ETSI GR NFV-IFA 016 V2.5.1 (2018-08)

Network Functions Virtualisation (NFV) Release 2; Information Modeling; Papyrus Guidelines

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Foreword

This Group Report (GR) has been produced by ETSI Industry Specification Group (ISG) Network Functions Virtualisation (NFV).

Modal verbs terminology

In the present document "**should**", "**should not**", "**may**", "**need not**", "**will**", "**will not**", "**can**" and "**cannot**" are to be interpreted as described in clause 3.2 of the ETSI Drafting Rules (Verbal forms for the expression of provisions).

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1 Scope

The present document gives guidelines for the use of Papyrus [i.1] when creating or maintaining NFV UML® [i.2] information model.

2 References

2.1 Normative references

Normative references are not applicable in the present document.

2.2 Informative references

References are either specific (identified by date of publication and/or edition number or version number) or non-specific. For specific references, only the cited version applies. For non-specific references, the latest version of the referenced document (including any amendments) applies.

NOTE: While any hyperlinks included in this clause were valid at the time of publication, ETSI cannot guarantee their long term validity.

The following referenced documents are not necessary for the application of the present document but they assist the user with regard to a particular subject area.

[i.1] Papyrus Eclipse™ UML® Modeling Tool.

NOTE: Available at https://www.eclipse.org/papyrus/.

[i.2] Eclipse™ Modeling Tools.

NOTE: Available at https://www.eclipse.org/downloads/packages/.

[i.3] OMG™ Unified Modeling Language™ (UML®) specifications 2.5.0.

NOTE: Available at http://www.omg.org/spec/UML/.

[i.4] ONF™ TR-515: "Open Networking Foundation Papyrus Guidelines 1.2" September 2016.

[i.5] ETSI GR NFV-IFA 017: "Network Functions Virtualisation (NFV) Release 2; Information Modeling; UML Modeling Guidelines".

[i.6] Eclipse™ Gendoc website.

NOTE: Available at http://www.eclipse.org/gendoc/.

[i.7] ETSI GR NFV-IFA 015: "Network Functions Virtualisation (NFV) Release 2; Management and Orchestration; Report on NFV Information Model".

[i.8] ETSI GR NFV-IFA 024: "Network Function Virtualisation (NFV) Release 2; Information Modeling; Report on External Touchpoints related to NFV Information Model".

3 Abbreviations

For the purposes of the present document, the following abbreviations apply:

IDE	Integrated Development Environment
JVM	Java Virtual Machine
MS	Microsoft®
ONF™	Open Networking Foundation

UML® Unified Model Language

4 Overview

The present document provides information for putting in operation and for using the Open Source tool Papyrus [i.1] and the Gendoc plugin [i.6].

The Papyrus tool is used to edit the NFV Information Model and Gendoc [i.6] is an Eclipse™ plug-in integrated with Papyrus that allows generating MS Word® documentation of a model from a template.

The UML® Modeling Guidelines are defined in ETSI GR NFV-IFA 017 [i.5].

The ONF™ Papyrus Guidelines (see ONF™ TR-515 [i.4]) have been used as a basis for these guidelines.

5 Getting Papyrus running

5.1 Introduction

The Open Source UML® tool Papyrus (see [i.1] is a plug-in for the Open Source integrated development environment (IDE) Eclipse™.

Current tool versions:

- Papyrus version 3.2.x or 3.3.x
- Gendoc version 0.6.x (V0.6.0)

This clause explains how to get Papyrus running and how to create a model.

5.2 Downloading Papyrus

The instructions to download Papyrus can be found in the Papyrus Download page:

https://www.eclipse.org/papyrus/download.html.

The basic procedure is to setup Papyrus with update sites as summarized on the download page:

- The most basic procedure for installing Papyrus consists in installing the Eclipse Modeling Package for your own platform.
- Then, use the discovery interface ("Help" > "Install Modeling Component") and select Papyrus.
- Install the latest release from Papyrus. See instructions below "Papyrus Update sites".

These steps will be detailed in this clause.

The Oxygen Eclipse Modeling Tools can be downloaded from the Oxygen download page:
https://www.eclipse.org/downloads/packages/release/Oxygen/3.

NOTE: The "Eclipse™ Modeling Tools" package needs to be downloaded, not any other package.

Figure 5.2-1: Eclipse Oxygen Modeling Tools Download Page

Eclipse Oxygen Modeling Tools requires a 1.8 compatible JVM.

Once downloaded, Eclipse™ cannot be "installed" on the target machine. The zip-file needs to be extracted in a new folder as shown on figure 5.2-2:

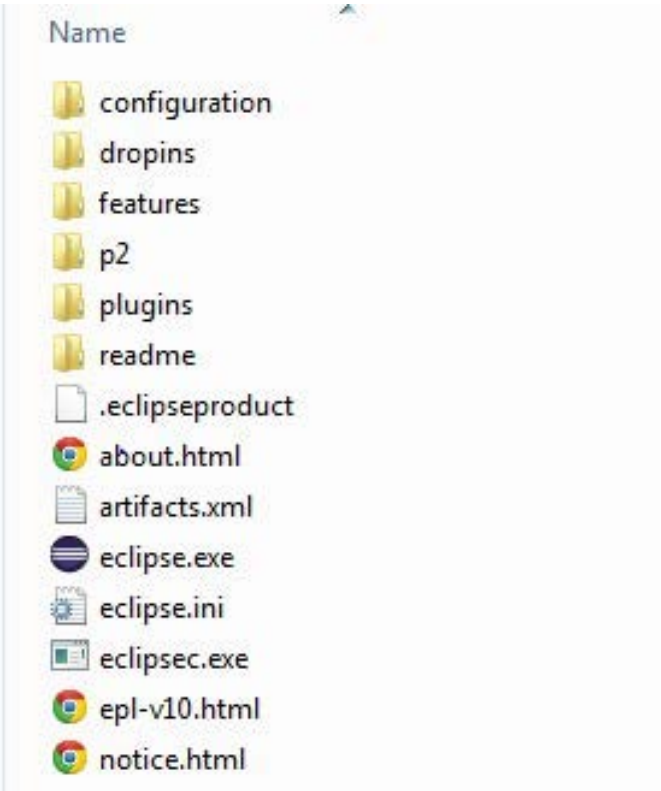


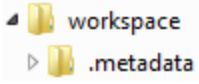
Figure 5.2-2: Content of the Eclipse Folder after Extracting the Zip-file

To launch Eclipse™, double-click on the Eclipse.exe file.

The initial Eclipse Welcome icon, shown in figure 5.2-3 appears.

Figure 5.2-3: Initial Eclipse Welcome Icon

After launching Papyrus, a default workspace folder is created in the home directory (…/users/<users name>/). The workspace configuration information is contained in the .metadata folder (which is automatically created):



Any empty (need not be empty but is recommended) folder - anywhere - can be used as the workspace-folder. The workspace can be selected during the start of Papyrus.

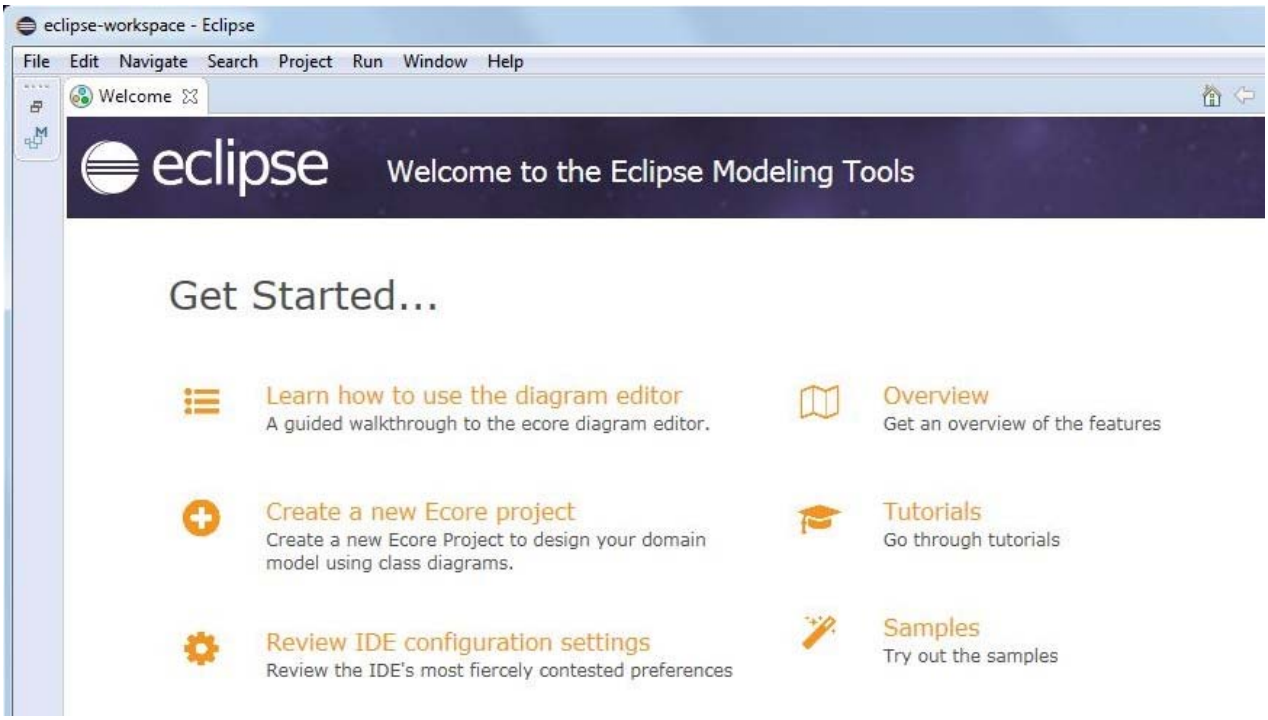


Figure 5.2-4: Initial Welcome page of Eclipse

Figure 5.2-4 shows the initial welcome page of Eclipse.

Close the Welcome tab at the upper left corner. Eclipse™ is now ready for initial installation of Papyrus.

To add Papyrus, click menu Help and then Install Modeling Components as shown in figure 5.2-4a, figure 5.2-5, figure 5.2-7 and figure 5.2-8.

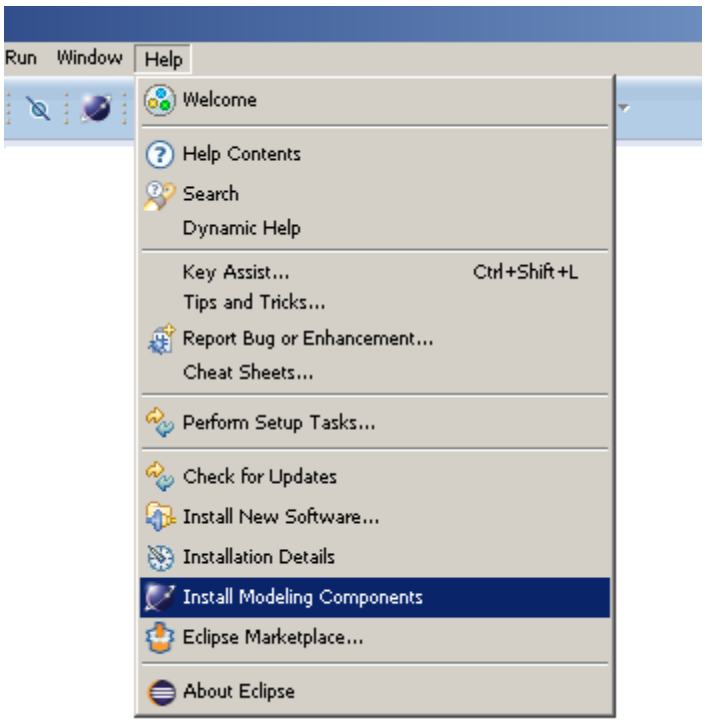


Figure 5.2-4a: Installing Papyrus (1)

Select Papyrus and click Finish.

