can use it for validation:

1. Create the validation rule in our model.
2. Select *DataType* metaclass as the constrained element of the rule.
3. Select *Binary* language for the expression of the rule.
4. Specify `com.nomagic.magicdraw.validation.TestRule.testMeta` as the body of the expression of the rule.

Run the validation suite with included validation rule. The method will be invoked for each datatype model element, found in the scope of the validation run. For each element, where this method returns false, an entry will be placed in the validation results table.

For more information about writing Java code, which navigates through the model and accesses various data from the model, see other sections of current user guide.

Binary validation rule in plugin

MagicDraw validation engine must be able load validation rule implementation class. Validation engine is able to load class if the implementation class exists in MagicDraw classpath or if the validation rule implementation class is in plugin classpath then the plugin must register the plugin's classloader to validation system in this way:

```
EvaluationConfigurator.getInstance().registerBinaryImplementers(<PluginClassName>.
class.getClassLoader());
```

How to provide a solution for a problem found during validation?

Validation rule returns annotations as validation results to the validation engine. Each annotation can contain a list of action objects that implements how a particular problem found by validation rule can be solved. In order to create an action for solving validation rule's provider must create a Java class that extends `com.nomagic.actions.NMAction` class and implement `public void actionPerformed(ActionEvent e)` method. User will be able to invoke the action from the validation results table or from browser. In order to enable performing the action on multiple targets the action class must implement `com.nomagic.magicdraw.annotation.AnnotationAction` interface.

See `MyAction.java`, `FixJavaConstantNamesAction.java`, `MyBinaryValidationRuleImpl.java` and `JavaConstantNameValidationRuleImpl.java` examples in `<MagicDraw_install_dir>/openapi/examples/validation` directory.

TEAMWORK

MagicDraw API provides Teamwork Server accessing methods.

Code sniplet:

```
// check logged user
if (!user.equals(TeamworkUtils.getLoggedUserName()))
{
    // login to teamwork
    if (!TeamworkUtils.login(server, -1, user, password))
    {
        // login failed
        return;
    }
}

// load teamwork project
ProjectDescriptor projectDescriptor = TeamworkUtils
                    .getRemoteProjectDescriptorByQualifiedName(projectName);
ProjectsManager projectsManager = Application.getInstance().
                                          getProjectsManager();

projectsManager.loadProject(projectDescriptor, true);
Project project = Application.getInstance().getProject();

Model model = project.getModel();

// get locked by user
Collection userLockedElements = TeamworkUtils.
                                    getLockedElement(project, user);
if (!userLockedElements.contains(model))
{
    // model is not locked by user, get all locked
    Collection allLockedElements = TeamworkUtils.
                                   getLockedElement(project, null);
    if (!allLockedElements.contains(model))
    {
        // model is not locked - lock
        TeamworkUtils.lockElement(project, model, false);
    }
}
SessionManager.getInstance().createSession("Rename Model");
// change name
model.setName("MyModel");
SessionManager.getInstance().closeSession();
// unlcok and commit (because do not discard)
TeamworkUtils.unlockElement(project, model, false, false);
projectsManager.closeProject();
// logout
TeamworkUtils.logout();
```

Check the *com.nomagic.magicdraw.teamwork.application.TeamworkUtils* class JavaDoc for method descriptions.

CODE ENGINEERING

Since MagicDraw 16.0 you can perform Code Engineering using OpenAPI.

Code engineering allows generation of source code from specific model, and source code reversing into model elements. MagicDraw provides API for:

- Code engineering sets creation for particular programming languages.
- Automatic component creation for every class involved in forward engineering and every file involved into reverse engineering.
- Specification of working or output, or temporary directories for processing source code files. Destination of the code reverse operation output can be any model package.

In this chapter we will review how to manage code engineering and how to do reverse and forward engineering.

Code Engineering Set

A CodeEngineeringSet object represents a code-engineering object as a resource for forward or reverse engineering.

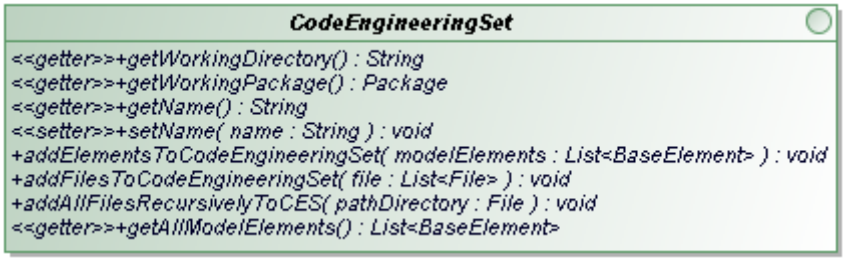


Figure 16 -- Interface of the Code Engineering Set

Each CodeEngineeringSet provides properties, which can be read:

- **Name**. Represents a name of the code engineering set, visible in the Browser.
- **Model elements**. Represents elements that are added into the code engineering set from the model.
- **Working directory**. Represents a code engineering directory where generated/reversed files are located.

Forward Engineering

To perform code generation, elements should be added to the CodeEngineeringSet object. Use the following method to add a list of model elements to the code engineering set:

- *addElementsToCodeEngineeringSet(List<BaseElement> modelElements)*

NOTE	Model elements should be in the working package, otherwise model element will not be added to code engineering set. Working package is set when creating code engineering set.

