<config>  
<output path=’C:\Users\ndavis\git\OnfInfoModelOutput\ModelDescriptions\TR-512.8\_OnfCoreIm-Control.docx' />  
</config>

<context model=’C:\Users\ndavis\git\ONFInfoModel\OnfModel\CoreModel.uml' element=’{0}’ importedBundles='gmf;papyrus' searchMetamodels='true'/>

<gendoc><drop/>

Change path substrings above from “{path for output files}\” to your local path for the output files and “{path for CoreModel}\” to your local path for the Core Model. <drop/>

DELETE: Prior to publishing this –gd.docx (including for review), change path substrings above from “C:\Users\ndavis\git\OnfInfoModelOutput\” to “{path for output files}\” and from “C:\Users\ndavis\git\ONFInfoModel\OnfModel\” to “{path for CoreModel}\” <drop/>



Core Information Model (CoreModel)

TR-512.9

OAM

Version 1.6

April 2022

ONF Document Type: Technical Recommendation

ONF Document Name: Core Information Model version 1.6

**Disclaimer**

THIS SPECIFICATION IS PROVIDED "AS IS" WITH NO WARRANTIES WHATSOEVER, INCLUDING ANY WARRANTY OF MERCHANTABILITY, NONINFRINGEMENT, FITNESS FOR ANY PARTICULAR PURPOSE, OR ANY WARRANTY OTHERWISE ARISING OUT OF ANY PROPOSAL, SPECIFICATION OR SAMPLE.

Any marks and brands contained herein are the property of their respective owners.

Open Networking Foundation  
1000 El Camino Real, Suite 100, Menlo Park, CA 94025  
[www.opennetworking.org](http://www.opennetworking.org)

©2022 Open Networking Foundation. All rights reserved.

Open Networking Foundation, the ONF symbol, and OpenFlow are registered trademarks of the Open Networking Foundation, in the United States and/or in other countries. All other brands, products, or service names are or may be trademarks or service marks of, and are used to identify, products or services of their respective owners.

**Important note**

This Technical Recommendations has been approved by the Project TST, but has not been approved by the ONF board.  This Technical Recommendation is an update to a previously released TR specification, but it has been approved under the ONF publishing guidelines for ‘Informational’ publications that allow Project technical steering teams (TSTs) to authorize publication of Informational documents.  The designation of ‘-info’ at the end of the document ID also reflects that the project team (not the ONF board) approved this TR.

Finalizing this document once generated… delete this text prior to publication:

* Replace “{{..}}” with square brackets (which trip up Gendoc)
* Select text in document from beginning of table of contents (first line) to end of document
  + Click menu item “Update Field” (on this large block of text)
    - if “Update Table…” dialogue appears select “Update entire table”
  + Repeat “update fields” 2 more times (on the same large block of text)
    - if “Update Table…” dialogue appears select “Update entire table”
* Remove reviewer comment

Note that the table of contents and figures need to be updated several times as the table length changes the page numbering and the cross references will need to be re-updated.

Table of Contents

[12 Back matter 93](#_Toc434403162)

[12.1 Editors 93](#_Toc434403163)

[12.2 Contributors 93](#_Toc434403164)

List of Figures

[Figure 1-1 Methodology of IM and DS Development 6](#_Toc430780029)

Document History

| **Version** | **Date** | **Description of Change** |
| --- | --- | --- |
| 1.6 | April 2022 | Initial version |

# Introduction to the document suite

This document is an addendum to the TR-512 ONF Core Information Model and forms part of the description of the ONF-CIM. For general overview material and references to the other parts refer to [TR-512.1](../TR-512.1_OnfCoreIm-Overview.pdf).

## References

For a full list of references see [TR-512.1](../TR-512.1_OnfCoreIm-Overview.pdf).

## Definitions

For a full list of definition see [TR-512.1](../TR-512.1_OnfCoreIm-Overview.pdf).

## Conventions

See [TR-512.1](../TR-512.1_OnfCoreIm-Overview.pdf) for an explanation of:

* UML conventions
* Lifecycle Stereotypes
* Diagram symbol set

## Viewing UML diagrams

Some of the UML diagrams are very dense. To view them either zoom (sometimes to 400%), open the associated image file (and zoom appropriately) or open the corresponding UML diagram via Papyrus (for each figure with a UML diagram the UML model diagram name is provided under the figure or within the figure).