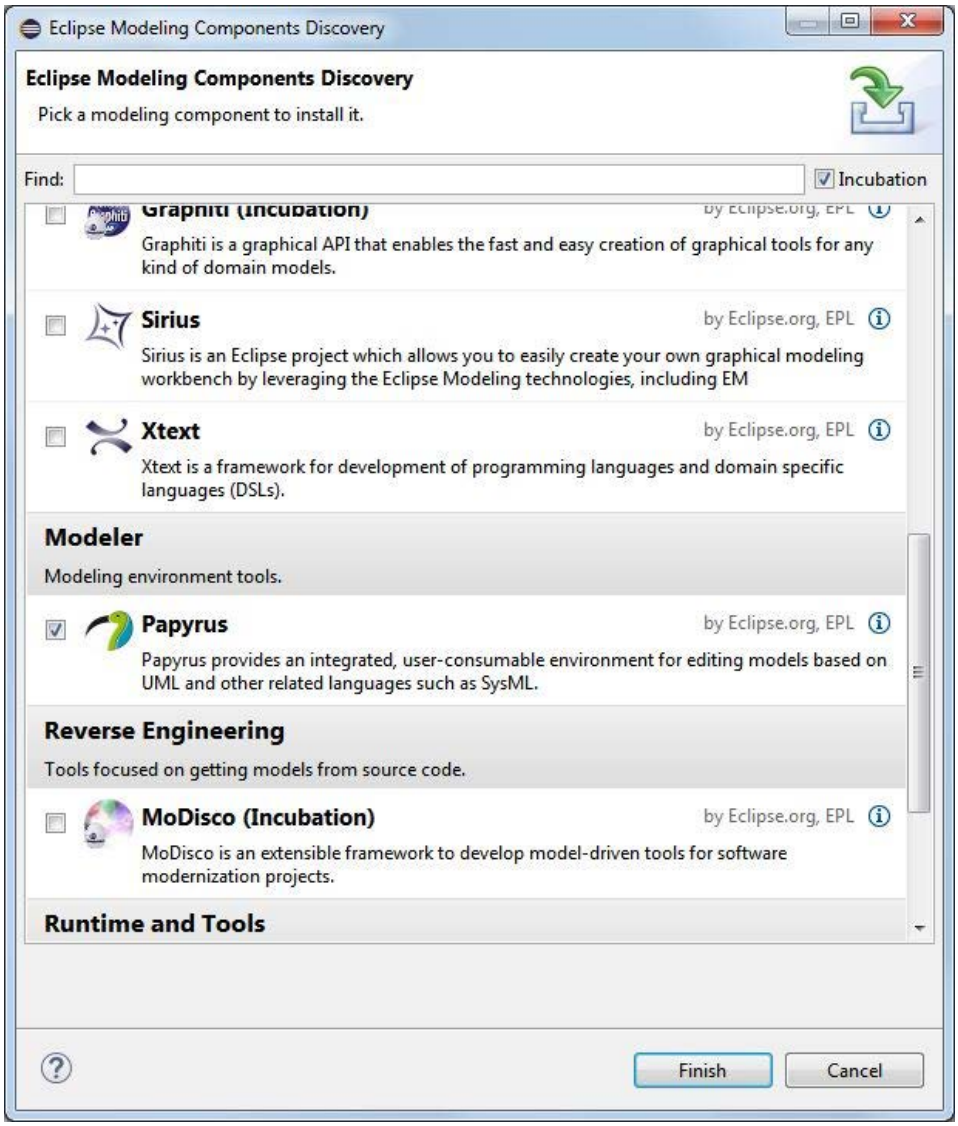


Figure 5.2-5: Installing Papyrus (2)

If a proxy to access internet is needed, it can be configured under Windows, Preferences, then General, Network Connections as shown on figure 5.2-6.

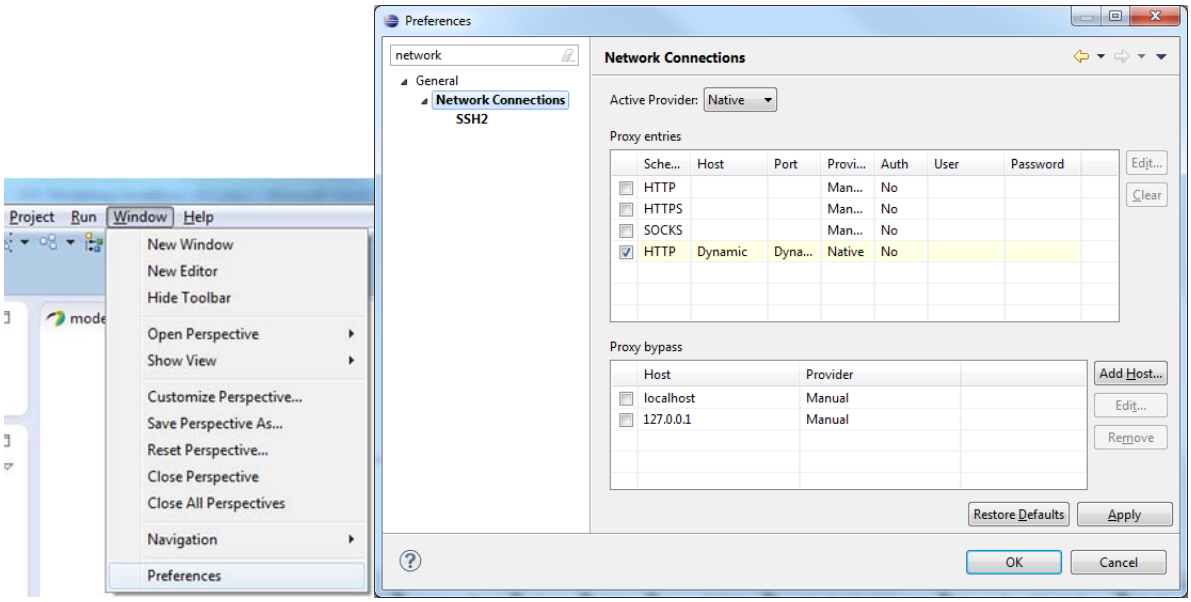


Figure 5.2-6: Proxy configuration

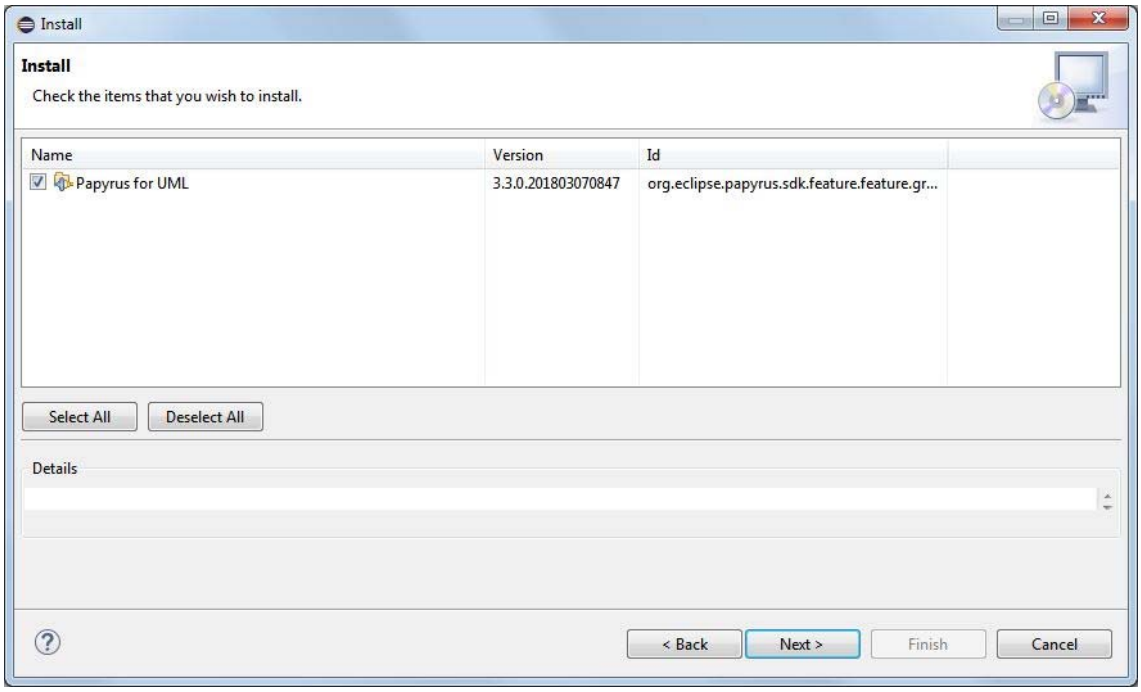


Figure 5.2-7: Installing Papyrus (3)

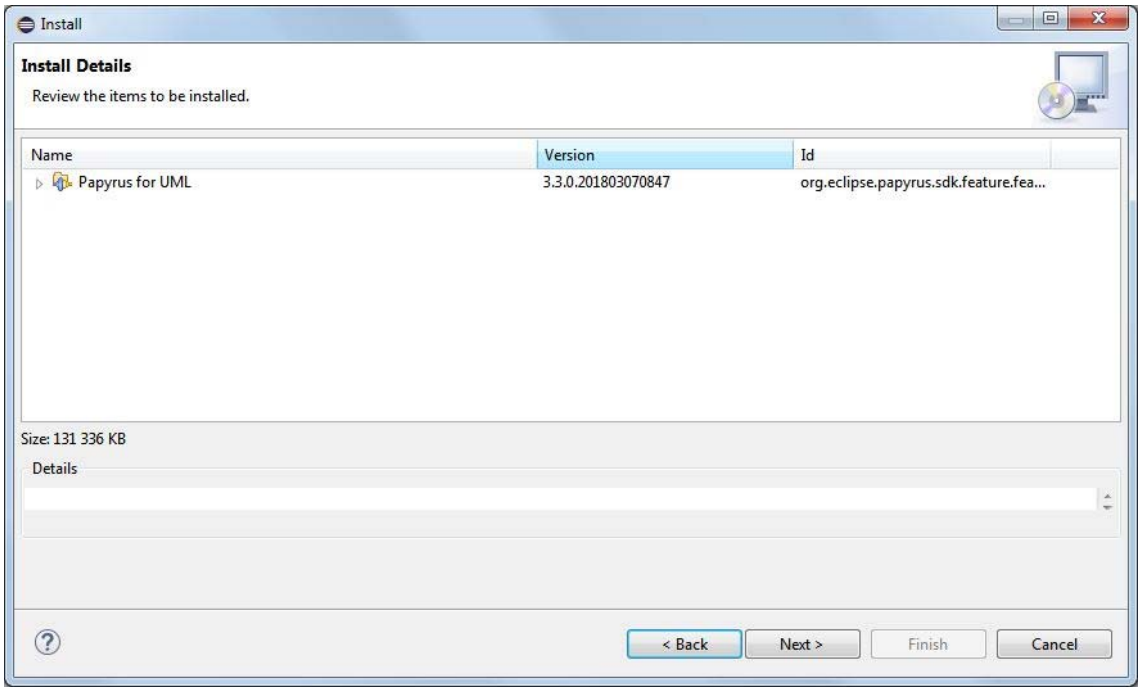


Figure 5.2.8: Installing Papyrus (4)

When prompted, accept the terms of the license agreement as shown on figure 5.2-9.