Reverse Engineering

Source code files are required to perform the Reverse Engineering. There are 2 methods available for adding files into code engineering set:

1. *addFilesToCodeEngineeringSet(List<File> file);*
   This method adds given list of files to code engineering set.
2. *addAllFilesRecursivelyToCES(String path);*
   This method adds all specific source code files to code engineering set, starting from given directory.

NOTE	Source code files should be in working directory, in order to have successful reverse.

Managing code engineering sets

CodeEngineeringManager class provides static API methods for creating, removing, reversing, generating and adjusting code-engineering settings. CodeEngineeringManager class is used for managing code engineering sets.

When creating the code engineering set, the following fields are required:

- Language and dialect IDs. All languages and dialects IDs are stored in the CodeEngineeringConstants class.
- Name of the code engineering set.
- Project, where code engineering set will be added.
- Working package.
- Working directory.

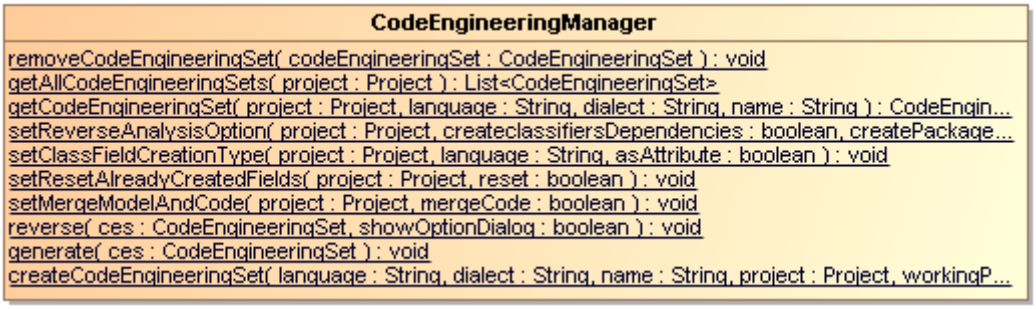


Figure 17 -- Class for managing Code Engineering Sets

- New CodeEngineeringSet can be created directly via CodeEngineeringManager:

CodeEngineeringManager.createCodeEngineeringSet(language,dialect, name, project, workingPackage, workingDirectory);

Language and dialect can be selected from the CodeEngineeringConstants class. Dialect is required for DDL and C++ languages.

NOTES	• null *workingPackage* means, that code engineering working package will be model Data by default; • null *workingDirectory* means, that code engineering working directory will be MagicDraw install root.

- To remove instance of CodeEngineeringSet use the following method:

CodeEngineeringManager.removeCodeEngineeringSet(codeEngineeringSet);

- All Code Engineering Sets can be retrieved by the following method:

CodeEngineeringManager.getAllCodeEngineeringSets(project);

- To perform generation of CodeEngineeringSet object use the following method:

CodeEngineeringManager.generate(codeEngineerigSet);

- To perform reverse engineering use the following method:

CodeEngineeringManager.reverse(codeEngineeringSet, showOptionsDialog);

Language specific options

JavaCEManager provides methods to set Java specific options.These options applies to all code engineering sets in project.

- To add classpaths for java code engineering sets, use:

  CodeEngineeringManager.setJavaClasspath(project, arrayOfclasspaths)

  NOTE: setting a new classpath will override the old one.

- To get applied classpaths for java code engineering sets, use:

  CodeEngineeringManager.getJavaClasspath(project)

- To resolve collection generics when reversing java code, use:

  CodeEngineeringManager.setResolveCollectionGenerics(project,true)

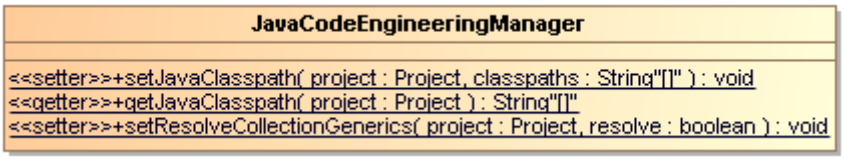


Figure 18 -- Class for managing JAVA Code Engineering Sets

Samples of the forward and reverse engineering

Performing the forward engineering

This example shows how to perform simple java code generation.

Step 1. Creating a CodeEngineeringSet

```
Project project = Application.getInstance().getProject();
String name = "sample CE project";
String workingDir = OPENAPI_DATA_DIRECTORY_PATH;
// create working package.
ElementsFactory ef = project.getElementsFactory();
Package workingPackage = ef.createPackageInstance();
workingPackage.setName("my working package");
workingPackage.setOwner(project.getModel());
// creating code engineering set.
CodeEngineeringSet javaGenerationSet =
CodeEngineeringManager.createCodeEngineeringSet(
CodeEngineeringConstants.Languages.JAVA, null, name, project, workingPackage,
workingDir);
```

Step 2. Adding model elements to the CodeEngineeringSet

```
Project project = Application.getInstance().getProject();
```

```
// create new element
ElementsFactory ef = project.getElementsFactory();
Class classA = ef.createClassInstance();
classA.setName("ClassA");
classA.setOwner(project.getModel());
List<BaseElement> modelsForSample = new ArrayList<BaseElement>();
modelsForSample.add(classA);
javaGenerationSet.addElementsToCodeEngineeringSet(modelsForSample);
```

Step 3. Performing CodeEngineeringSet generation

```
CodeEngineeringManager.generate(javaGenerationSet);
```

Performing the reverse engineering

This example shows how to perform simple java code reverse.