## Understanding the figures

Figures showing fragments of the model using standard UML symbols as well as figures illustrating application of the model are provided throughout this document. Many of the application-oriented figures also provide UML class diagrams for the corresponding model fragments (see [TR-512.1](../TR-512.1_OnfCoreIm-Overview.pdf) for diagram symbol sets). All UML diagrams depict a subset of the relationships between the classes, such as inheritance (i.e. specialization), association relationships (such as aggregation and composition), and conditional features or capabilities. Some UML diagrams also show further details of the individual classes, such as their attributes and the data types used by the attributes.

## Introduction to the OAM model

This document describes a general model of OAM suitable for representation of the capabilities that relate to monitoring the network and for representation of the relationship to the model of the network from the monitoring perspective.

A data dictionary that sets out the details of all classes, data types and attributes is also provided ([TR-512.D](TR-512.DD_OnfCoreIm-DataDictionary.pdf)D).

# Operations, Administration and Maintenance (OAM)

## Background

Broad considerations

* Automation
* Control loop
  + Sense
  + Discern
  + Infer
  + Decide
  + Act

Focus of the OAM model is really Sense/Discern…

* Determination of what to measure
* Coordination
  + Configuration of detectors
  + Activation of detectors
  + Etc.
* Detection and Measurement
  + Event detection
  + Counting
  + Thresholding
* Collection/Reporting
  + Alerting
  + Bulk values
* Storage
* Analysis
* Interpretation

Some detailed mechanisms

* Snapshot
* Spotlight
* Ongoing
* Periodic

OAM Focus considering the Core Model:

* Determination of what to measure
  + Outside the scope of the Core Model (but essentially ControlConstruct responsibility)
* Coordination
  + ControlConstruct
  + ControlTask
  + etc.
* Representation of detectors/measures
  + Encapsulated in each entity (e.g., LTP)
    - Detectors, counters etc.
    - Unfoldable using variable encapsulation principle
      * E.g., LTP with measurement LTP extracted
  + Specification model used to explain arrangement
* Collection and reporting
  + Control model streaming etc.
* Storage
  + Requires expanded representation of log and log record?

Further considerations:

* Measurement
  + Span
  + Focus
  + Duration

TAPI model provides a specific representation

Using the core model

* FC = measurement span
* LTP = measurement point

Degrees of modeling:

* Fully embedded
* Embedded measures with separate measurement spans
  + Photonic example
* Separated measures with associated measurement spans

Measurement strategies

* Single ended passive
* Two ended, one-way within frame
* Two ended, one-way separate packets
* Two ended, two-way, round trip

Activity

* Always on
* On occasionally
* Single shot
* On demand

Model enhancements

* Definitions
  + LTP
  + FC
* Properties
* LTP-LTP association?
* Etc.

Instance examples.

Mapping to TAPI.

# The approach to modeling “OAM”

The figure below shows the core of the Control model.

[for(p:Package|Package.allInstances())]<drop/>

Inserts the diagram identified in first quotes with the title identified in second quotes <drop/>  
[p.insertStandardDiagram(‘Control-ControlConstructAndExposureContextCore’, ’Core Control Model’)/]

[/for]<drop/>

The classes are described in the section below. Some aspects of the model described below are shown in figures in sections 3.3, 3.4 and 3.5. The figures above intentionally do not include all associations etc. mentioned in the detailed class information below. The figures focus on the control model, the classes listed show all aspects of the class.

### ControlConstruct

[for (cl:Class | Class.allInstances()->sortedBy(name))]<drop/>

[if (cl.qualifiedName.contains(‘GeneralControllerModel’))]<drop/>

[if (cl.name.contains(‘ControlConstruct’))]<drop/>

Inserts the details of the class in first quotes from the package in second quotes <drop/>  
[cl.insertClass(cl.name,’GeneralControllerModel’)/]

Inserts the attributes of the class <drop/>   
[cl.insertAttributeTableBrief ()/]

[/if]<drop/>

[/if]<drop/>

[/for]<drop/>

# Future considerations

## Application …

**End of document**

</gendoc><drop/>

To take latest template: <drop/>

* delete text from “Template version…” to end of file <drop/>
* insert a line in “Normal” style<drop/>
* insert text (Insert 🡪 Object 🡪 Text from File… (alt njf)) from: <drop/>
  + TR-512.GT\_OnfCoreIm-CommonGendocTemplate-Fragments.docx <drop/>

