



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

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ETSI

650 Route des Lucioles
F-06921 Sophia Antipolis Cedex - FRANCE

Tel.: +33 4 92 94 42 00 Fax: +33 4 93 65 47 16

Siret N° 348 623 562 00017 - NAF 742 C
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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 defines the guidelines that have to be taken into account during the creation of a protocol-neutral UML (Unified Modeling Language) information model.

These guidelines are informative for the general reader, but need to be followed when designing models for the ETSI NFV 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] Unified Modeling Language™ (UML®).

NOTE: Available at <http://www.uml.org/>.

[i.3] OMG Unified Modeling Language (OMG UML), Version 2.5.

NOTE: Available at <http://www.omg.org/spec/UML/2.5/>.

[i.4] Open Networking Foundation UML Modeling Guidelines V1.2, September 2016 (ONF TR-514).

[i.5] ETSI GR NFV-IFA 015: "Network Functions Virtualisation (NFV) Release 2; Management and Orchestration; Report on NFV Information Model".

[i.6] ETSI GS NFV 003: "Network Functions Virtualisation (NFV); Terminology for Main Concepts in NFV".

3 Definitions and abbreviations

3.1 Definitions

For the purposes of the present document, the terms and definitions given in ETSI GS NFV 003 [i.6] apply.

3.2 Abbreviations

For the purposes of the present document, the abbreviations given in ETSI GS NFV 003 [i.6] and the following apply:

MAC	Media Access Control
UCC	Upper Camel Case
UML	Unified Modeling Language

4 Overview

UML defines a large number of basic model elements (UML artefacts). In order to assure consistent and harmonious information models, only a selected subset of these artefacts are used in the UML model guidelines in the present document. The semantic of the selected artefacts is defined in [i.2].

The guidelines of each basic model artefact are divided into three parts:

- 1) Short description.
- 2) Graphical notation examples.
- 3) Properties.

The guidelines have been developed using the Papyrus open source UML tool [i.1].

The ONF UML Modeling Guidelines [i.4] have been used as a basis for these guidelines. The present document only uses a subset of the guidelines defined in the ONF UML Modeling Guidelines [i.4]. The parts not used are indicated clearly in each clause.

NOTE: The OpenInterfaceModel Profile and its stereotypes are not used by the ETSI NFV Information Model.

5 UML artefact descriptions

5.1 Classes

5.1.1 Description

Classes are used to convey a structural (often called static) representation of an entity, including properties and attributes.

5.1.2 Class notation

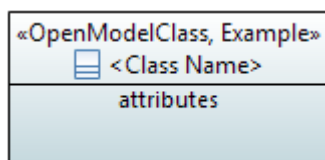


Figure 5.1.2-1: Graphical Notation for classes

As highlighted in figure 5.1.2-1, a class is represented with a name compartment and an attributes compartment. It is recommended that the name compartment contains also the assigned lifecycle stereotypes. The attributes compartment can be set in a diagram to not expose the attributes or to expose some or all of the attributes.

In some diagrams the attributes are hidden to reduce clutter, in others only a subset of the attributes is exposed to focus attention on those attributes. It is also possible to hide the attribute compartment of a class in the class diagrams where a large number of classes need to be shown, as depicted in figure 5.1.2-2.

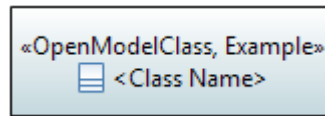


Figure 5.1.2-2: Graphical Notation for Classes without Attributes Compartment

It is recommended that the name compartment also show stereotypes for the class where relevant. When showing stereotypes, the compartment may include the stereotype "OpenModelClass" (as all classes in the model have this stereotype by default) and may also include other stereotypes.

In the general UML definition a class may have name, attribute and operation compartments, as shown in figure 5.1.2-3, but since the structural part and the behavioural part of the model are decoupled, the operation compartment, is not used and always hidden.