Step 1. Creating the CodeEngineeringSet

```
Project project = Application.getInstance().getProject();
String name = "sample CE project";
String workingDir = OPENAPI_DATA_DIRECTORY_PATH;// e.g C:\myworkingPackage
// create working package.
ElementsFactory ef = project.getElementsFactory();
Package workingPackage = ef.createPackageInstance();
workingPackage.setName("my working package");
workingPackage.setOwner(project.getModel());
// creating code engineering set.
CodeEngineeringSet set = CodeEngineeringManager.createCodeEngineeringSet(
CodeEngineeringConstants.Languages.JAVA, null, name, project, workingPackage,
workingDir);
```

Here null dialect is used for java language, because java doesn't have any dialect.

Step 2. Adding source code to the CodeEngineeringSet

```
ces.addAllFilesRecursivelyToCES(new File(workingDir + File.separator + "test
directory")); // starting from C:\myworkingPackage\test directory\
```

This sets given instance of code engineering set working directory and adds all files from that directory.

Set java classpaths for project:

```
String[] claspath = new String[] { path1, path2, path3, path4 };
JavaCodeEngineeringManager.setJavaClasspath(mTestProject2, project);
```

Step 3. Performing reverse of the CodeEngineeringSet

```
CodeEngineeringManager.reverse(ces, false);
```

ORACLE DDL GENERATION AND CUSTOMIZATION

MagicDraw Oracle DDL script generation is based on the Velocity engine. It provides ability to change generated DDL script by changing velocity template. In this chapter we will introduce how Oracle DDL generation works in MagicDraw, how to change template for some specific things.

Knowledge of the Velocity Template Language is necessary for understanding, editing, or creating templates.

Velocity documentation can be downloaded from: http://click.sourceforge.net/docs/velocity/VelocityUsers-Guide.pdf.

For more information about Oracle DDL 11g, see http://download.oracle.com/docs/cd/B28359_01/server.111/b28286/toc.htm

Introduction to Oracle DDL generation in MagicDraw

The MagicDraw Oracle DDL generation consists of the following three components:

- Velocity engine. Oracle DDL generation is performed by Velocity engine. The engine collects context variables and mergers them into template.
- Template. Template is a user-defined document that provides Velocity Template Language (VTL) syntax. The VTL syntax is used to manipulate the context variables for generating text script.

  The template file can be changed in the **CG Properties Editor** dialog box (in the Oracle DDL set shortcut menu, choose the **Properties** command).

  The default Oracle DDL template is stored in <MagicDraw install folder>\ data\DB_engineering\Oracle_template folder.
- Context variables. Context variables are MagicDraw models (retrieved from OpenAPI), code engineering set information, and user-defined variables.

To identify Oracle object check applied Stereotypes and Tagged Values.

Understanding Oracle DDL Template structure

Default Oracle DDL template is stored in <MagicDraw install folder>\ data\DB_engineering\Oracle_template folder. Template consists of many macros - velocity functions. Each macro is dedicated for particular object generation.

This example shows velocity macro for Oracle VIEW object generation:

```
#macro ( generateView $data )
     #set ( $QUERY_RESTICTION = "query restriction")
     #set ( $force = false)
     #set ( $force = $oracleHelper.getBooleanValueFromDefaultProfile(
$data,$VIEW_STEREOTYPE, $FORCE_TAG ) )
```

```
     #set ( $sqlrestriction = false)
     #set ( $sqlrestriction = $ oracleHelper.getFirstPropertyValueFromProfile(
$data,$VIEW_STEREOTYPE, $QUERY_RESTICTION ) )
     #set ( $sql = false)
     #set ( $sql = $ oracleHelper.getFirstPropertyValueFromProfile(
$data,$VIEW_STEREOTYPE, $QUERY_TAG ))
     #set ( $columns = false)
     #set ( $columns = $ oracleHelper.getViewColumnList( $data ) )
     #if ($columns)
           #set ( $columns = " ($columns)" )
     #else
           #set ( $columns = $nospace )
     #end
     #writeDocumentation ( $data $nospace )
     #writeLine( "$ oracleHelper.getCreate($data)#if ( $
oracleHelper.getPropertiesListFromDefaultProfile($data, $VIEW_STEREOTYPE,
$FORCE_TAG).size()>0 )#if( $force ) FORCE#else NO FORCE#end#end VIEW $
oracleHelper.getQualifiedName( $data )$columns AS" $nospace)
     #if ( $sql )#writeLine( $sql $tab )#end#writeText( ${sqlrestriction} ${space}
${nospace})${semicolon}
#end
```

Model element with stereotype “view” is passed to macro function, and then all element information is retrieved by $oracleHelper utility class. Oracle View stereotype has 3 properties. These tagged values store information about force, query restriction and query statements.

```
Method $oracleHelper.getFirstPropertyValueFromProfile( $data,$VIEW_STEREOTYPE,
$QUERY_RESTICTION) gets query restriction statement from element $data.
```

Customizing template

To change generation of the particular Oracle Object, add new functionality to its macro in velocity template. Helper utility class will assist in retrieving model information. Read the next chapter to get familiar with available methods.