Template version 0.0.11 1 June 2018 <drop/>

# Fragment: Insert class <drop/>

<fragment name=’insertClass’ importedBundles=’commons;gmf;papyrus’><drop/>  
<arg name=’cl’ type=’uml::Class’/><drop/>  
<arg name=’className’ type=’String’/><drop/>  
<arg name=’packageName’ type=’String’/><drop/>  
[if (not cl.qualifiedName.contains(packageName))]<drop/>  
[else] <drop/>  
[if(cl.name.contains(className))]<drop/>

Qualified Name: [cl.qualifiedName/]

[if cl.ownedComment->notEmpty()]<drop/>

[for (co:Comment | cl.ownedComment)] <drop/>

<dropEmpty>[cleanAndFormat(co.\_body.clean())/]</dropEmpty>

[/for]<drop/>

[else]To be provided

[/if]<drop/>

[if (cl.isAbstract)]<drop/>

This class is abstract.

[/if]<drop/>

[if (cl.oclAsType(uml::Class).general ->notEmpty())]<drop/>

Inherits properties from:

[for (gen:Class | cl.oclAsType(uml::Class).general)]<drop/>

* [gen.name/]

[/for]<drop/>

[/if]<drop/>

[for (st:Stereotype | cl.getAppliedStereotypes())]<drop/>  
[if(not st.name.contains(‘OpenModelClass’))]<drop/>

This class is [st.name/].

[else] <drop/>  
[/if]<drop/>  
[/for]<drop/>  
[else] <drop/>  
[/if]  
[/if]  
</fragment><drop/>

# Fragment: Insert standard diagram <drop/>

<fragment name=’insertStandardDiagram’ importedBundles=’commons;gmf;papyrus’><drop/>  
<arg name=’p’ type=’uml::Package’/><drop/>  
<arg name=’diagramName’ type=’String’/><drop/>  
<arg name=’diagramTitle’ type=’String’/><drop/>

[for (d:Diagram|p.getPapyrusDiagrams())]<drop/>

[if d.name.contains(diagramName)]

<drop/>

<image object='[d.getDiagram()/]' maxW='true' keepH='false' keepW = ‘false’></image>

CoreModel diagram: [d.name/]

Figure 6-2 [diagramTitle/]

[else]<drop/>

[/if]<drop/>

[/for]<drop/>  
</fragment><drop/>

# Fragment: Insert small diagram <drop/>

<fragment name=’insertSmallDiagram’ importedBundles=’commons;gmf;papyrus’><drop/>  
<arg name=’p’ type=’uml::Package’/><drop/>  
<arg name=’diagramName’ type=’String’/><drop/>  
<arg name=’diagramTitle’ type=’String’/><drop/>

[for (d:Diagram|p.getPapyrusDiagrams())]<drop/>

[if d.name.contains(diagramName)]

<drop/>

<image object='[d.getDiagram()/]' maxW='true' keepH='false' keepW = ‘false’></image>

CoreModel diagram: [d.name/]

Figure 6-2 [diagramTitle/]

[else]<drop/>

[/if]<drop/>

[/for]<drop/>  
</fragment><drop/>

# Fragment: Insert attribute row brief not Obsolete<drop/>

<fragment name=’insertAttributeRowBriefNotObsolete’ importedBundles=’commons;gmf;papyrus’><drop/>

Does not work unless we have Mature stereotype… <drop/>  
<arg name=’p’ type=’uml::Property’/><drop/>

[for (st:Stereotype | p.getAppliedStereotypes())]<drop/>

[if(not st.name.contains(‘OpenModelAttribute’))]

[if(not st.name.contains(‘Obsolete’))]

| [p.name/] | [for (st:Stereotype | p.getAppliedStereotypes())]<drop/>  [if(not st.name.contains(‘OpenModelAttribute’))] [st.name/]  [/if]<drop/>  [/for]<drop/>  Do NOT remove the previous line as word throws an error if the cell is empty <drop/> | [if p.ownedComment->notEmpty()]<drop/>  [for (c:Comment | p.ownedComment)] <drop/>  [cleanAndFormat(c.\_body.clean())/]  [/for]  [else] [if (p.name.contains (‘\_’))]See referenced class  [else]To be provided  [/if]<drop/>  [/if]<drop/>  Do NOT remove the previous line as word throws an error if the cell is empty <drop/> |
| --- | --- | --- |