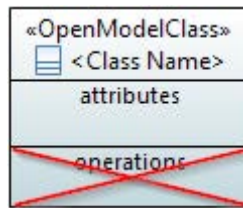


Figure 5.1.2-3: Graphical Notation for Classes with Attributes and Deprecated Operations Compartment

5.1.3 Class properties

A class has the following properties:

- Name:
 - Follows Upper Camel Case (UCC) convention. Each class in the model has a unique name. An example of Upper Camel Case: NetworkService.
- Documentation:
 - Contains a short definition. The documentation is carried in the "Applied comments" field in Papyrus as shown on figure 5.1.3-1; i.e. the "Owned comments" field is not used. The complete documentation should be written in a single comment; i.e. at most one "Applied comment".

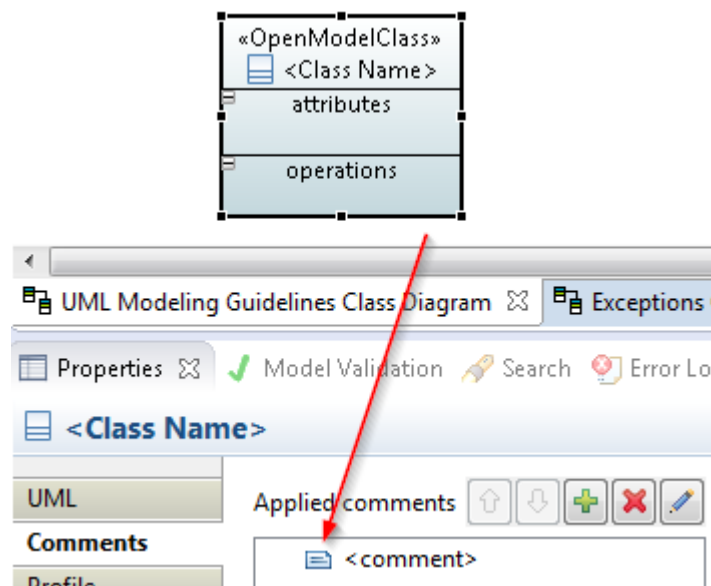


Figure 5.1.3-1: Entering documentation

- Superclass:
 - Inheritance may be used to deal with shared properties. Multiple inheritance is not supported in ETSI NFV Information Model.
- Abstract:
 - Indicates if the object class can be instantiated or is just used for inheritance; i.e. abstract classes will not be instantiated.
- Additional properties are defined in the "OpenModelClass" stereotype which extends by default (required) the "metaclass" Class as shown on figure 5.1.3-2.

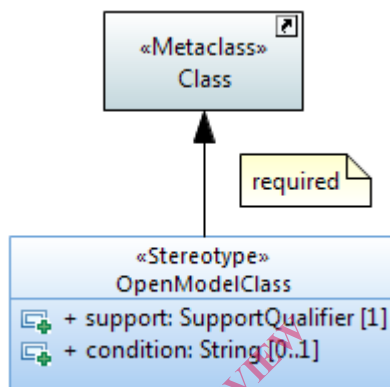


Figure 5.1.3-2: "OpenModelClass" Stereotype

- support:
 - This property qualifies the support of the object class at the management interface. See definition in clause 5.9.
- condition:
 - This property contains the condition for the condition-related support qualifiers.

The following class stereotype is not used for ETSI NFV Information Model:

- Choice.

The following UML defined class properties are not used:

- Is leaf (default = false).
- Is active (default = false).
- Visibility (default = public).

5.2 Attributes in classes

5.2.1 Description

Attributes contain the properties of an object class. Note that the roles of navigable association ends become an attribute at the other associated end when this association end is owned by the classifier; see also "Role Type" property in clause 5.3.3.

NOTE: The association end can also be owned by the association itself in which case it does not become an attribute.

5.2.2 Attribute notation

The notation, shown in figure 5.2.2-1, is:

- `"<list of stereotypes>"<visibility> <attribute name> : <attribute type> [<multiplicity>] = <default value>.`

NOTE: When no default is relevant or no default is defined, the "=" is not shown.