We suggest to make a back up of default template. Default template is stored in <MagicDraw install folder>\data\DB_engineering\Oracle_template folder. The template file can be changed in the **CG Properties Editor** dialog box (in the Oracle DDL set shortcut menu, choose the **Properties** command).

When generating DDL, objects are passed from code engineering set to velocity engine.

Object, that are passed to Oracle DDL velocity engine:

Object name	Object type	Description
`$CESList`	`List<NamedElement>`	List of model elements that are added to code engineering set.
`$dropRequired`	`boolean`	Flag to notify if drop objects is required. This is a drop setting option which generates Drop statement.
`$oracleHelper`	`Java.lang.Class`	This is helper class, for retrieving information from model elements. Use this class to check element for applied stereotypes, get tagged values and element’s owned information.
`$newLineBracket`	`boolean`	Generation Option to generate bracket in new line.
`$genDocumentation`	`boolean`	Language option for documentation generation.

Utility class

This utility class helps to retrieve information from MagicDraw model elements.

Use these commands to get particular information:

- `$oracleHelper.hasStereotype($element, $stereotypeName)`

  Returns true if given element has applied given stereotype.

	Name	Type	Description
Parameters	`$element`	`com.nomagic.uml2.ext.magicdraw.classes.mdkernel.Element`	Element to check.
	`$stereotypeName`	`java.lang.String`	Stereotype name to be checked.
Return	-	`boolean`	true if elements has applied stereotype with given name.

- `$oracleHelper.getBooleanValueFromDefaultProfile($element, $stereotypeName, $propertyName)`

  Given an Element, Stereotype name and Tag name, returns tag value as Boolean from Oracle profile.

	Name	Type	Description
Parameters	`$element`	`com.nomagic.uml2.ext.magicdraw.classes.mdkernel.Element`	Element to check.
	`$stereotypeName`	`java.lang.String`	Stereotype name (from default profile) that should be applied.
	`$propertyName`	`java.lang.String`	Property name which value will be retrieved.
Return	-	`boolean`	Boolean value of property (tag).

- `$oracleHelper.getPropertiesListFromDefaultProfile($element, $stereotypeName, $propertyName)`

  Returns list of given property values, that exists on given element with applied stereotype from Oracle profile.

	Name	Type	Description
Parameters	`$element`	`com.nomagic.uml2.ext.magicdraw.classes.mdkernel.Element`	Element to be tested.
	`$stereotypeName`	`java.lang.String`	Stereotype name which should be applied.
	`$propertyName`	`java.lang.String`	Property (Tag) name to get values from.
Return	-	`java.util.List`	List of property values.

- `$oracleHelper.getFirstPropertyValueFromProfile($element, $stereotypeName, $propertyName)`

Returns First given Tag property value from given element, which has applied given stereotype.

	Name	Type	Description
Parameters	`$element`	`com.nomagic.uml2.ext.magicdraw.classes.mdkernel.Element`	Element to be tested.
	`$stereotypeName`	`java.lang.String`	Stereotype name, that should be applied to element.
	`$propertyName`	`java.lang.String`	Property name where to check for values.
Return	-	`java.lang.String`	First property value in String representation.

- `$oracleHelper.getDefaultValueAsBoolean($property)`

Given an property, returns default value as boolean.

	Name	Type	Description
Parameter	`$property`	`com.nomagic.uml2.ext.magicdraw.classes.mdkernel.Property`	Boolean Property to be check for default value.
Return	-	`boolean`	Default boolean value of property (tag).

- `$oracleHelper.getFirtPropertyValueFromGivenProfile($element, $profileName, $stereotypeName, $propertyName)`

Returns first given tag property value from given element, which has applied given stereotype from profile.

	Name	Type	Description
Parameters	`$element`	`com.nomagic.uml2.ext.magicdraw.classes.mdkernel.Element`	Element to be tested.
	`$profileName`	`java.lang.String`	Profile name where stereotype exists.
	`$stereotypeName`	`java.lang.String`	Stereotype name.
	`$propertyName`	`java.lang.String`	Property (Tag) name, which value will be checked.
Return	-	`java.lang.String`	First value in property list in String.

- `$oracleHelper.getPropertiesListFromProfile($element, $profileName, $stereotypeName, $propertyName)`

Returns list of given property values, that exists on given element with applied stereotype from given profile.

	Name	Type	Description

Parameters	`$element`	`com.nomagic.uml2.ext.magicdraw.classes.mdkernel.Element`	Element to be tested.
	`$profileName`	`java.lang.String`	Profile name where stereotype exists.
	`$stereotypeName`	`java.lang.String`	Stereotype name.
	`$propertyName`	`java.lang.String`	Property (Tag) name, which value will be checked.
Return	-	`java.util.List`	List of property values.

- `$oracleHelper.getStringValue($object)`

Given an value from Tag, returns String representation.

	Name	Type	Description
Parameter	`$element`	`com.nomagic.uml2.ext.magicdraw.classes.mdkernel.Element`	Element to be tested.
Return	-	`boolean`	true if element is the datatype.

