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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

October 2022

ONF Document Type: Technical Recommendation

ONF Document Name: Core Information Model version 1.6

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**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.

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Document History

| **Version** | **Date** | **Description of Change** |
| --- | --- | --- |
| 1.6 | October 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)

To cover

Text, letter

Description automatically generated

## Background

Purpose

* Measure to validate integrity
* Measure to identify and alert of problems
* Measure to generate trigger for problem recovery

Context

* Automation
* Management-control continuum
  + Measurement at many levels with many abstractions
* Timeframes, scopes and spans
  + Whole network
  + Long term measures
  + Short term measures to trigger switching

Positioning measurement in the context of a general control loop

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

Focus of the OAM model is really Sense/Discern…

Key aspects

* Something to measure
* Measurement device
* Activity to perform measurements
* Capture of results
* Conveying results

Determination of what to measure

* Relevance to purpose
  + Measurements assume some desired signal shape/outcome//
    - Delay
    - Errors
    - Repeats
    - Etc.
  + Post processing of measurements for some specific application
* Cost/value
* Challenges
  + Volume of data opportunities
  + Efficient reliable transfer of relevant information
  + Setting up measures in the right context

Measurement position

* Measurement occurs at a termination of some signal
  + Inherent measurements as part of signal processing (clarify this is the framing signal)
  + Additional measurements
  + Separable measurement
  + Non-intrusive monitoring
  + Live v in test (and relevance of intrusiveness)

Essential functions related to termination and signal processing

1. Key parts
   * Frame
   * Bit
   * Source identifier
   * Mapping and decoding
   * (use the LTP spec to break out parts)
     + Error measurement is a termination of a signal
     + Etc.

## Model

### Traditional models

Models of detectors that measure some aspect of a signal have tended to split into two different forms. Those that consider the detector as:

1. An integral part of the termination function (e.g., an SDH frame error counter)
2. Part of a dedicated detector function (e.g., an Ethernet MEP)

Clearly, regardless of the position of the detector in the model it is necessary to terminate some signal or part of the signal so as to measure some aspect of it.

Some measurements:

1. Are on the fundamental signal of transmission (e.g., frame alignment error counter)
2. Are of some additional aspect of the signal designed to enable assessment of signal integrity (e.g., error measurement, which require some additional coding to enable error detection)
3. Require dedicated additional signals (e.g., SDH Trail Trace which requires an additional framed structure).

Where the detectors are considered as an integral part (1) above, measurements of type (c) above require a complex termination in termination structure.

### Core OAM model

#### Termination aspect

As has been discussed in (Spec doc) an LP in an LTP

* can be of arbitrary complexity including deep nesting of termination functions
* can encapsulate some subset of a full LP
  + Just a CP
  + Just a TCP
  + Just the adapter
  + Some other subset

A sequence of LTPs with subset LPs can be chained and connected in various ways. This versatile variable encapsulate of the LTP model allows the LTP to support both forms of detector modeling ((1) and (2) above).

A detector can be encapsulated in the LP that represents the processing of the primary (service/traffic//) or it can be encapsulated in an LP that solely represents the termination of the measurable property where that LP is part of an LTP that is connected to the LTP includes the LP that represents the processing of the primary signal.

The following figures show examples of various encapsulations.

* Separating out the monitors with encapsulation examples
* Separating out the signalling and control from main traffic
* Boundary, technology, admin, measurement demarcation, signal granularity…

The arrangement of the LP content of each LTP is represented via specifications (reference).

Hence OAM detection is modelled using the existing LTP class. Arrangements of LTPs can represent:

* NCM
* Intermediate Non-intrusive
* TCM
* MEP/MIP
* Deep inspection

Specific OAM mechanisms

* Sensor
* Continuous and non-continuous measures
  + Ongoing
  + Periodic
  + Occasional
  + …
* Bins
* Spotlights and snapshot
* Thersholds
* Etc.

Representing OAM in the core… may be .A.x document

* Explicit model forms

#### Flow aspect

Add text on FC and MEG… measurement span

### Further complexity

Multi-flow measurements.

### OAM and measurement lifecycle

Operation

* Job/Task
  + Profiles
* Coordination
  + Configuration of detectors
  + Activation of detectors
  + Etc.
* Detection and Measurement
  + Event detection
  + Counting
  + Thresholding
  + Zero suppression
  + Same value suppression
* Collection/Reporting
  + Alerting
  + Bulk values
* Storage
* Analysis
* Interpretation

## Applying the core model

OAM Focus considering the Core Model:

* Determination of what to measure
  + Outside the scope of the Core Model (but essentially ControlConstruct responsibility)
  + Consider equipment..
* 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
  + Using expanded representation of log and log record?
* Measurement Focus
* Measurement Duration
  + Use the temporal model

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
* Snapshot
* On demand

Model enhancements

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

## Mapping to TAPI.

# Future considerations

## Application …

**End of document**

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* insert a line in “Normal” style<drop/>
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  + TR-512.GT\_OnfCoreIm-CommonGendocTemplate-Fragments.docx <drop/>

Template version 0.0.11 1 June 2018 <drop/>

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CoreModel diagram: [d.name/]

Figure 6-2 [diagramTitle/]

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CoreModel diagram: [d.name/]

Figure 6-2 [diagramTitle/]

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| --- | --- | --- |

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

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Table 1: Attributes for [cl.name/]

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Table 1: Attributes for [cl.name/]

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[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/>

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[/for]<drop/>

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[/for]<drop/>  
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| --- | --- | --- |
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  + </dropEmpty>[/for]<drop/>
  + [if dt.getAppliedStereotypes()->notEmpty()] <drop/>
  + Applied stereotypes:
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    - [st.name/]
    - [/for]<drop/>
  + [/if]<drop/>

[/for]<drop/>

[/if]<drop/>

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