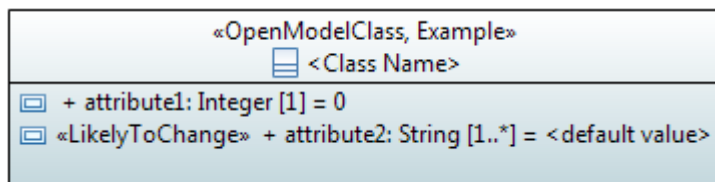


Figure 5.2.2-1: Graphical Notation for object class with attributes

5.2.3 Attribute properties

An attribute has the following properties:

- Name:
 - Follows Lower Camel Case (LCC) and is unique across all attribute names in the inheritance tree. An example of Lower Camel Case: virtualMemSize
 - It is recommended that all Boolean typed attribute names start with 'is' (e.g. 'isAbstract'), or a verb such as 'has' and the whole attribute name should be composed in a way that it is possible to answer it by 'true' or 'false'.
- Documentation:
 - Contains a short definition. The documentation is carried in the "Applied comments" field in Papyrus; i.e. the "Owned comments" field is not used. The complete documentation should be written in a single comment; i.e. at most one "Applied comment".
- Type:
 - Refers to a datatype or a basic UML type. See clause 5.5.
 - If it is needed to reference another information model element (i.e. class), then an association is used (see clause 5.3).
- Default Value:
 - Provides the value that the attribute has to start with in case the value is not provided during creation, or already defined because of a system state.
- Multiplicity (*, 1, 1..*, 0..1, ...):
 - Defines the number of values the attribute can simultaneously have:
 - * is a list attribute with 0, one or multiple values;
 - 1 attribute has always one value;
 - 1..* is a list attribute with at least one value;
 - 0..1 attribute may have no or at most one value;
 - Default value is 1;
 - Other values are possible; e.g. "2..17".

- Additional properties are defined in the "OpenModelAttribute" stereotype which extends by default (required) the "metaclass" Property, as shown on figure 5.2.3-1.

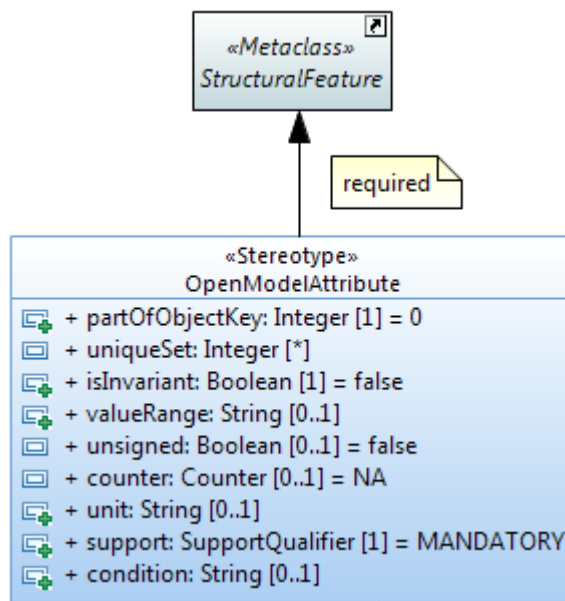


Figure 5.2.3-1: "OpenModelAttribute" Stereotype

- isInvariant:
 - This property identifies if the value of the attribute can be changed after it has been created.
- support:
 - This property qualifies the support of the object class at the management interface. See definition in clause 5.9.
- condition:
 - This property contains the condition for the condition-related support qualifiers.
- Other properties:
 - PassedByReference:
 - This property is only applied to attributes that have an object class defined as their type; i.e. association member ends owned by the class which became attributes. The stereotype is applied on a case by case basis. Figure 5.2.3-2 is showing this stereotype.
 - The property defines that the attribute contains only the reference (e.g. name, identifier, address) of the referred object instance(s) when being transferred across the interface. Otherwise the attribute contains the complete information of the object instance(s) when being transferred across the interface.

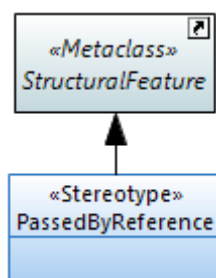


Figure 5.2.3-2: "PassedByReference" Stereotype