- `$oracleHelper.isDataType($element)`

Returns true if element is data type.

	Name	Type	Description
Parameter	`$element`	`com.nomagic.uml2.ext.magicdraw.classes.mdkernel.Element`	Element to be tested.
Return	-	`boolean`	true if element is datatype.

- `$oracleHelper.getType($type, $modifier)`

Given a type and modifier, returns it's description.

	Name	Type	Description
Parameters	`$type`	`com.nomagic.uml2.ext.magicdraw.classes.mdkernel.Type`	Type of element.
	`$modifier`	`java.lang.String`	Modifier of Type.
Return	-	`java.lang.String`	Type definition for Oracle DDL.

- `$oracleHelper.getTypeModifier($element)`

Returns Type modifier for given element.

	Name	Type	Description
Parameter	`$element`	`com.nomagic.uml2.ext.magicdraw.classes.mdkernel.Element`	Element to be tested.
Return	-	`java.lang.String`	Type modifier description.

- `$oracleHelper.getParameters($operation)`

Returns list of operation parameters.

	Name	Type	Description
Parameters	`$element`	`com.nomagic.uml2.ext.magicdraw.classes.mdkernel.Operation`	Operation to be tested.
Return	-	`java.util.List`	List of operation parameters.

- `$oracleHelper.getColumnConstraint($column)`

Return given property Constraint.

	Name	Type	Description
Parameter	`$column`	`com.nomagic.uml2.ext.magicdraw.classes.mdkernel.Property`	Column to check for constraint.
Return	-	`java.lang.String`	Constraint definition.

- `$oracleHelper.getCreate($element)`

Returns CREATE statement for given element.

	Name	Type	Description
Parameter	`$element`	`com.nomagic.uml2.ext.magicdraw.classes.mdkernel.Element`	Element to be tested.
Return	-	`Java.lang.String`	description - CREATE or CREATE OR REPLACE.

- `$oracleHelper.getReturnParameter($operation, $createIfNeeded)`

Returns Return type parameter of given Operation.

	Name	Type	Description
Parameters	`$operation`	`com.nomagic.uml2.ext.magicdraw.classes.mdkernel.BehavioralFeature`	Operation to check.
	`$createIfNeeded`	`boolean`	Flag to create return parameter if it is not exists.
Return	-	`com.nomagic.uml2.ext.magicdraw.classes.mdkernel.Parameter`	Return parameter of given Operation

- `$oracleHelper.getIndexNameDefinition($index)`

Returns Name of given Index.

	Name	Type	Description
Parameter	`$index`	`com.nomagic.uml2.ext.magicdraw..classes.mdkernel.BehavioralFeature`	BehavioralFeature as a oracle index to be checked for name.

Return	-	java.lang.String	Name of index.

- `$oracleHelper.getTableConstraintDefinition($dependency)`

Given a dependency, returns table constraint definition.

	Name	Type	Description
Parameters	$dependency	com.nomagic.uml2.ext.magicdraw..classes.ddependencies.Dependency	Dependency to be tested.
Return	-	java.lang.String	Definition of table constraint.

- `$oracleHelper.isObjectPackage($element)`

Checks if given element is a Package.

	Name	Type	Description
Parameter	$element	com.nomagic.uml2.ext.magicdraw..classes.mdkernel.Element	Element to be tested.
Return	-	boolean	true if element is Package.

- `$oracleHelper.isPackageDatabase($package)`

Returns true if given package is Database.

	Name	Type	Description
Parameter	$package	com.nomagic.uml2.ext.magicdraw..classes.mdkernel.Package	Package to be tested.
Return	-	boolean	true if package is database.

- `$oracleHelper.isPublic($element)`

Returns true if given element has public visibility.

	Name	Type	Description
Parameter	$element	com.nomagic.uml2.ext.magicdraw..classes.mdkernel.Element	Element to be tested.
Return	-	boolean	true if element has public visibility.

- `$oracleHelper.reverseList($list)`

Reverses give list.

	Name	Type	Description
Parameter	$list	Java.util.List	List to be reversed.
Return	-	Java.util.List	Reversed list.

- `$oracleHelper.getRefName($element)`

Returns reference name description for element with "Ref:Element" tag.

	Name	Type	Description

Parameter	`$element`	`com.nomagic.uml2.ext.magicdraw..classes.mdkernel.Element`	Element to be tested.
Return	-	`java.lang.String`	Reference element name.

Example

In this sample we will extend current Oracle View DROP statement. In the Default template we have Oracle view drop function. In this sample the simple macro is presented and it generates the following text:

```
DROP VIEW view_name;
```

See the sample bellow:

```
#macro (dropView $data )
#writeLine( "DROP VIEW $utils.getQualifiedName( $data )${semicolon}" $nospace)
#end
```

We will add a new tag to identify the "CASCADE CONSTRAINTS" clause in the DROP VIEW statement. The following script will be generated:

```
DROP VIEW view_name CASCADE CONSTRAINTS;
```

There are three steps to do this:

Step 1. Creating a new stereotype and tags

We need to create a new stereotype with the Boolean property, or extend the default “View” Stereotype with a new property. Name a new property "cascade_clause". Apply the stereotype to the View object and set value to “true”.

We added a new tag to the view stereotype in the default profile.