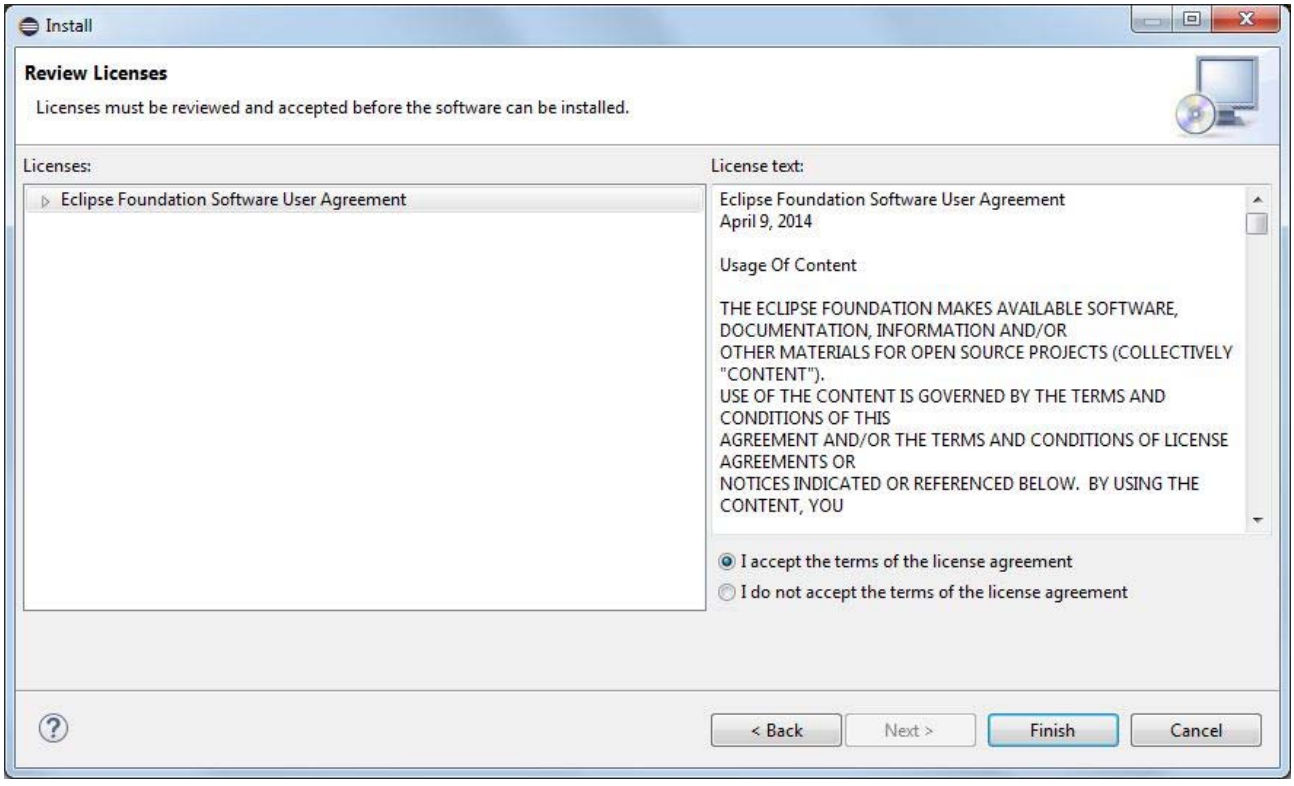


Figure 5.2-9: Installing Papyrus (5)

After restarting Eclipse™, switch to the Papyrus Perspective as shown on figure 5.2-10 or figure 5.2-11 by:

- either going via menu Window > Perspective > Open Perspective > Other…:

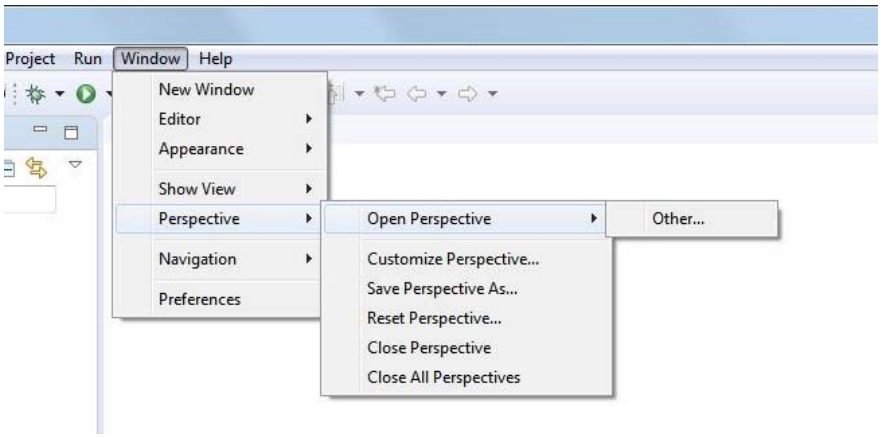


Figure 5.2-10: Open Papyrus perspective (1)

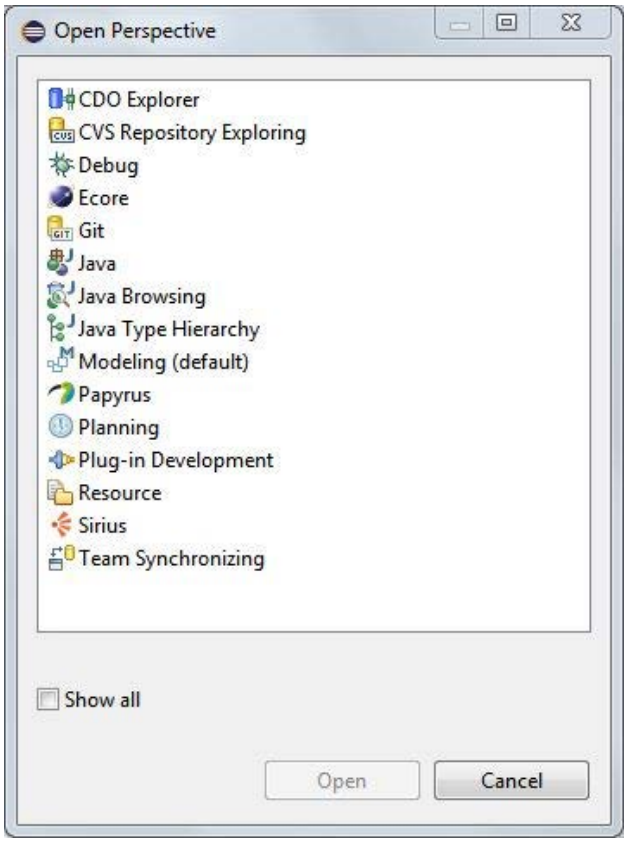
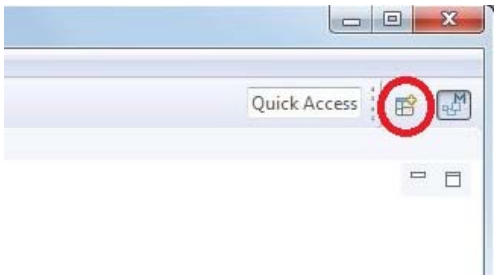


Figure 5.2-11: Open Papyrus perspective (2)

- or by clicking the Open Perspective-button ( ) at the top right side of the screen:



and then selecting Papyrus as shown on figure 5.2-12.

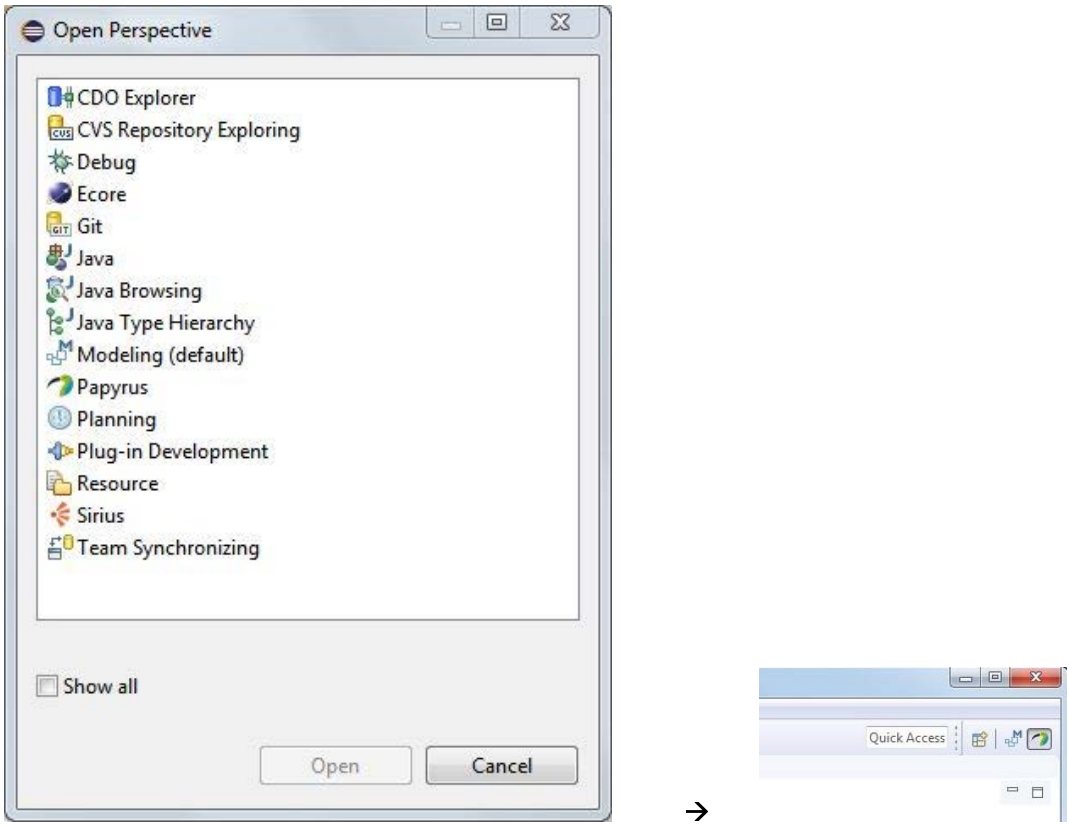


Figure 5.2-12: Open Papyrus Perspective

5.3 Papyrus overview

The outline of the Papyrus Perspective presents different windows and toolbars as shown in figure 5.3-1.