[/if]<drop/>

[/if]<drop/>

[/for]<drop/>  
</fragment><drop/>

# Fragment: Insert attribute row brief <drop/>

<fragment name=’insertAttributeRowBrief’ importedBundles=’commons;gmf;papyrus’><drop/>  
<arg name=’p’ type=’uml::Property’/><drop/>

| [p.name/] | [for (st:Stereotype | p.getAppliedStereotypes())]<drop/>  [if(not st.name.contains(‘OpenModelAttribute’))] [st.name/]  [/if]<drop/>  [/for]<drop/>  Do NOT remove the previous line as word throws an error if the cell is empty <drop/> | [if p.ownedComment->notEmpty()]<drop/>  [for (c:Comment | p.ownedComment)] <drop/>  [cleanAndFormat(c.\_body.clean())/]  [/for]  [else] [if (p.name.contains (‘\_’))]See referenced class  [else]To be provided  [/if]<drop/>  [/if]<drop/>  Do NOT remove the previous line as word throws an error if the cell is empty <drop/> |
| --- | --- | --- |

</fragment><drop/>

# Fragment: Start attribute table brief <drop/>

<fragment name=’insertAttributeTableHeader’ importedBundles=’commons;gmf;papyrus’><drop/>  
<arg name=’cl’ type=’uml::Class’/><drop/>

|  |  |  |
| --- | --- | --- |
| **Attribute Name** | **Lifecycle Stereotype (empty = Mature)** | **Description** |

</fragment><drop/>

# Fragment: Insert Attribute table brief <drop/>

<fragment name=’insertAttributeTableBrief’ importedBundles=’commons;gmf;papyrus’ importedFragments='insertAttributeTableHeader;insertAttributeRowBrief’><drop/>  
<arg name=’cl’ type=’uml::Class’/><drop/>  
[if cl.ownedAttribute->notEmpty()]<drop/>

Table 1: Attributes for [cl.name/]

<table><drop/>

[cl.insertAttributeTableHeader ()/]

[for (p:Property|cl.ownedAttribute)]<drop/>

[if (not p.name.contains(‘\_’))]<drop/>

[p.insertAttributeRowBrief ()/]

[/if]<drop/>

[/for]<drop/>

[for (p:Property|cl.ownedAttribute)]<drop/>

[if (p.name.contains(‘\_’))]<drop/>

[p.insertAttributeRowBrief ()/]

[/if]<drop/>

[/for]<drop/>

</table><drop/>

[/if]<drop/>

</fragment><drop/>

# Fragment: Insert Ten Specified Attribute table brief <drop/>

<fragment name=’insertTenSpecifiedAttributeTableBrief’ importedBundles=’commons;gmf;papyrus’ importedFragments='insertAttributeTableHeader;insertAttributeRowBrief’><drop/>  
<arg name=’cl’ type=’uml::Class’/><drop/>

<arg name=’p1’ type=‘String’/><drop/>

<arg name=’p2’ type=‘String’/><drop/>  
<arg name=’p3’ type=‘String’/><drop/>  
<arg name=’p4’ type=‘String’/><drop/>  
<arg name=’p5’ type=‘String’/><drop/>  
<arg name=’p6’ type=‘String’/><drop/>  
<arg name=’p7’ type=‘String’/><drop/>  
<arg name=’p8’ type=‘String’/><drop/>  
<arg name=’p9’ type=‘String’/><drop/>  
<arg name=’p10’ type=‘String’/><drop/>  
[if cl.ownedAttribute->notEmpty()]<drop/>

Table 1: Attributes for [cl.name/]

<table><drop/>

[cl.insertAttributeTableHeader ()/]

[for (p:Property|cl.ownedAttribute)]<drop/>

[if (p.name.contains(p1) or p.name.contains(p2) or p.name.contains(p3) or p.name.contains(p4) or p.name.contains(p5) or p.name.contains(p6) or p.name.contains(p7) or p.name.contains(p8) or p.name.contains(p9) or p.name.contains(p10))]<drop/>

[if (not p.name.contains(‘\_’))]<drop/>

[p.insertAttributeRowBrief ()/]

[/if]<drop/>

[/if]<drop/>

[if (p.name.contains(p1) or p.name.contains(p2) or p.name.contains(p3) or p.name.contains(p4) or p.name.contains(p5) or p.name.contains(p6) or p.name.contains(p7) or p.name.contains(p8) or p.name.contains(p9) or p.name.contains(p10))]<drop/>

[if (p.name.contains(‘\_’))]<drop/>

[p.insertAttributeRowBrief ()/]