Step 2. Changing the template file

Add the following lines to the template file:

```
#set($cascadeOption =false)
##this line is required to for setting new variable to false state.
#set($cascadeOption = $oracleHelper.getBooleanValueFromDefaultProfile(
$data,$VIEW_STEREOTYPE, "cascade_clause") )
```

This line retrieves boolean value from the given tag in given stereotype "$view_stereotype" and sets it to a newly created $cascadeOption value.

Then add a new checking clause into the drop statement. See the final method bellow:

```
#macro (dropView $data )
## sets value to new variable
#set($cascadeOption =
$oracleHelper.getBooleanValueFromDefaultProfile($data,$VIEW_STEREOTYPE,
"cascade_clause") )
#writeLine( "DROP VIEW $utils.getQualifiedName( $data )#if ($cascadeOption) CASCADE
CONSTRAINTS#end${semicolon}" $nospace)
#end
```

RUNNING MAGICDRAW IN BATCH MODE

MagicDraw plug-ins allows adding some custom action into MagicDraw actions sets. This approach works fine providing custom actions for user in UI, but does not solve custom task executing in the batch mode. For example, if you want to run MagicDraw, open some project, execute code generation and close MagicDraw, plug-ins will not work.

NOTE! MagicDraw application can not be run on headless device even in batch mode. Graphical environment is required.

MagicDraw provides API for running it in the batch mode. For this you need to extend the following class:

```
com.nomagic.magicdraw.commandline.CommandLine
```

Code sniplet:

```
public class ExportDiagramImages extends CommandLine
{
   public static void main(String[] args)
   {
      // launch MagicDraw
      new ExportDiagramImages().launch(args);
   }
   protected void run()
   {
      File projectFile = ...;
      //open some project
      ProjectDescriptor projectDescriptor =
      ProjectDescriptorsFactory.createProjectDescriptor(projectFile.toURI());
      Application.getInstance().getProjectsManager().loadProject(projectDescriptor
      , true);
      // project is opened and now you can work with your project
   }
}
```

Full working sample is provided in Open API examples with name ImageGenerator. It takes a project file, destination directory as arguments and generates images for all diagrams.

NOTE! Do not forget to add all *.jar files recursively (*except md_commontw.jar and md_commontw_api.jar*) from <MagicDraw installation directory>/lib directory into the classpath. Make sure the patch.jar is the first in the classpath.

NEW! CREATING MAGIC DRAW TEST CASES

MagicDraw provides a JUnit (www.junit.org) based test framework which can be used for the MagicDraw JUnit tests development. The main purpose of the MagicDraw test framework is to simplify the automatic unit and integration tests development for the MagicDraw program and its plug-ins. The MagicDraw test framework can be used by developers for testing their own MagicDraw plug-ins or for testing standard essential MagicDraw features.

The MagicDraw test framework consists of an abstract JUnit test case implementation and a number of tools which might be used for the following purposes:

- Starting the MagicDraw program.
- Managing MagicDraw projects
- Checking MagicDraw program for memory leaks.

