Core Information Model (CoreModel)

TR-512.A.5
Appendix – Circuit Switched Examples (Layer 1 & 2)

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Disclaimer

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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.

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Document History

Version	Date	Description of Change
		Appendix material was not published prior to Version 1.3
1.3.1	January 2018	First version.
1.4	November 2018	No change.
1.5	September 2021	Enhancements to model structure
1.6	January 2024	Updated release and dates.

1 Introduction to the document suite

This document is an appendix of the 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.

1.1 References

For a full list of references see TR-512.1.

1.2 Definitions

For a full list of definition see TR-512.1.

1.3 Conventions

See TR-512.1 for an explanation of:

- UML conventions
- Lifecycle Stereotypes
- Diagram symbol set

1.4 Viewing UML diagrams

Some of the UML diagrams are very dense. To view them either zoom (sometimes to 400%) or 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).

1.5 Understanding the figures

Figures showing fragments of the model using standard UML symbols and also 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 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.

1.6 Appendix Overview

This document is part of the Appendix to TR-512. An overview of the Appendix is provided in TR-512.A.1.

2 Introduction to this Appendix document

This document provides various examples of the use of the CIM to model circuit switched network structures.

This document is not intent to be exhaustive; it does not show all possible examples. The intention is that this document provides sufficient structure patterns to enable someone with appropriate knowledge of management/control of circuit switched protocols and corresponding devices to model the ports of those devices. The document should be used in conjunction with TR-512.A.4 and TR-512.A.6 to model multi-layer-protocol devices.

The examples in this document are built from descriptions in earlier referenced works.

3 General circuit examples

This document introduces a model of layer protocols for circuit switched systems. The figures show a compact diagrammatic representation of the order of layer protocols for various port types. Some of the figures show a representation aligned with that in TR-512.2 figure 4-10.

Some of the earlier examples show both the layering and then the ports assembled into a stylized device with a somewhat arbitrary arrangement of layer protocol terminations on circuit packs, cards etc. (Equipment) of the device[1].

3.1 Basic OTN device example

The following figure shows the model for a fragment of a device where an OC48_STM-16 Tributary is interconnected to an OTN line port. In this case the device offers only single layer connection flexibility at ODU1[2].

The OC48_STM-16 signal received on the tributary port is terminated to expose the STM-16 MS signal. This signal is mapped into an ODU1. This is then forwarded, via an FC, to the Line port where it is multiplexed into an ODU 2. The ODU2 supports four instances of ODU1. The ODU1 is mapped via a number of intermediate adaptations into the ODU2. The ODU2 is multiplexed into an ODU4. The ODU4 supports 10 instances of ODU2. The ODU2 is mapped via intermediate adaptations into the ODU4. The ODU4 is then mapped into onto the MEDIA via an OTSi. For this case, it is assumed that there is only one OTSi required to carry the ODU4 and that the ODU4 fully occupies the OTSi. It is also assumed that this OTSi is the only one carried by the media channel.

The details of the media mappings and overhead are covered by TR-512.A.4. The figure in this document only shows a simplified summary of the media layering.

The figure follows the usual convention (see TR-512.1) shows LTPs (green/purple boxes) and LP instance (dashed lines in the green/purple boxes). The figure highlights all levels of

[1] The figures are not intended to represent any particular real device. Any apparent similarity to a vendor's device is purely coincidental.
[2] Further examples will be added that illustrate devices with multiple layers of flexibility.

adaptation that are identified in the corresponding ITU-T recommendations (see References in TR-512.1).

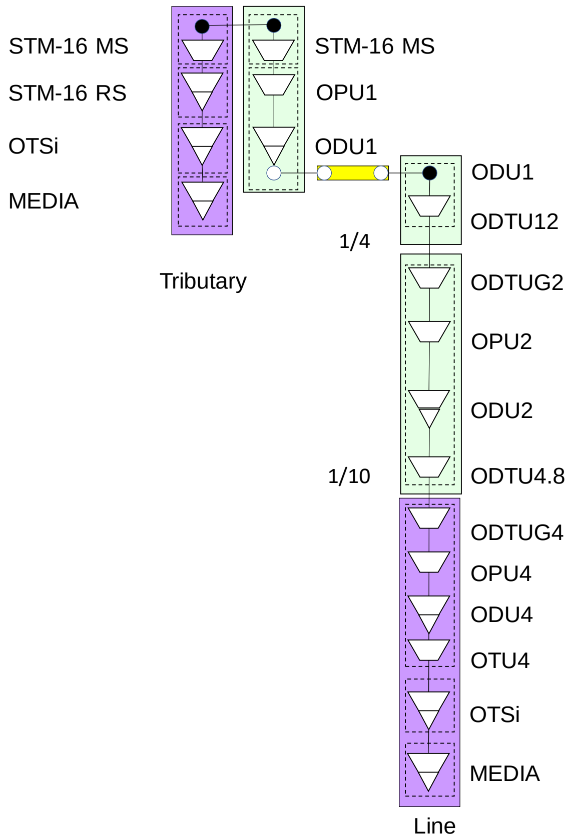

Figure 3-1 Basic OTN device example showing STM-16 Tributary and Line

In this and the following figures, the cardinality between the client and server is shown as m/n e.g. ODU1 / ODU2 is 1 / 4.