[/if]<drop/>

[/if]<drop/>

[/for]<drop/>

</table><drop/>

[/if]<drop/>

</fragment><drop/>

# Fragment: Insert DataType <drop/>

<fragment name=’insertDataType’ importedBundles=’commons;gmf;papyrus’><drop/>  
<arg name=’dt’ type=’uml::DataType’/><drop/>  
<arg name=’dataTypeName’ type=’String’/><drop/>  
<arg name=’packageName’ type=’String’/><drop/>  
[if (dt.qualifiedName.contains(packageName))]<drop/>  
[if(dt.name.contains(dataTypeName))]<drop/>

Qualified Name: [dt.qualifiedName/]

[for (co:Comment | dt.ownedComment)]<drop/>

<dropEmpty>[cleanAndFormat(co.\_body.clean())/]</dropEmpty>

[/for]<drop/>  
[if (dt.oclAsType(uml::DataType).general ->notEmpty())]<drop/>

Inherits properties from:

[for (tp:DataType | dt.oclAsType(uml::DataType).general)]<drop/>

* [tp.name/]

[/for]<drop/>

[for (gen:Class | dt.oclAsType(uml::DataType).general)]<drop/>

* [gen.name/]

[/for]<drop/>

[/if]<drop/>

[for (st:Stereotype | dt.getAppliedStereotypes())]<drop/>  
This class is [st.name/].

[/for]<drop/>  
[else] <drop/>  
[/if]  
[/if]  
</fragment><drop/>

# Fragment: Start Data Type attribute table brief <drop/>

<fragment name=’insertDataTypeAttributeTableHeader’ importedBundles=’commons;gmf;papyrus’><drop/>  
<arg name=’dt’ type=’uml::DataType’/><drop/>

|  |  |  |
| --- | --- | --- |
| **Attribute Name** | **Lifecycle Stereotype (empty = Mature)** | **Description** |

</fragment><drop/>

# Fragment: Insert Data Type Attribute table brief <drop/>

<fragment name=’insertDataTypeAttributeTableBrief’ importedBundles=’commons;gmf;papyrus’ importedFragments='insertDataTypeAttributeTableHeader;insertAttributeRowBrief’><drop/>  
<arg name=’dt’ type=’uml::DataType’/><drop/>  
[if dt.ownedAttribute->notEmpty()]<drop/>

Table 1: Attributes for [dt.name/]

<table><drop/>

[dt.insertDataTypeAttributeTableHeader ()/]

[for (p:Property|dt.ownedAttribute)]<drop/>

[p.insertAttributeRowBrief ()/]

[/for]<drop/>

</table><drop/>

[/if]<drop/>

</fragment><drop/>

# Fragment: Insert enums <drop/>

<fragment name=’insertEnums’ importedBundles=’commons;gmf;papyrus’><drop/>  
<arg name=’dt’ type=’uml::DataType’/><drop/>

#### [dt.name/]

Qualified Name: [dt.qualifiedName/]

[for (co:Comment | dt.ownedComment)]<drop/>

<dropEmpty>[cleanAndFormat(co.\_body.clean())/]</dropEmpty>

[/for]<drop/>

Applied stereotypes:

[if dt.getAppliedStereotypes()->notEmpty()] <drop/>

[for (st:Stereotype | dt.getAppliedStereotypes())]<drop/>

* [st.name/]

[/for]<drop/>

[else] No stereotypes applied

[/if]<drop/>

[if (dt.oclAsType(uml::DataType).general ->notEmpty())]<drop/>

Inherits literals from:

[for (tp:DataType | dt.oclAsType(uml::DataType).general)]<drop/>

* [tp.name/]

[/for]

[/if]<drop/>

[if (dt.oclAsType(Enumeration).ownedLiteral->notEmpty())]<drop/>

Contains Enumeration Literals:

[for (e:EnumerationLiteral|dt.oclAsType(Enumeration).ownedLiteral)]<drop/>

* [e.name/]:
  + [for (co:Comment | e.ownedComment)]<drop/>
  + <dropEmpty>[cleanAndFormat(co.\_body.clean())/]
  + </dropEmpty>[/for]<drop/>
  + [if dt.getAppliedStereotypes()->notEmpty()] <drop/>
  + Applied stereotypes:
    - [for (st:Stereotype | e.getAppliedStereotypes())]<drop/>
    - [st.name/]
    - [/for]<drop/>
  + [/if]<drop/>

[/for]<drop/>

[/if]<drop/>

</fragment><drop/>