IEEE P1904.2™/D0.23
Draft Standard for Management Channel for Customer-Premises Equipment Connected to Ethernet-based Subscriber Access Networks

Sponsor

Standards Development Board
of the
IEEE Communications Society

Approved <XX MONTH 20XX>

IEEE-SA Standards Board

Abstract: This standard TBD
Keywords: TBD

The Institute of Electrical and Electronics Engineers, Inc.
3 Park Avenue, New York, NY 10016-5997, USA

PDF: ISBN 978-0-XXXX-XXXX-X STDXXXXX
Print: ISBN 978-0-XXXX-XXXX-X STDPDXXXXX

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This introduction is not part of IEEE P1904.2/D0.1

This standard TBD …

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, Working Group Chair
, Editor

The following individuals submitted technical contributions or commented on the draft standard at various stages of the project development.

Name

The following members of the <individual/entity> balloting committee voted on this standard. Balloters may have voted for approval, disapproval, or abstention.

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Contents

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1 Overview

1.1 Scope

This standard TBD ...

1.2 Purpose

The purpose of this standard is to TBD …

1.3 Coverage

This specification provides TBD ...

1.4 Overview of clauses

This subclause provides an overview of the scope of individual clauses included in this specification, namely:

— TBD ...

2 Normative references

The following referenced documents are indispensable for the application of this document (i.e., they must be understood and used, so each referenced document is cited in text and its relationship to this document is explained). For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments or corrigenda) applies.

3 Definitions, acronyms, and abbreviations

3.1 Definitions

For the purposes of this document, the following terms and definitions apply. The IEEE Standards Dictionary Online should be consulted for terms not defined in this clause.[1]

TBD

3.2 Acronyms and abbreviations

UMT - Universal Management Tunnel

UMTDP - Universal Management Tunnel Discovery Protocol

3.3 Special Terms

Term: Definition

3.4 Notation for state diagrams

All the state diagrams used in this standard meet the set of requirements included in the following subclauses.

3.4.1 General conventions

The operation of any protocol defined in this standard can be described by subdividing the protocol into a number of interrelated functions. The operation of the functions can be described by state diagrams. Each diagram represents the domain of a function and consists of a group of connected, mutually exclusive states. Only one state of a function is active at any given time (see Figure 3-1).

[1] IEEE Standards Dictionary Online subscription is available at http://www.ieee.org/portal/innovate/products/standard/standards_dictionary.html.

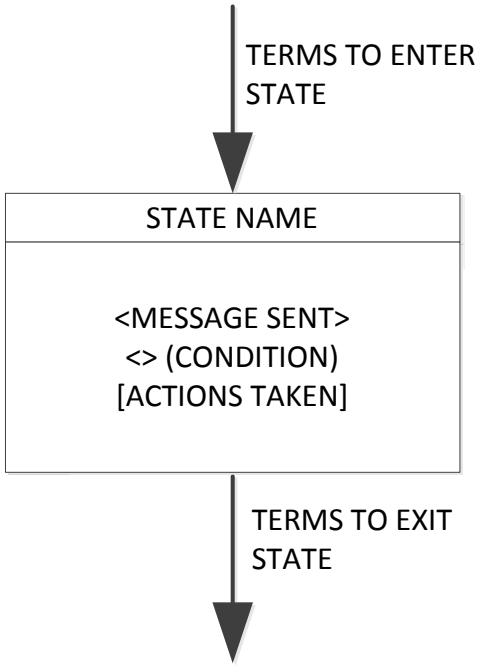

Figure 13-1—State diagram notation example

3.4.1.1 Representation of states

Each state that the function can assume is represented by a rectangle. These are divided into two parts by a horizontal line. In the upper part the state is identified by a name in capital letters. The lower part contains the body of the given state, containing description of the actions taken in this state, as defined in 3.4.3.

3.4.1.2 Transitions

All permissible transitions between the states of a function are represented graphically by arrows between them. A transition that is global in nature (for example, an exit condition from all states to the IDLE or RESET state) is indicated by an open arrow (an arrow with no source block). Global transitions are evaluated continuously whenever any state is evaluating its exit conditions. When the condition for a global transition becomes true, it supersedes all other transitions, including Unconditional Transition (UCT), returning control to the block pointed to by the open arrow.

Labels on transitions are qualifiers that are required to be fulfilled before the transition is taken. The label UCT designates an unconditional transition. Qualifiers described by short phrases are enclosed in parentheses.

The following terms are valid transition qualifiers:

— Boolean expressions

— An event such as the expiration of a timer: timer_done

— An event such as the reception of a message: MAC_DATA.indication

— An unconditional transition: UCT

— A branch taken when other exit conditions are not satisfied: ELSE

State transitions occur instantaneously. No transition in the state diagram can cross another transition. When possible, any two transitions with different logical conditions are not joined together into a single transition line.

3.4.2 State diagrams and accompanying text

State diagrams take precedence over text.

3.4.3 Actions inside state blocks

The actions inside a state block execute instantaneously. Actions inside state blocks are atomic (i.e., uninterruptible).