A simplified representation is shown in figure 3-2. This simplified form has been used in the examples. In the simplified representation the ODTUG and the OPU have been absorbed in the ODU client-side adapter and the OTU has been absorbed in the ODU termination since they always have a 1:1 relationship.

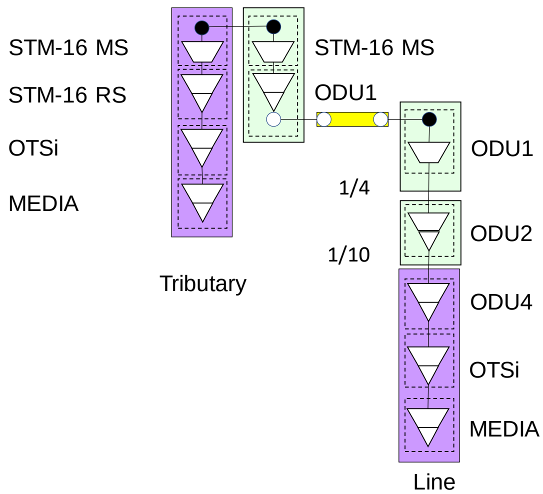

Figure 3-2 Basic OTN device example showing compact representation of a STM-16 Tributary and OTN Line

Figure 3-3 shows a device that supports the STM-16 to OTU4 mapping shown above. The device has four tributary slots (only one is equipped). The equipped tributary card supports four ODU1 capacity ports that map each STM16 into an ODU1. One of the ODU1s is connected to the left Line Card where it is then multiplexed into an ODU2, as ODU1 #1. The ODU2 is multiplexed into an ODU4, as ODU2 #1. The ODU4 is carried directly by a single OTSi that is the only one using the MEDIA at this point.

In addition, an ODU1, is connected between the right and left Line Cards. The ODU1 is #4 in ODU2 #1 on both sides[3].

[3] This symmetry may be due to a device limitation or may be coincidental. To determine which the specs for the device could be inspected. See TR-512.7 for details on FD specs.