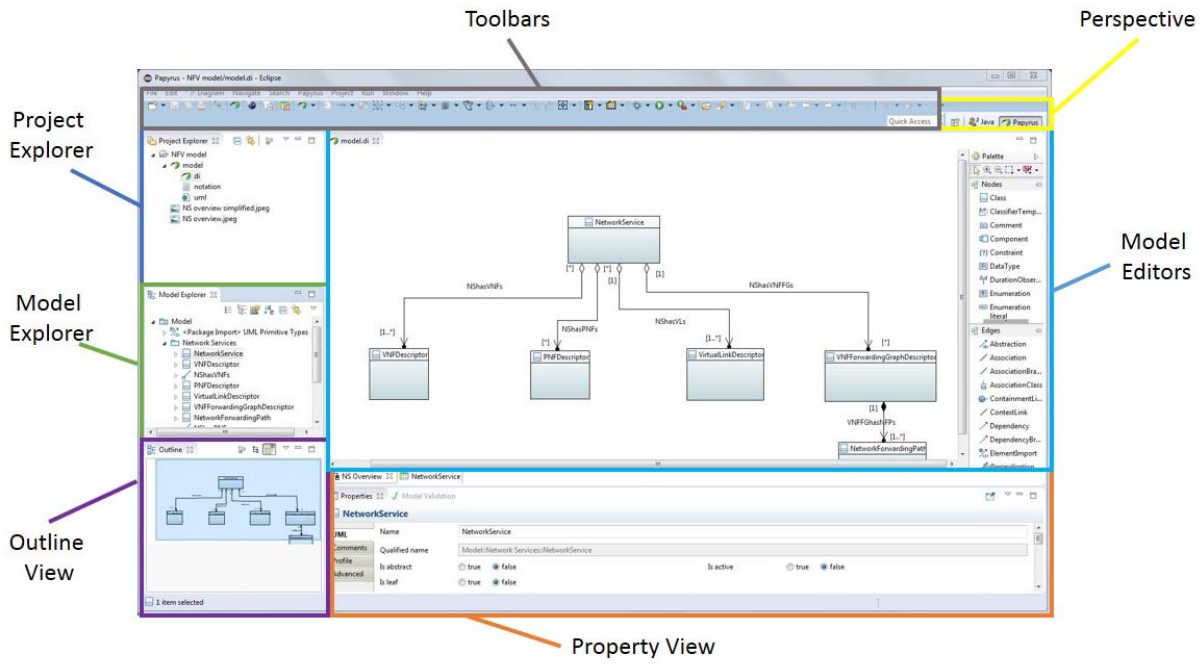


Figure 5.3-1: Outline of Papyrus perspective

- **Perspective:** it provides the modeling context and the layout of the windows, as well as the definition of the menus and toolbars. For using Papyrus, it is always set to "Papyrus".
- **Project Explorer:** it is used to manage Papyrus projects at system level. It provides a view on the model files in the workspace folder.
- **Model Explorer:** it provides the internal view of the model selected in the Project Explorer. It is a tree-based model editor for the whole model. If the Project Explorer contains several models, only one at a time can be selected to be edited in the Model Explorer.
- **Model Editors:** it allows graphic edition of the model via diagrams. Class diagrams are the only type of diagram mandated.
- **Property View:** it is a form-based editor allowing to view and edit the detailed property of a given element.
- **Outline View:** it provides a read-only view of the model presented in the Model Editor.

5.4 Installing Gendoc plugin

The Gendoc plugin is used in conjunction with a document template. The template contains instructions that enable generation of a Microsoft® Word® document. The document can include extracts from the model such as diagrams, class definitions, attribute definitions along with their stereotypes, etc. as well as figures and text directly entered into the template. This clause provides instructions on how to install Gendoc followed by guidance on construction of Gendoc templates along with example fragments of templates.

Click menu Help and then Install New Software... as shown in figure 5.4-1.

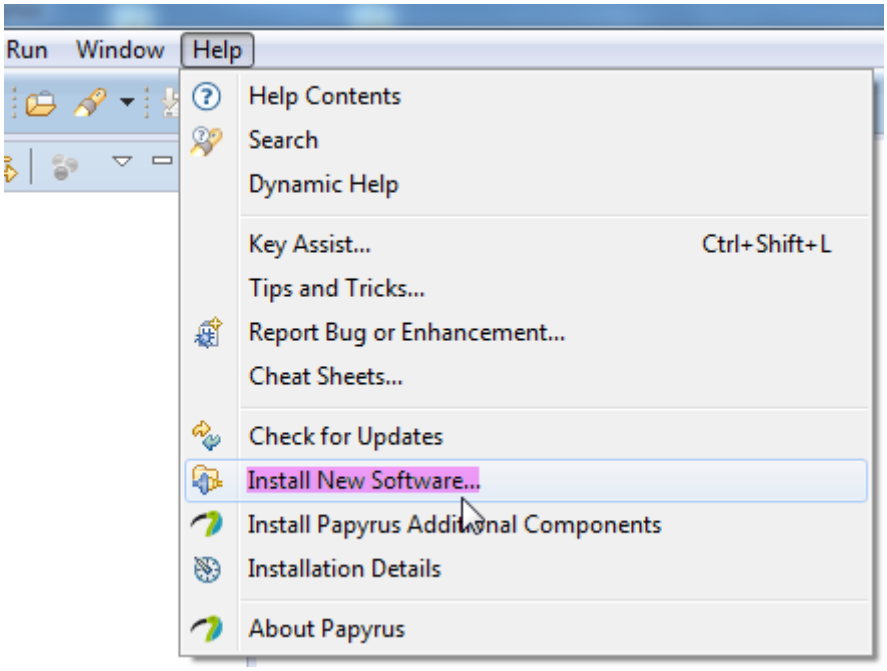


Figure 5.4-1: Installing Gendoc (1)

Click Add... and enter the Gendoc 0.6.0 update site as shown in figure 5.4-2:

- http://download.eclipse.org/gendoc/updates/releases/0.6.0/

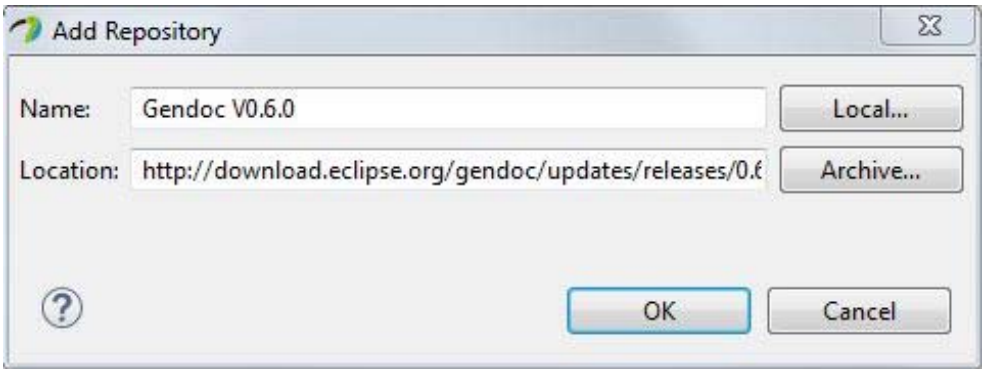


Figure 5.4-2: Installing Gendoc (2)

Select Gendoc as shown in figure 5.4-3.

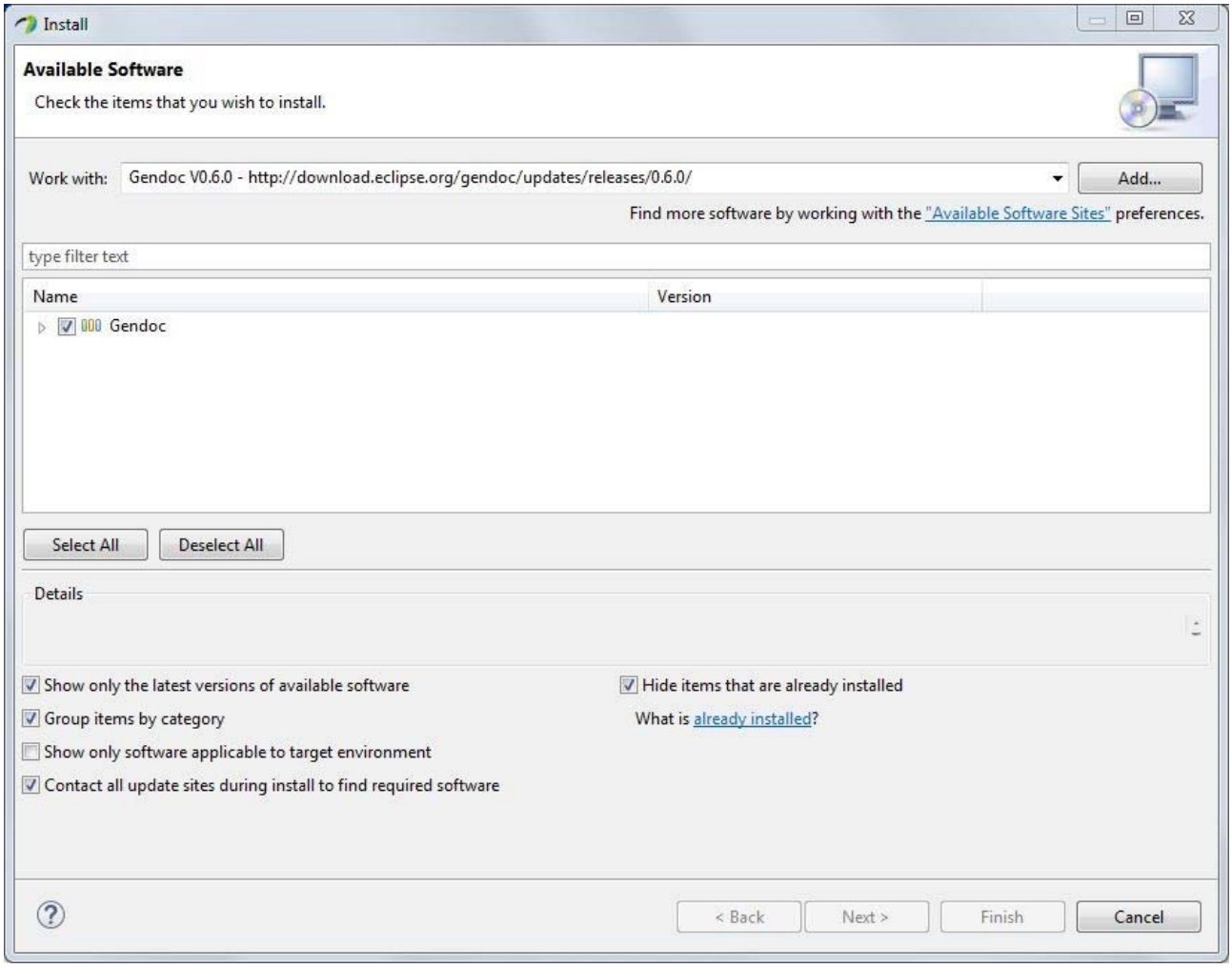
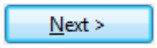


Figure 5.4-3: Installing Gendoc (3)

Then click  and follow the instructions.