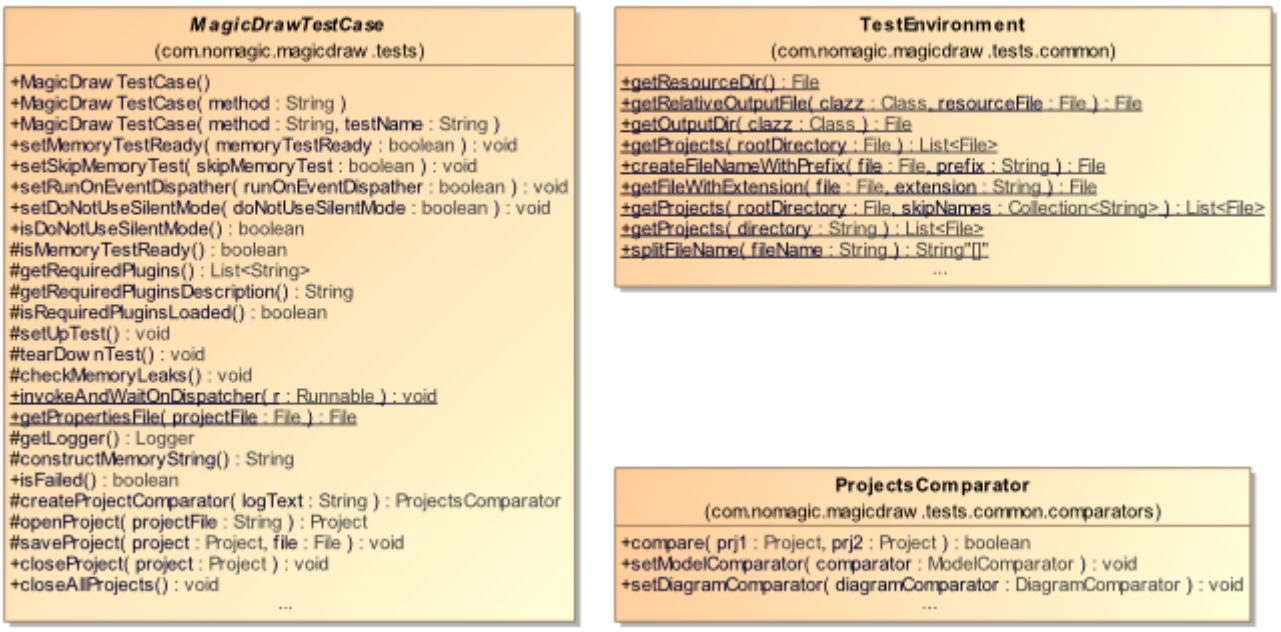


Figure 19 -- Main classes of MagicDraw test framework

Creating MagicDraw JUnit Test Case

The MagicDraw JUnit test case should be created by extending the abstract MagicDrawTestCase class from MagicDraw Open API (see the following MyTest sample). The MagicDrawTestCase class starts the MagicDraw program automatically for each test case method defined in MagicDrawTestCase and performs the memory leaks test after each completed test case.

MagicDrawTestCase provides default and specific constructors for creating a test case instance with a specific custom name for the specific test case method. Test cases with specific names might be helpful when several instances of the same test case are created and analyzed.

The MagicDraw test case initialization and tear down should be implemented in overridden MagicDrawTestCase setUpTest() and tearDownTest() methods. The standard JUnit method suite() might be used for preparing the tests suite with several instances of test cases which may use different test data.

```
import com.nomagic.magicdraw.tests.MagicDrawTestCase;
public class MyTest extends MagicDrawTestCase
{
     public MyTest(String testMethodToRun, String testName)
     {
           super(testMethodToRun, testName);
     }

     @Override
     protected void setUpTest() throws Exception
     {
           super.setUpTest();
           //do setup here
     }

     @Override
     protected void tearDownTest() throws Exception
     {
           super.tearDownTest();
           //do tear down here
     }

     public void testSomething()
     {
           //implement unit test here
     }

     public static Test suite() throws Exception
     {
           //you may create test suite with several instances of test.
           TestSuite suite = new TestSuite();
           suite.addTest(new MyTest("testSomething", "MagicDraw Test Sample"));
           suite.addTest(new MyTest("testSomething", "Another MagicDraw Test
Sample"));
           return suite;
     }
}
```

MagicDrawTestCase also provides methods for opening, saving, and closing MagicDraw projects. It also performs the memory leak test after the test case has been completed and after the MagicDraw project has been closed. The memory leak test for the whole test case can be disabled using the setMemoryTestReady() method, while the setSkipMemoryTest() method can be used to disable the memory leaks test on closing the MagicDraw project.

The list of required MagicDraw plug-ins for the test case can be configured by overriding the getRequiredPlugins() method of MagicDrawTestCase. The overridden method implementation should return the list of required plug-ins IDs. Textual information about required MagicDraw plug-ins and their loading status can be obtained using getRequiredPluginsDescription() and isRequiredPluginsLoaded() methods.

Textual information about the test process can be logged using the Log4j logger. The test case logger for the TEST category can be accessed using the getLog() method of MagicDrawTestCase. More information about the Log4j logger configuration and usage can be found at http://logging.apache.org/log4j/1.2/manual.html.

Comparing MagicDraw Projects

To compare two projects for testing purpose, the MagicDraw test framework provides the ProjectComparator class with the compare() method for comparing two MagicDraw projects (see the following figure). The default implementation of ProjectComparator can be created using the createProjectComparator() method of the

MagicDrawTestCase class. MagicDraw projects can be compared by checking their model elements and element symbols in diagrams for equality.