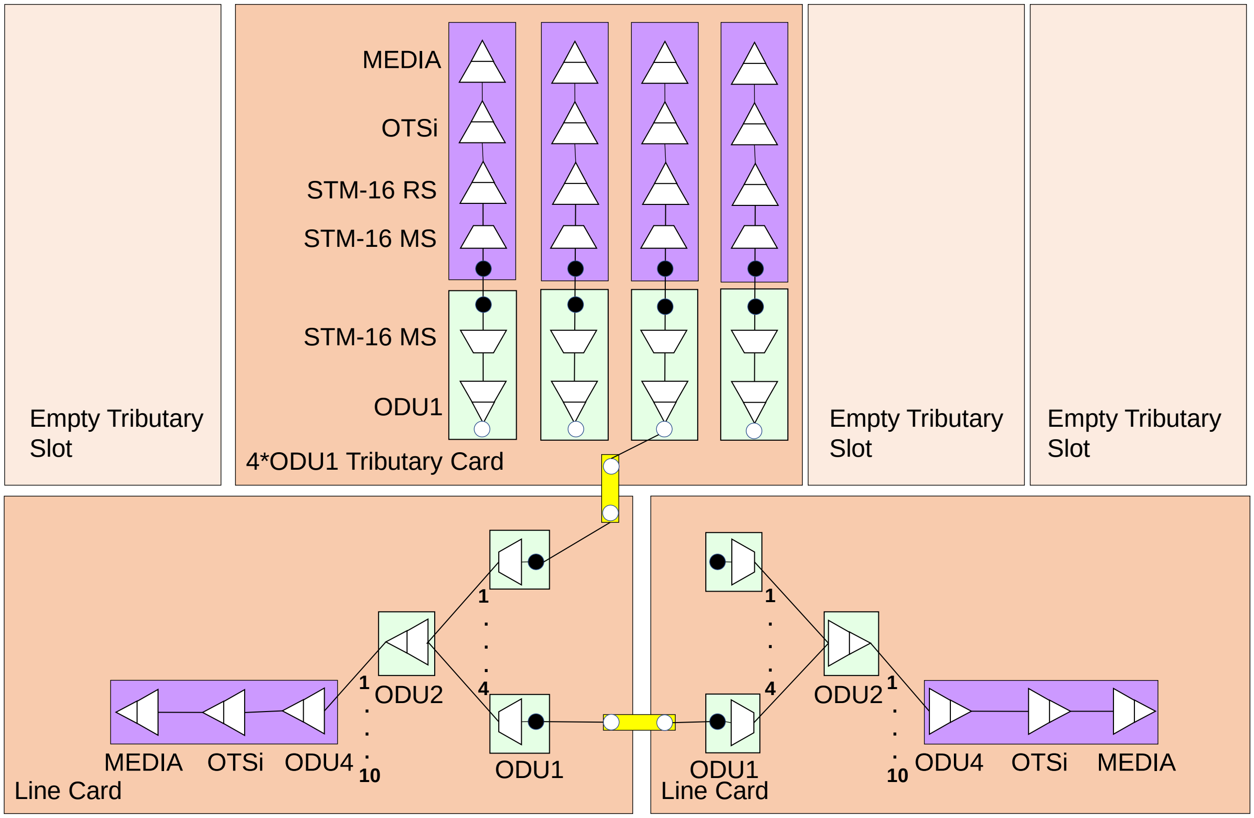

Figure 3-3 Basic OTN device supporting STM 16 tributary ports

4 Circuit layer examples

4.1 Single layer examples

Figure 4-1shows multiplexing of ODU2 into ODU4.

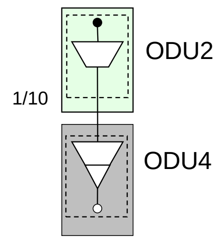

Figure 4-1 ODU4 server with ODU2 clients

Figure 4-2 shows an ODU4 supporting both ODU0 and ODU2 clients at the same time.

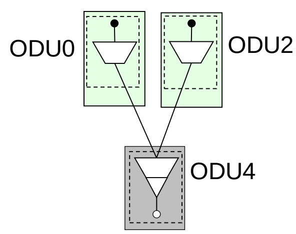

Figure 4-2 ODU4 server with both ODU0 and ODU2 clients

Figure 4-3 shows the mapping of a 100GE client into an ODU4.

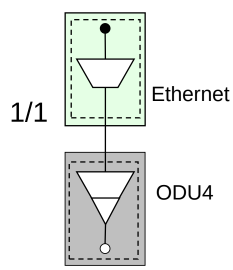

Figure 4-3 ODU4 server with 100GE client (direct mapping)

4.2 Multi-layer examples

Figure 4-4, shows the multiplexing of ODU2 into ODU4. Then the ODU4 is mapped into an OTU4.

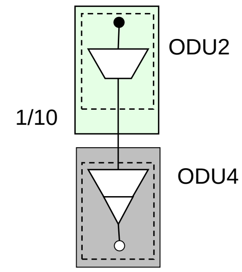

Figure 4-4 OTU4 server with ODU4 client with ODU2 clients

Figure 4-5, shows an Ethernet client GFP-F mapped into an ODUFlex which is multiplexed into an ODU4.

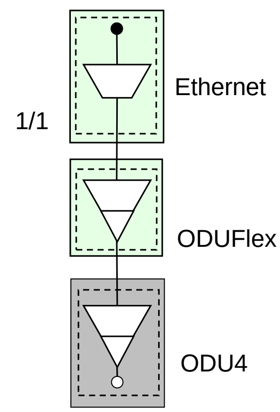

Figure 4-5 ODU4 server with ODUFlex client with a GFP-F mapped Ethernet client

Figure 4.6 shows an ODU4 server with both ODU2 and ODUFlex clients.

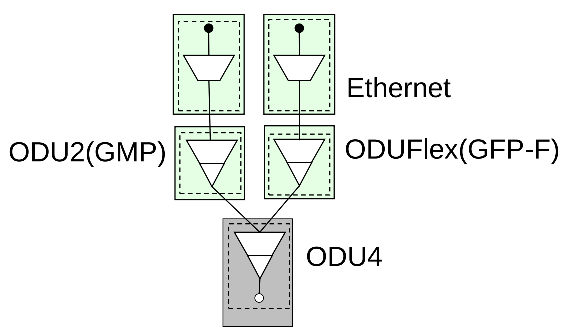

Figure 4-6 ODU4 server with both ODU2 and ODUFlex clients

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