5.5 Importing a model

The Papyrus Perspective offers a Project Explorer and a Model Explorer as shown in figure 5.5-1.

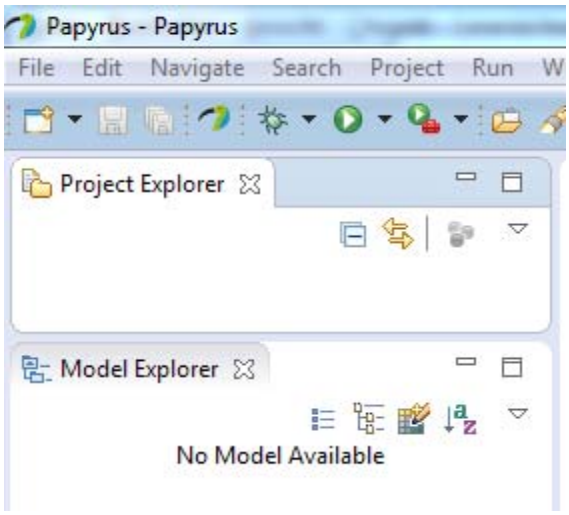


Figure 5.5-1: Papyrus Project Explorer/Model Explorer

NOTE 1: Models cannot exist on their own. Every model needs to be contained in a project.

NOTE 2: A project can contain zero or more models.

The Project Explorer window provides a view on the model files in the workspace-folder. The Model Explorer window provides the internal view of the model selected in the Project Explorer. The Model Explorer can only show (edit) one model at a time.

The actual interface specification is contained in the Information Model and the additional properties of the UML® artefacts are defined in a Profile Model. It is possible to organize the two models in a single project (*Alternative 1* in figure 5.5-2) or in two separate projects (*Alternative 2* in figure 5.5-2).

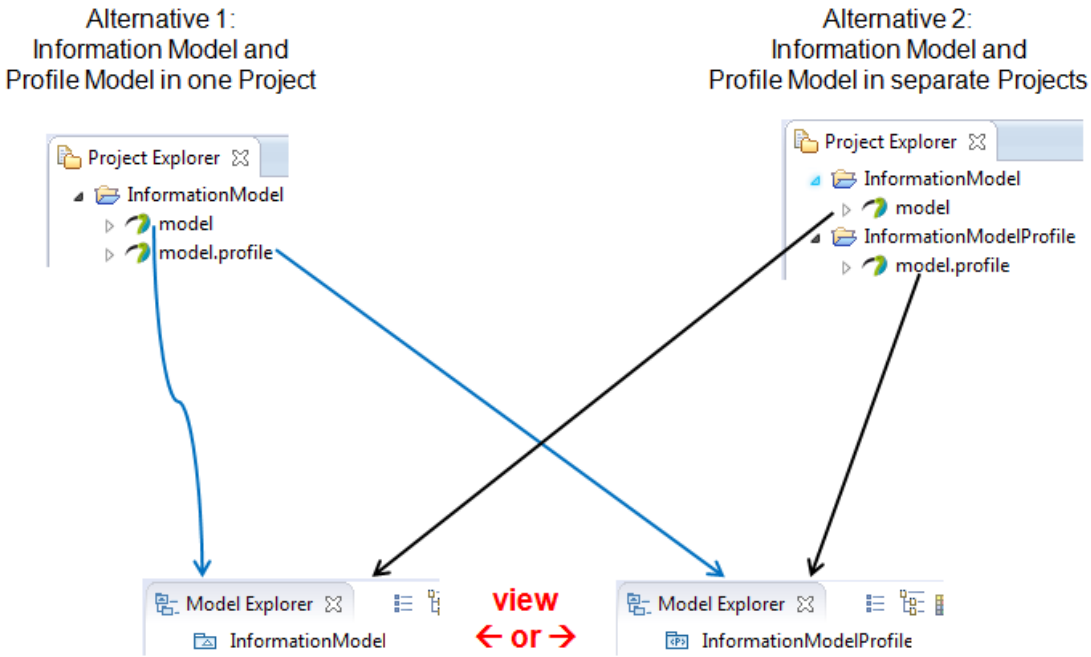


Figure 5.5-2: Papyrus Model Structure

NOTE 3: ETSI NFV Information Model is using Alternative 2: Information Model and Profile Model in separate projects.

NOTE 4: ETSI NFV Information Model is using the OpenModel Profile and the ProfileLifecycle Profile. Those 2 profiles are provided as part of the model ZIP. The OpenInterfaceModel Profile is not used by the ETSI NFV Information Model.

Download the latest model GR (e.g. ETSI GR NFV-IFA 015 [i.7]). The extracted ZIP contains a ZIP file of the current model. For the ETSI NFV Information Model, the format is NfvInformationModelv<*version*>.zip.

The next step is to import the OpenModelProfile files and XxxModel files into Papyrus.

Right-click in the Project Explorer area to open the menu containing the Import button as shown in figure 5.5-3.

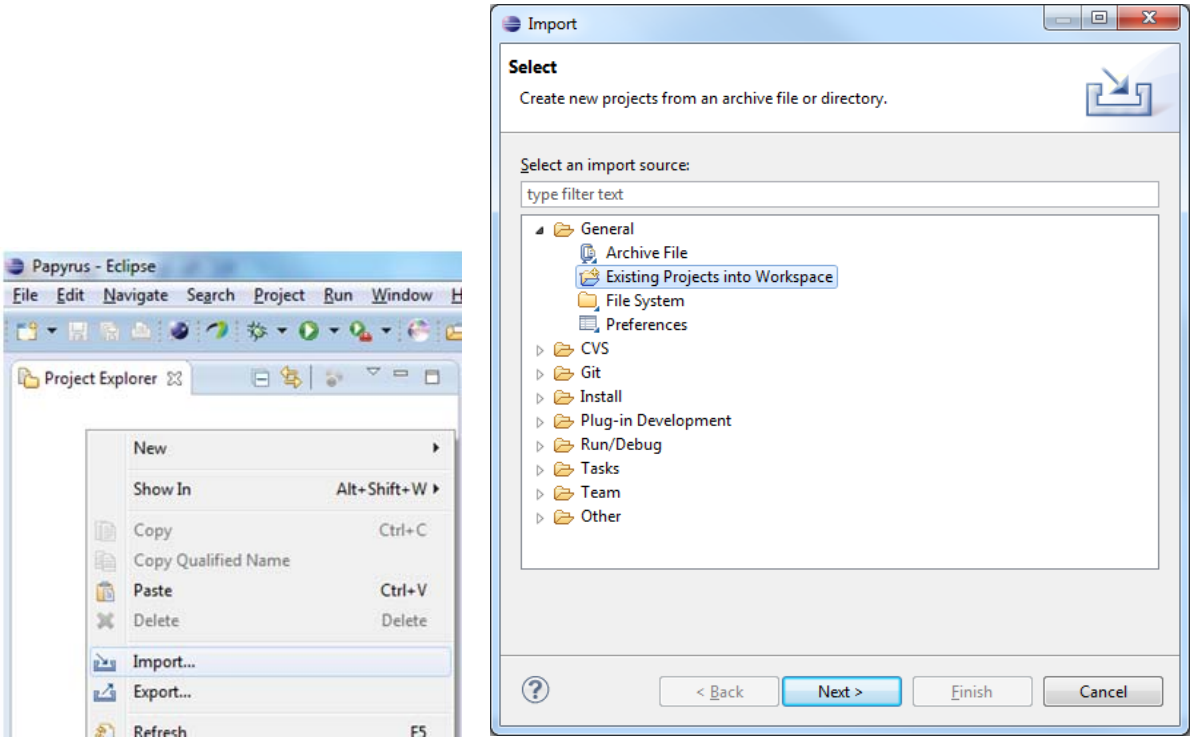


Figure 5.5-3: Importing a model (1)

Select General> Existing Projects into Workspace. Click Next> and then point via the Browse button to navigate to the folder containing the archive file to be imported as shown in figure 5.5-4.

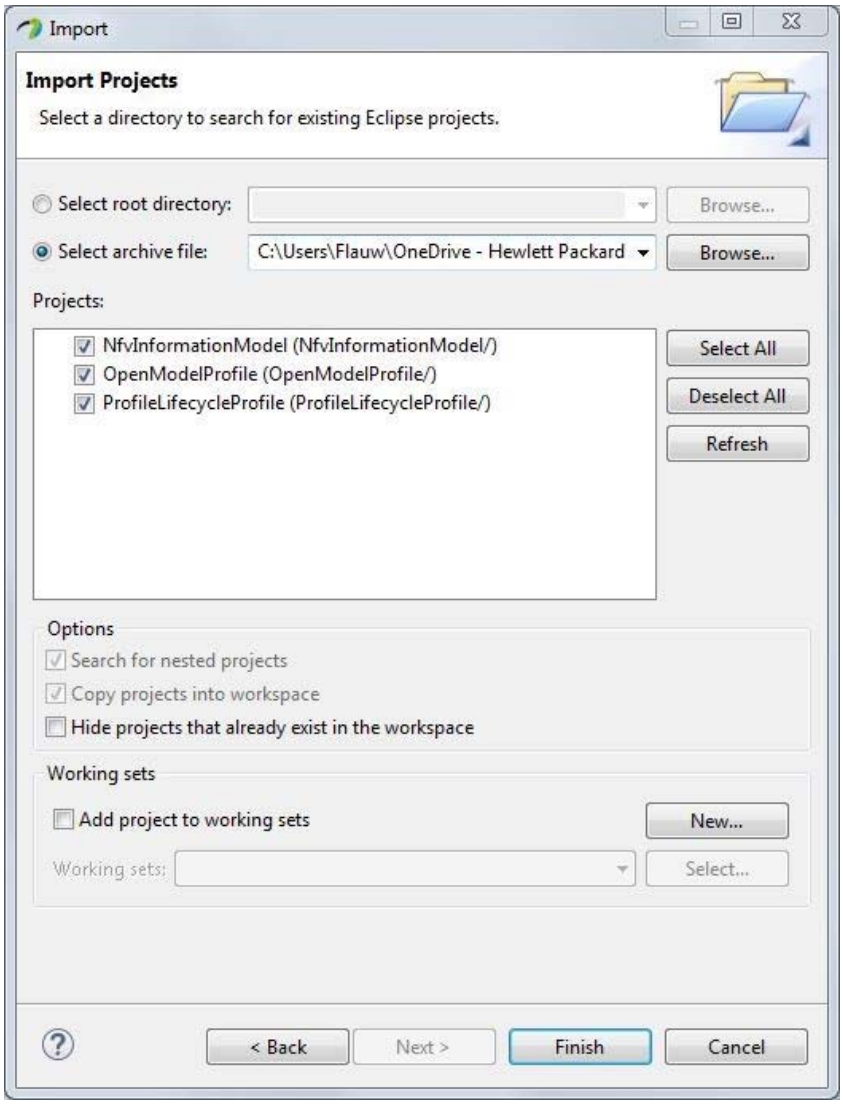


Figure 5.5-4: Importing a model (2)

Always import both the Information Model and the 2 Profiles.