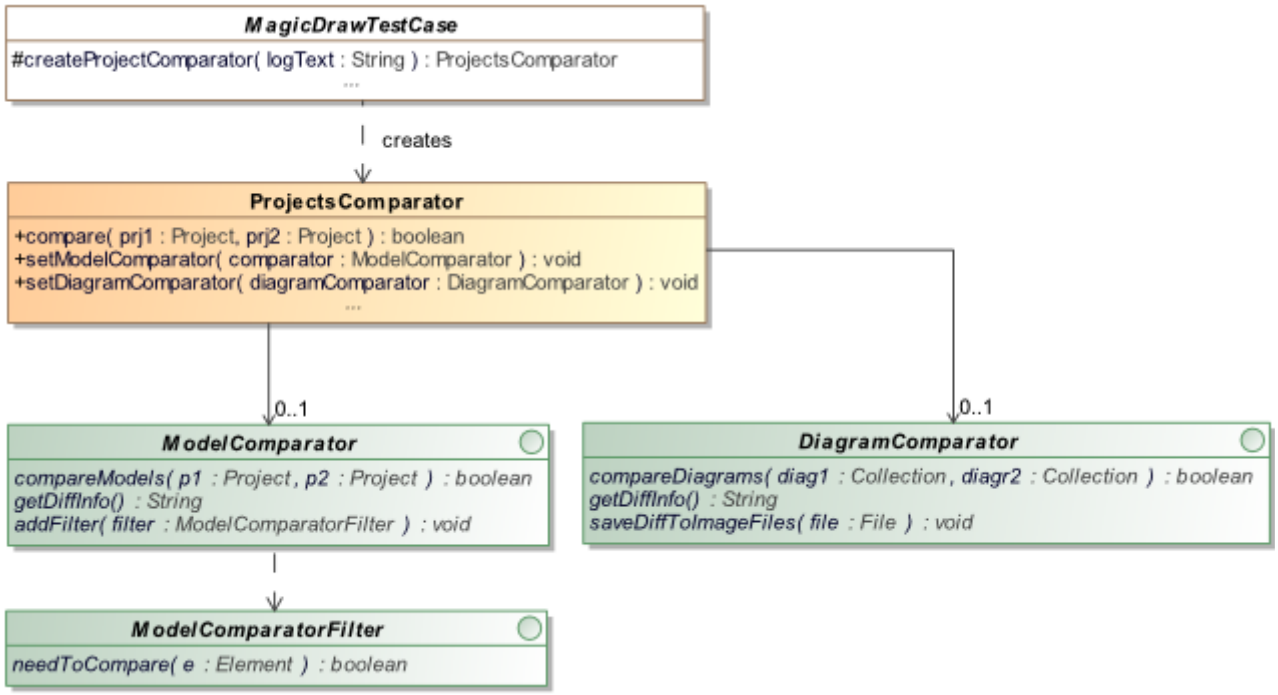


Figure 20 -- Project comparator provided by MagicDraw test framework

The model elements comparison can be configured using the ModelComparator interface. Developers may exclude some model elements from the comparison by providing the custom ModelComparatorFilter interface implementation. Please note that the default implementation of ProjectComparator does not compare the diagram information table, root model comment, and elements from modules.

The default implementation of DiagramComparator compares diagrams for changes by analyzing a location and size of the symbols presented in diagrams. The graphical differences of compared diagrams can be saved in the graphical PNG file using the saveDiffToImageFiles() method of the DiagramComparator interface.

Developers may create their own comparators for the custom diagrams and model elements comparison by implementing ModelComparator and DiagramComparator interfaces. The custom Model and Diagram comparators implementation can be set to ProjectComparator using appropriate setter methods.

Working with Test Resources

MagicDraw test cases may use external resources such as configuration files and MagicDraw projects for testing purposes. It is recommended to keep external test resources apart from test case implementation class files. The MagicDraw test framework provides methods for retrieving test resources from the one specific resource directory. Resource directory can be accessed by calling the TestEnvironment.getResourceDir() method. This method obtains the directory specified by the tests.resources system property. For information about specifying the tests.resources system property see "Configure Test Environment" on page 143. Configure Test Environment chapter. The MagicDraw test framework also provides methods for collecting MagicDraw projects from the resource directory. Developers may use TestEnvironment.getProjects() for collecting projects recursively from a specific directory. Unnecessary projects can be filtered out by specifying their names in skip.txt files placed in the projects directory.

MagicDraw test cases may produce some resources as a test output. The output directory for a specific test case can be created using TestEnvironment.getOutputDir(class). The class here specifies a class of the test

case which output directory should be accessed. There are also methods for working with output files. An output file for a specific MagicDraw project can be simply created by changing the project file extension (TestEnvironment.getFileWithExtension) or adding a special prefix to its name (TestEnvironment.createFileNameWithPrefix()).

Configure Test Environment

MagicDraw test cases can be run as a regular JUnit test case using the JUnit TestRunner class or configuration tools such as Ant or Maven. However, some MagicDraw test case specific system properties should be set.

In order to start MagicDraw correctly, all MagicDraw libraries from <MagicDraw installation directory>\lib should be added recursively to the test case running class path. The MagicDraw test case starts the MagicDraw program which requires the higher heap size configuration. The Max heap size should be no less than 400MB and the maximum size for the permanent generation heap should be no less than 128MB. These properties can be configured by providing arguments to Java Virtual Machine (JVM) as follows:

```
-Xmx800M -XX:MaxPermSize=135m
```

The MagicDraw installation directory should be also specified using the install.root system property which can be passed to JVM as a runtime argument as following:

```
-Dinstall.root=path_to_MagicDraw_installation_directory
```

If MagicDraw installation is set up to use the floating license, the following server properties should be passed to JVM as runtime arguments:

```
-DFL_SERVER_ADDRESS=flexnet_license_server_address
-DFL_SERVER_PORT=license_server_port
-DFL_EDITION=magicdraw_edition
```

Test cases may use external resources such as configuration files and MagicDraw projects during tests. It is recommended to keep external test resources apart from test case implementation class files. The MagicDraw test framework provides methods for retrieving test resources from the one specific resource directory. The resource directory for test cases can be configured by specifying the tests.resources system property of JVM. The tests resource property can be passed to JVM as a runtime argument as follows:

```
-Dtests.resources=path_to_resources_directory
```

The Log4j logger using in MagicDraw test cases can be configured by specifying the test.properties file which should be placed in <MagicDraw Installation directory>\data. The following sample presents the content of the test.properties file. It configures the logger to print INFO category messages to a console with a specific pattern.

```
log4j.appender.SO=org.apache.log4j.ConsoleAppender
log4j.appender.SO.layout=org.apache.log4j.PatternLayout
log4j.appender.SO.layout.ConversionPattern=%d [%t] %-5p %c - %m%n
log4j.rootCategory=INFO,SO
log4j.category.PLUGINS=INFO
log4j.category.GENERAL=INFO
log4j.category.MULTIUSER=INFO
```

More information about Log4j logger configurations can be found at http://logging.apache.org/log4j/1.2/manual.html.