A double click on NfvModel in the Project Explorer opens the model in the Model Explorer as show in figure 5.5-5.

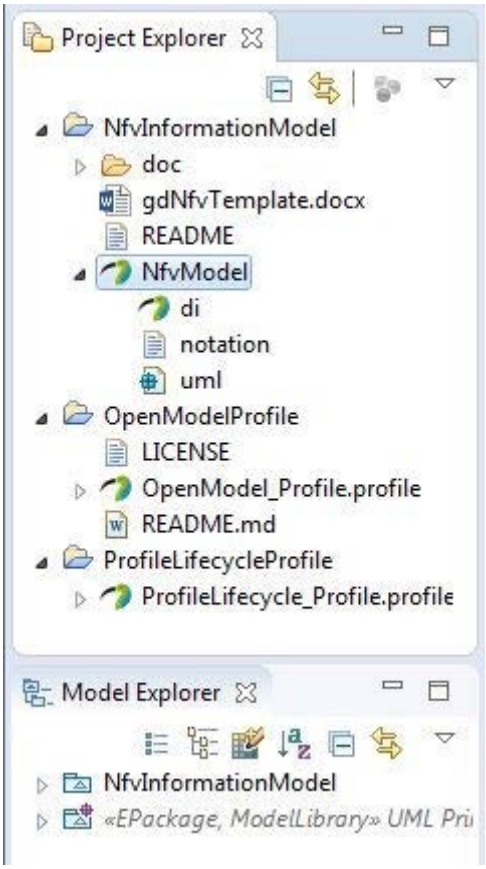


Figure 5.5-5: Open a Model

Now the model import is completed.

5.6 Deleting a Project

Projects can be deleted from the Project Explorer by a right click on the project (e.g. XxxModel) and selecting Delete as shown in figure 5.6-1.

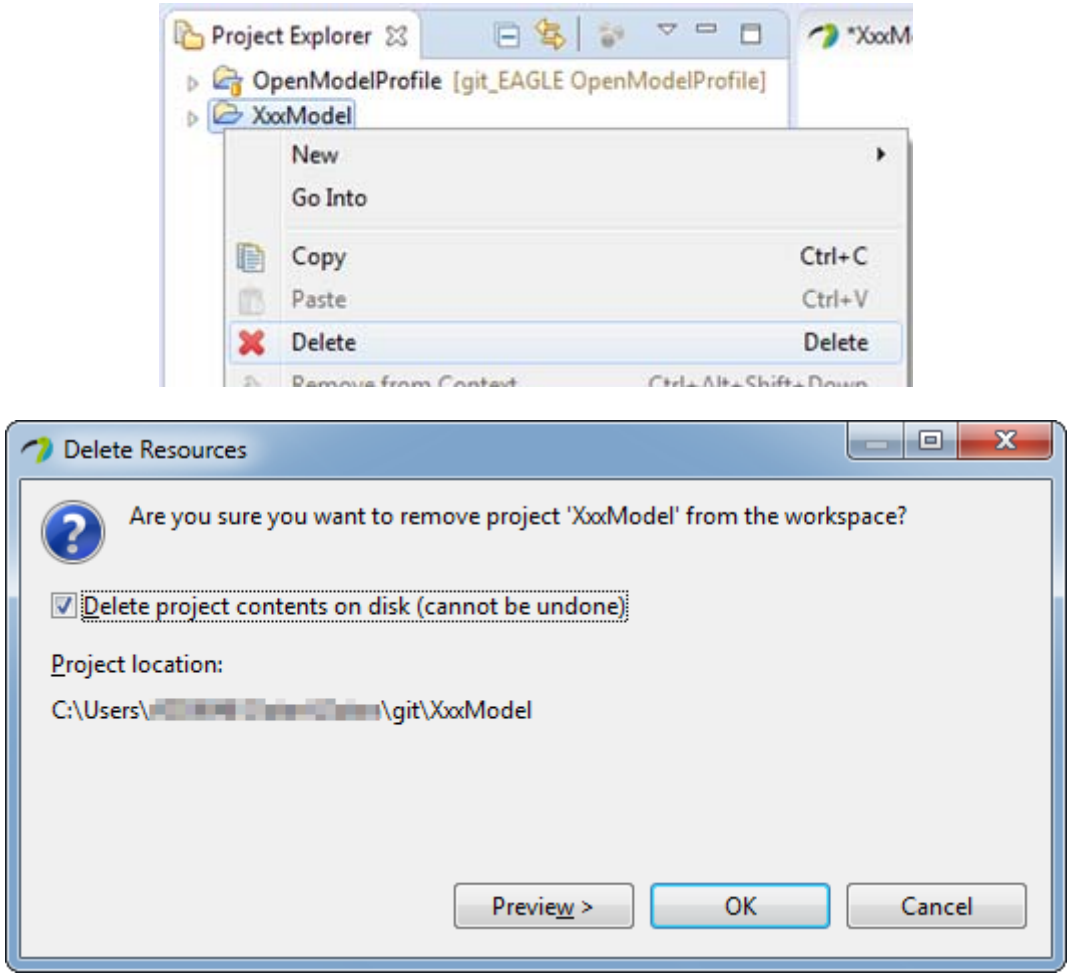


Figure 5.6-1: Delete a Project

6 Using Papyrus

6.1 Illustrative Profile and Model

This guideline document uses an illustrative UML® profile, as shown in figure 6.1-1, and an illustrative core-model, as shown in figure 6.1-2, and sub-model to explain the handling of Papyrus.

UML® artefacts are defined by their properties (i.e. a kind of Meta Model). Standard properties are defined by the UML® Specification [i.3] which are usually already supported by the UML® tool (e.g. Papyrus). Additional specific properties are defined in a UML® Profile (model).

The UML® Guidelines document ETSI GR NFV-IFA 017 [i.5] describes the additional properties in detail.

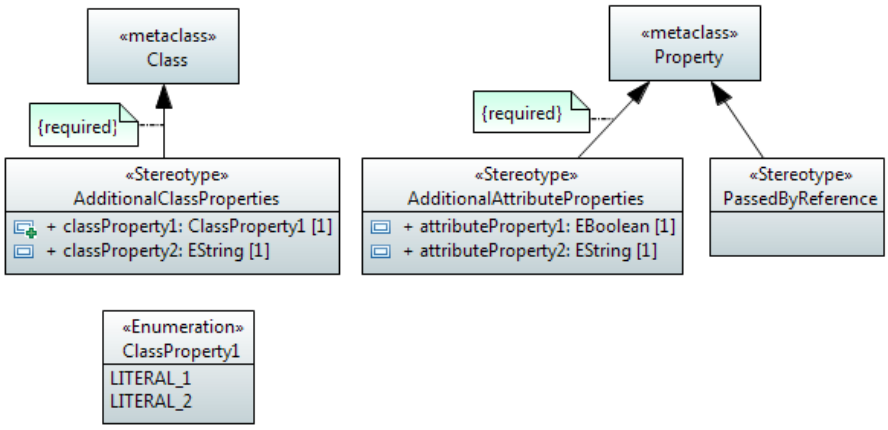


Figure 6.1-1: Illustrative UML® Profile

The AdditionalClassProperties stereotype adds properties classProperty1 and classProperty2 to the object classes in the model. The extension relationship has been defined as "required" which adds the additional properties to all object classes; i.e. for every class created, the AdditionalClassProperties stereotype will be present by default.

The AdditionalAttributeProperties stereotype adds properties attributeProperty1 and attributeProperty2 to the attributes in the model. The extension relationship has been defined as "required", which adds the additional properties to all attributes; i.e. for every attribute created, the AdditionalAttributeProperties stereotype will be present by default.

The PassedByReference stereotype identifies an attribute or an operation parameter being passed by value or passed by reference. The extension relationship has not been defined as "required", which means that the stereotype has to be associated to the attribute on a case by case basis.

NOTE: Only those attributes and operation parameters that refer to object classes may have the PassedByReference stereotype.

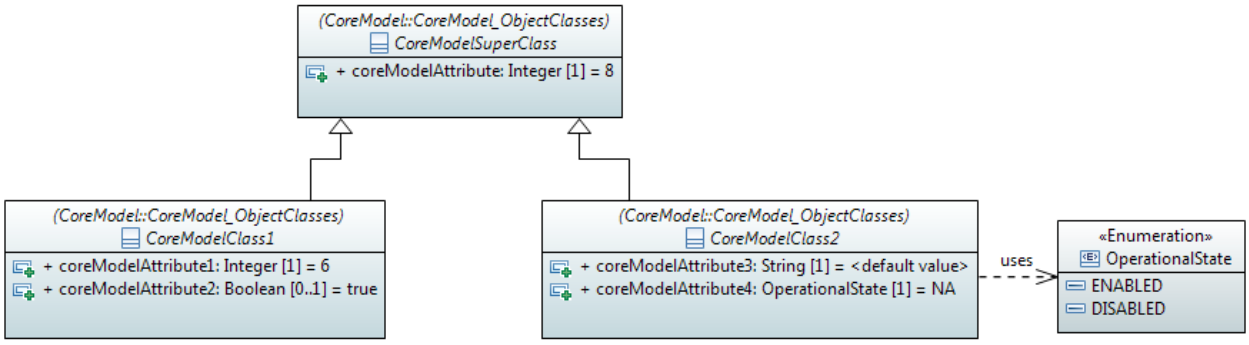


Figure 6.1-2: Illustrative Core Model

The initial core model contains a super-class and two sub-classes.

The profile from figure 6.1-1 is associated to the model. This adds the additional properties to the artefacts in the model or allows their use in the model respectively.

It is possible to check if a profile is associated to the model (and which one) by clicking on XxxModel inside the Model Explorer and then click the **Profile** tab of the Properties view as shown in figure 6.1-3.

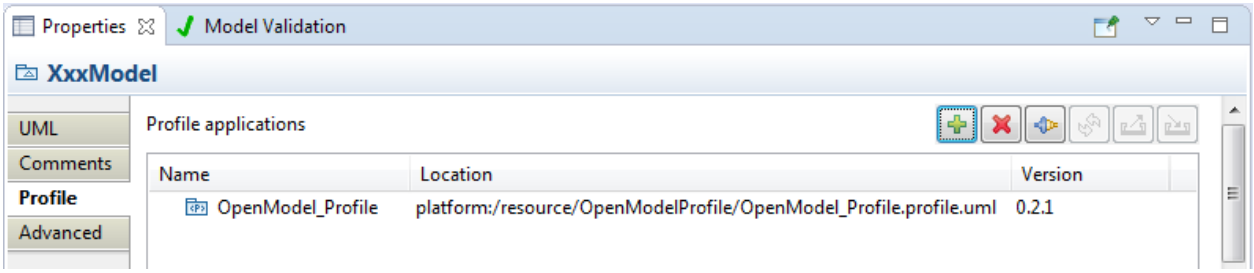


Figure 6.1-3: Profile Associated to the Model

6.2 Papyrus file structure

A Papyrus model is stored in three different files (.di, .notation, .uml) as show in figure 6.2-1.

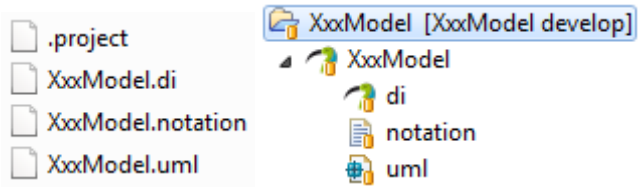


Figure 6.2-1: Papyrus file structure (left: file structure, right: papyrus project structure)

A model cannot exist on its own in Papyrus. It can only be contained by a "project". A project can contain many models. The .project file contains the information about the project.

6.3 Submitting a modified model

Modified models should be submitted as contribution for the corresponding model project (i.e. ETSI GR NFV-IFA 015 [i.7] or ETSI GR NFV-IFA 024 [i.8]).

The model needs to be provided as a zip file, containing both model and profile files.

Select the project in the Project Explorer area and right-click to open the menu containing the Export button and select Archive File under the General folder as show in figure 6.3-1.

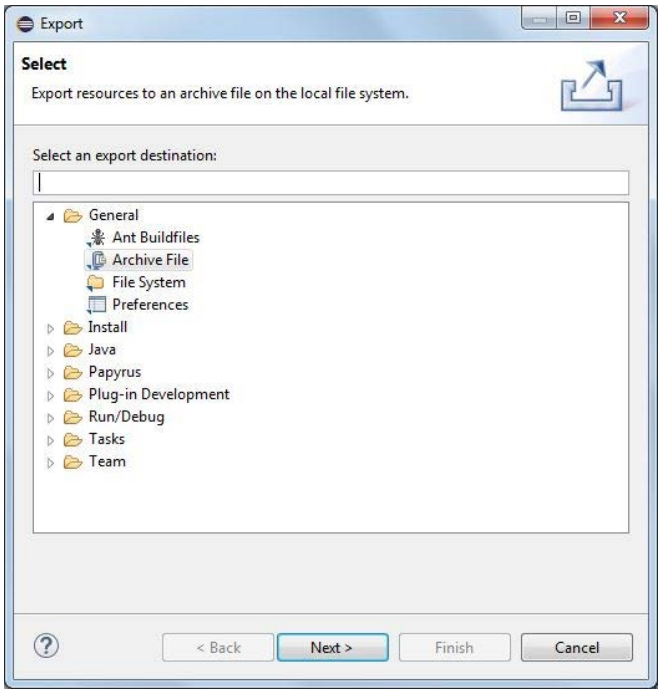


Figure 6.3-1: Exporting a model (1)

Select the model project and the profile project. In the model project, do not select the doc sub-folder and fill the archive name as show in figure 6.3-2.

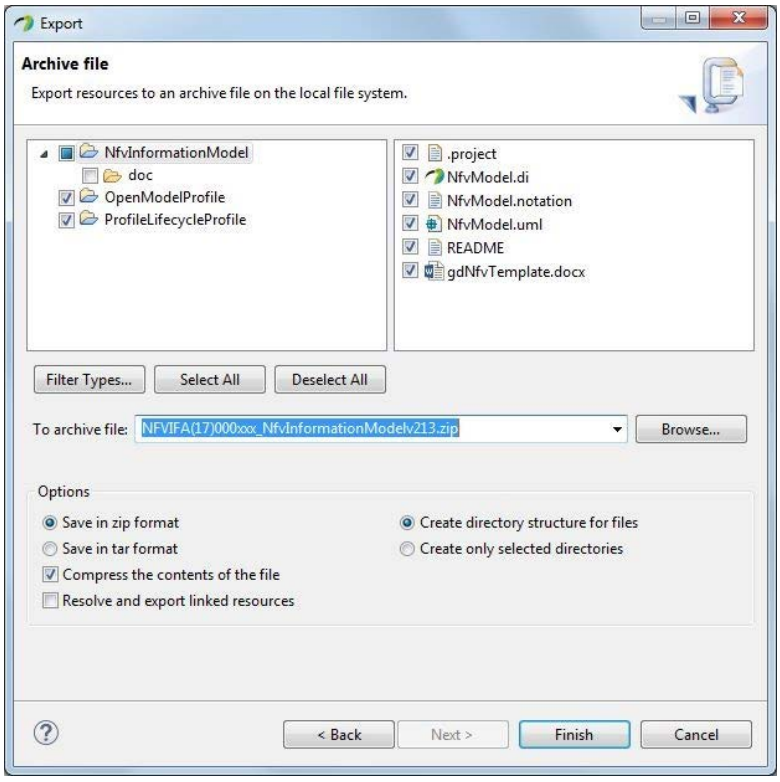


Figure 6.3-2: Exporting a model (2)

The resulting zip file contains the model and should be included in the contribution.

6.4 Generating model documentation

Gendoc [i.6] is an Eclipse™ plug-in integrated with Papyrus that allows generating MS Word® documentation of a model from a template. The template is stored in a system folder accessible via an Eclipse™ project so that the template can be seen in the Papyrus Project Explorer.

For the ETSI NFV Information Model, a specific Gendoc template gdNfvTemplate.docx allows generating MS Word® documentation for the complete NFV Information Model.

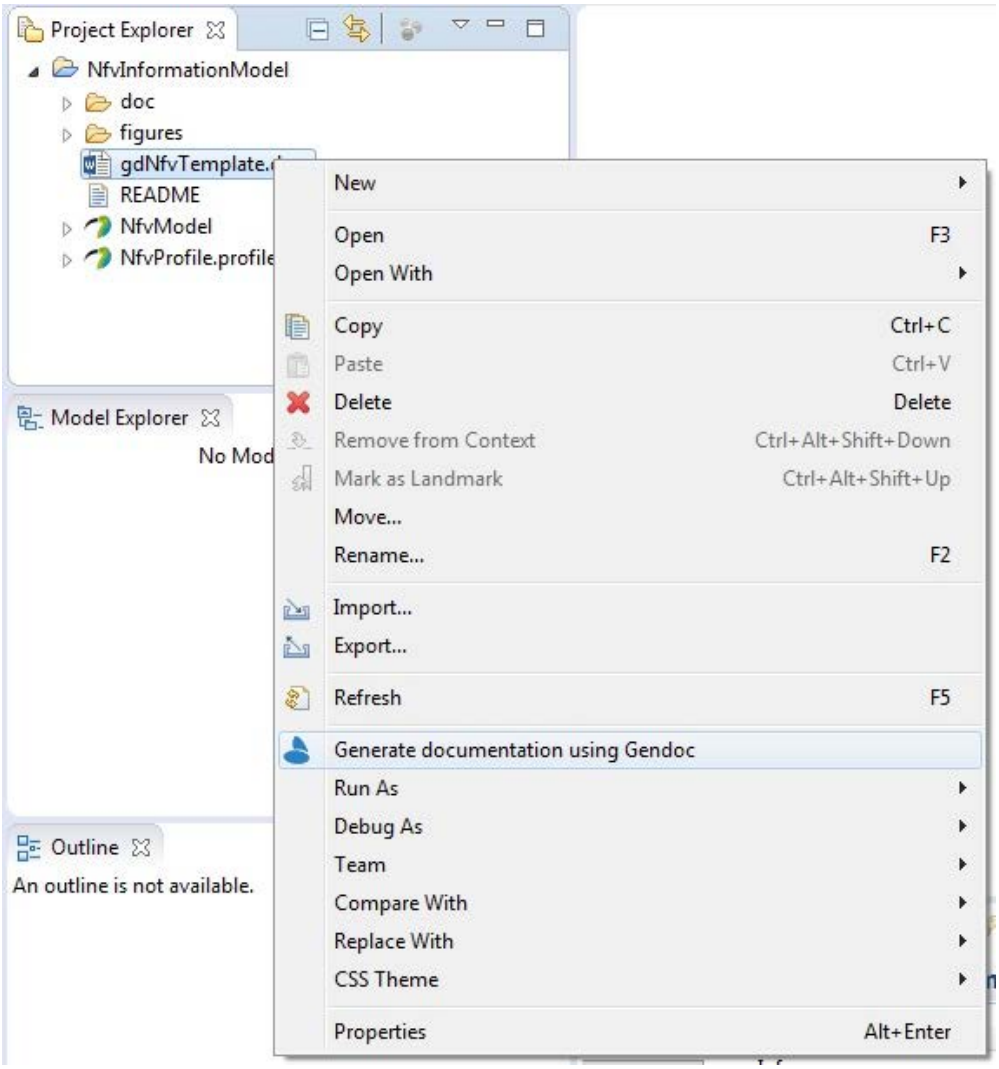


Figure 6.4-1: Generating Gendoc documentation

To generate documentation, right-click on the gdNfvTemplate.docx file and select the menu "Generate documentation using Gendoc" as shown in figure 6.4-1.

The resulting file is in the doc sub-folder of the project and is named NfvInformationModel-vxxx.docx by default.

The name of the model file is assumed to be NfvModel and the version by default is the current NFV Information Model version. These 2 information items are defined as parameters in Gendoc. To change one of those 2 information, the gdNfvTemplate.docx file can be edited as shown in figure 6.4-2.

```
All the text in red is comments and won't appear in the output. Do not remove the drop EOL.   <drop/>
2 variables are needed:                                                                       <drop/>
        - model_name: only change the default if you rename the papyrus model file            <drop/>
        - model_version: align if needed to the current version                               <drop/>
Only change text in brown below.                                                              <drop/>
By default, the generated documentation will be stored in the doc folder in the project directory to store the generated
documentation.                                                                                <drop/>
Note that none of the red text in this document will appear in the output                     <drop/>
Note that commands that do not result in text being printed are highlighted in purple. Text and commands that cause
print are in black                                                                            <drop/>
<drop/>
<config>
<param key='model_name' value=' NfvModel.uml' />
<param key='model_version' value=' v002 />
<output path='${project_loc}/doc/NfvInformationModel-${model_version}.docx' />
</config>
```

Figure 6.4-2: Gendoc template parameters

Only change the text in brown. Do not touch the rest of the template.

As the doc sub-folder of the project already contained the NfvInformationModel-vxxx.docx corresponding to the current released draft that is provided as part of the kit, it is recommended, when generating documentation for a contribution, to suffix the version (v002 in the example above) with a suffix for instance the contribution number (for example, v002-xyz). This would allow the doc folder to contain 2 files:

- NfvInformationModel-vxxx.docx, containing the Gendoc of the current released draft.
- NfvInformationModel-vxxx-xyz.docx, containing the Gendoc that includes the changes from this contribution.

Doing a word compare between those 2 files generates the Gendoc file with change bars needed for a contribution. This Gendoc file should also be included in the contribution.

6.5 Using Class Diagrams

In the general UML® definition a class may have name, attribute and operation compartments, but as the operation compartment is not used, it should always be hidden.

If attributes are defined, the attributes compartment can be set in a given diagram to not expose the attributes or to expose some or all of the attributes.

The recommendation is to avoid exposing attributes if they are defined, so as to reduce clutter.

However, in some cases, only a subset of the attributes defined can be exposed so as to focus attention.

To hide compartments, right-click on the object class, select Filter and then Show/Hide Compartments as shown in figure 6.5-1.

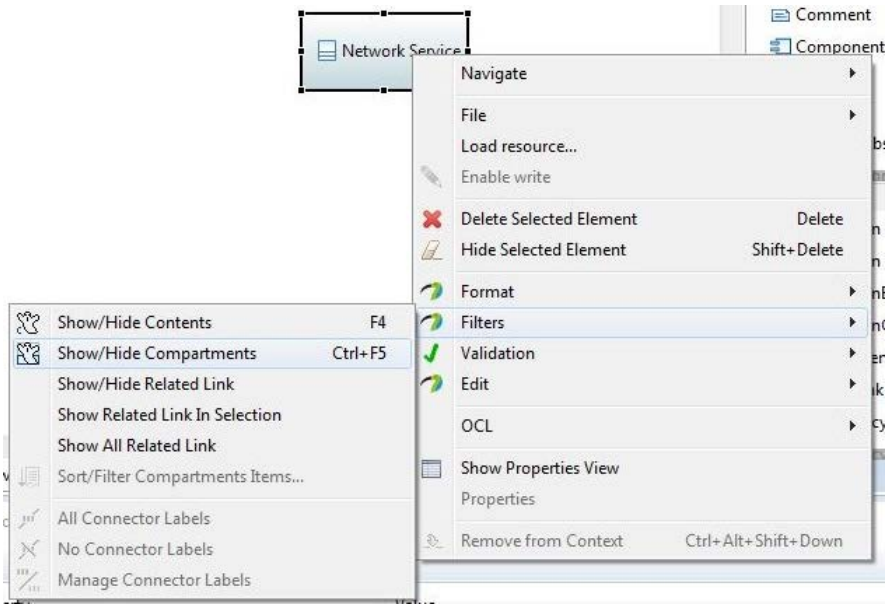


Figure 6.5-1: Hiding compartments (1)

Uncheck all checkboxes in the compartment column as show in figure 6.5-2.

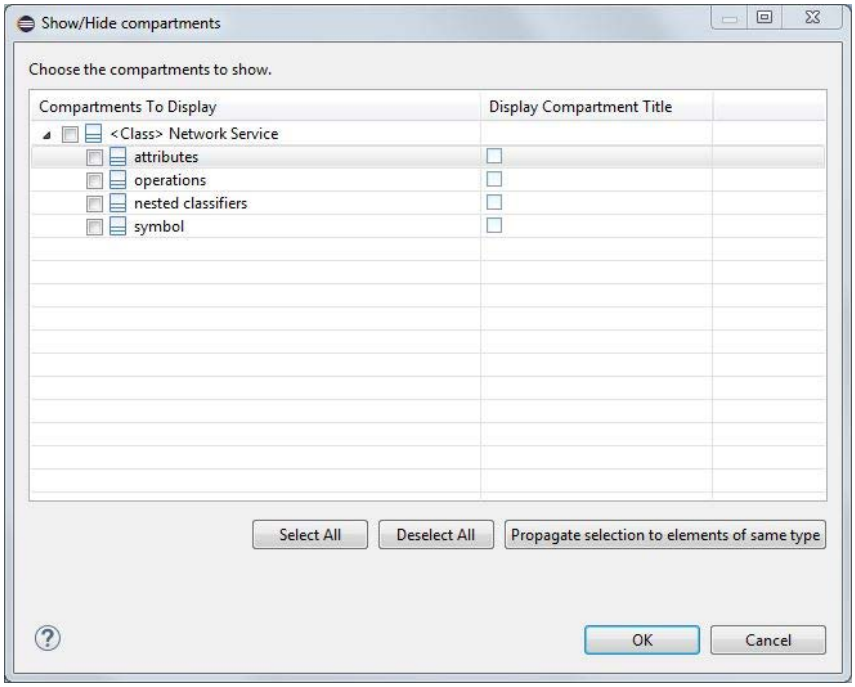


Figure 6.5-2: Hiding compartments (2)

6.6 Applying a stereotype to an element

Each element in UML® can have one or more stereotypes assigned to it. For the NfvModel three stereotypes are used: <<OpenModelClass>>, <<OpenModelAttribute>>, <<OpenModelNotification>> as well as a set of lifecycle related stereotypes.

By default if an element of type Class, Property or Signal is created, the corresponding stereotype <<OpenModelClass>> or <<OpenModelAttribute>> or <<OpenModelNotification>> is applied respectively.

The lifecycle related attributes have to be added manually. To add a stereotype go to the Property view of the element and select the Profile tab as shown in figure 6.6-1.

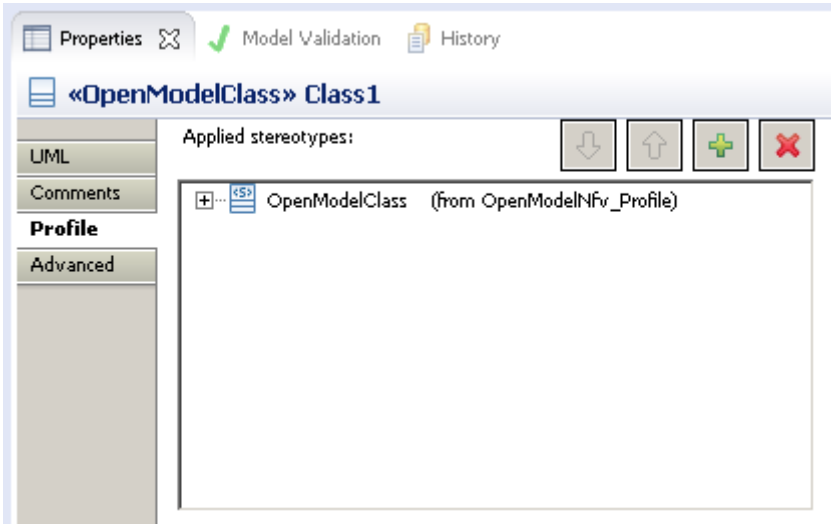


Figure 6.6-1: Class properties - Profile

Click on the  icon to apply a new stereotype. Select the applicable stereotype and apply it by a click on  as shown in figure 6.6-2.

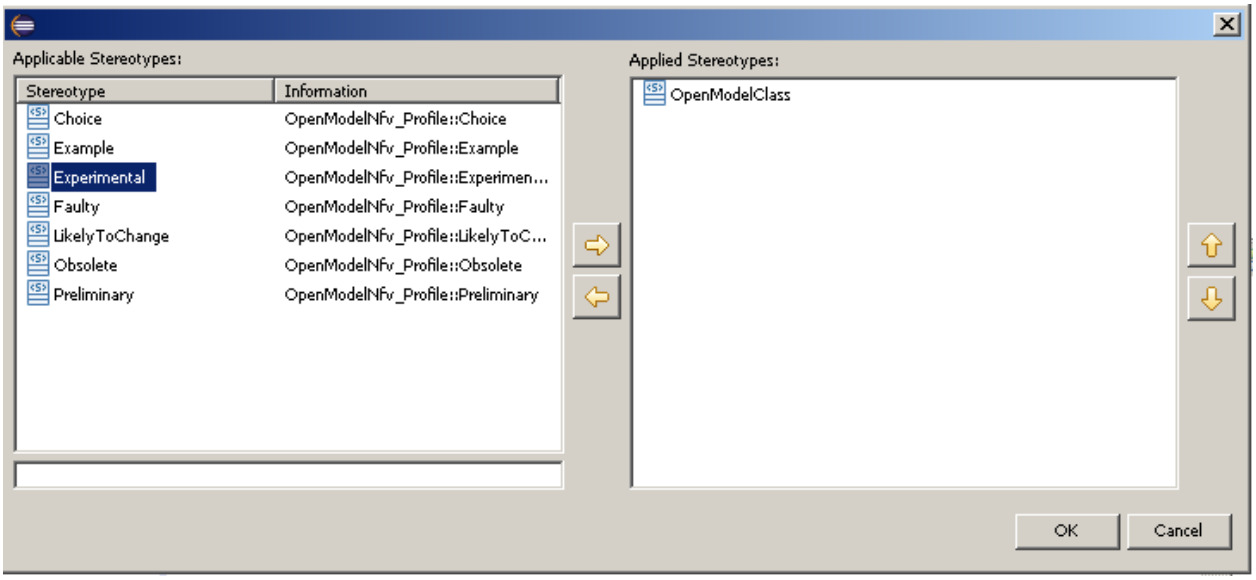


Figure 6.6-2: Stereotype selection

Click Ok and the stereotype shows up in the "Applied stereotypes:" box.

New artefacts should have the Experimental stereotype.

6.7 Changing the value of a stereotype attribute

To change the parameter of an applied stereotype, go to the Property view of the element and select the Profile tab. Click the "+" in front of the stereotype for which a value of an attribute needs to be changed. A field to specify the value appears to the right of the "Applied stereotypes:" as shown in figure 6.7-1.

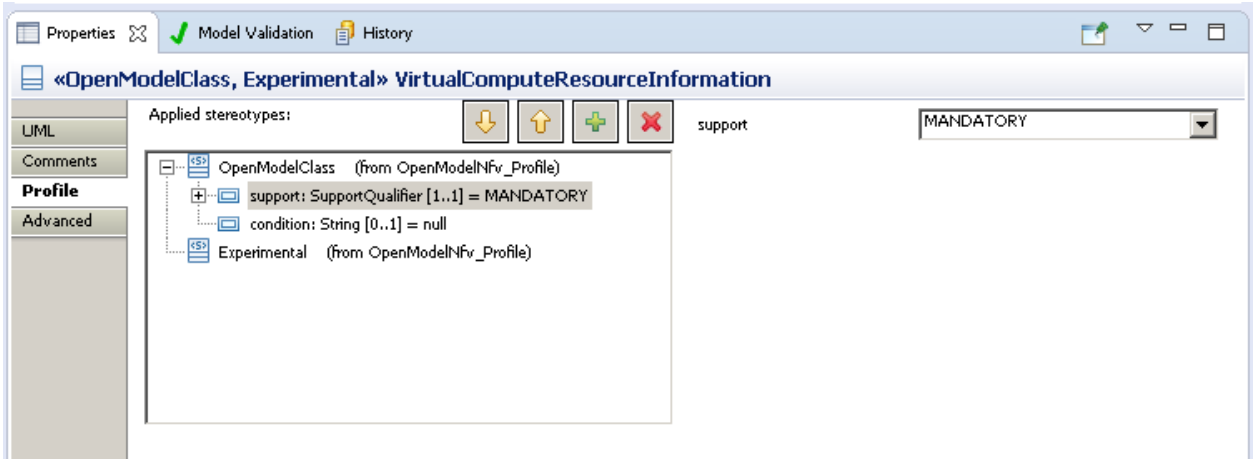


Figure 6.7-1: Modify stereotype attribute

Annex A:
Authors & contributors

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History

Document history		
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