After performing all the actions listed in a state block one time, the state diagram then continuously evaluates exit conditions for the given state block until one is satisfied, at which point control passes through a transition arrow to the next block. While the state awaits fulfillment of one of its exit conditions, the actions inside do not implicitly repeat.

Valid state actions may include generation of *indication* and *request* primitives.

No actions are taken outside of any blocks of the state diagram.

3.4.4 State diagram variables

Once set, variables retain their values as long as succeeding blocks contain no references to them.

Setting the parameter of a formal interface message assures that, on the next transmission of that message, the last parameter value set is transmitted.

Testing the parameter of a formal interface message tests the value of that message parameter that was received on the last transmission of said message. Message parameters may be assigned default values that persist until the first reception of the relevant message.

3.4.5 Operators

The state diagram operators are shown in Table 3-1.

Table 3-1—State diagram operators

Character	Meaning
AND	Boolean AND
OR	Boolean OR
XOR	Boolean XOR
!	Boolean NOT
<	Less than
>	More than
≤	Less than or equal to
≥	More than or equal to
==	Equals (a test of equality)
!=	Not equals
()	Indicates precedence

Character	Meaning
=	Assignment operator
|	Concatenation operation that combines several sub-fields or parameters into a single aggregated field or parameter
else	No other state condition is satisfied
true	Designation of a Boolean value of TRUE
false	Designation of a Boolean value of FALSE

3.4.6 Timers

Some of the state diagrams use timers for various purposes, e.g., measurement of time, and confirmation of activity. All timers operate in the same fashion.

A timer is reset and starts counting upon entering a state where [start x_timer, x_timer_value] is asserted. Time "x" after the timer has been started, "x_timer_done" is asserted and remains asserted until the timer is reset. At all other times, "x_timer_not_done" is asserted.

When entering a state where [start x_timer, x_timer_value] is asserted, the timer is reset and restarted even if the entered state is the same as the exited state.

Any timer can be stopped at any time upon entering a state where [stop x_timer] is asserted, which aborts the operation of the "x_timer" asserting "x_timer_not_done" indication until the timer is restarted again.

3.4.7 Hexadecimal notation

Numerical values designated by the 0x prefix indicate a hexadecimal notation of the corresponding number, with the least significant bit shown on the right. For example: 0x0F represents an 8-bit hexadecimal value of the decimal number 15; 0x00-00-00-00 represents a 32-bit hexadecimal value of the decimal number 0; 0x11-AB-11-AB represents a 32-bit hexadecimal value of the decimal number 296423851.

3.4.8 Binary notation

Numerical values designated by the 0b prefix indicate a binary notation of the corresponding number, with the least significant bit shown on the right. For example: 0b0001000 represents an 8-bit binary value of the decimal number 8.

3.5 Notation for PICS

The supplier of a device implementation that is claimed to conform to this standard is required to complete a protocol implementation conformance statement (PICS) proforma.

A completed PICS proforma is the PICS for the implementation in question. The PICS is a statement of which capabilities and options of this standard have been implemented. The PICS can be used for a variety of purposes by various parties, including the following:

a) As a checklist by the protocol implementer, to reduce the risk of failure to conform to the standard through oversight;

b) As a detailed indication of the capabilities of the implementation, stated relative to the common basis for understanding provided by the standard PICS proforma, by the supplier and acquirer, or potential acquirer, of the implementation;

c) As a basis for initially checking the possibility of interworking with another implementation by the user, or potential user, of the implementation (note that, while interworking can never be guaranteed, failure to interwork can often be predicted from incompatible PICS);

d) As the basis for selecting appropriate tests against which to assess the claim for conformance of the implementation, by a protocol tester.

Each PICS entry is uniquely identified by an item number, with the following form: [Package][Device]-[Feature][Number], where:

— [Package] is the designation of the given Package,

— [Device] identifies whether the given PICS item describes the ONU (U) or OLT (T) requirements,

— [Feature] is the identification of individual features, and finally,

— [Number] is a number allocated to each subsequent PICS entry. This item may have one of two possible formats: a decimal number or a decimal number followed by a lower-case letter. The first format is used to designate PICS with functionally distinct requirements. The latter format is used to designate PICS with functionally similar requirements.

For example, CU-LPTK3a represents a PICS entry for an ONU compliant with Package C for the “optical link protection, trunk type” feature, item 3, subitem a.

3.5.1 Abbreviations and special symbols

The following symbols are used in the PICS proforma:

M	mandatory field/function
!	negation
O	optional field/function
O.<n>	optional field/function, but at least one of the group of options labeled by the same numeral <n> is required
O/<n>	optional field/function, but one and only one of the group of options labeled by the same numeral <n> is required
X	prohibited field/function
<item>:	simple-predicate condition, dependent on the support marked for <item>
<item1>*<item2>:	AND-predicate condition, the requirement needs to be met if both optional items are implemented

3.5.2 Instructions for completing the PICS proforma

The first part of the PICS proforma, Implementation Identification and Protocol Summary, is to be completed as indicated with the information necessary to identify fully both the supplier and the implementation.

The main part of the PICS proforma is a fixed-format questionnaire divided into subclauses, each containing a group of items. Answers to the questionnaire items are to be provided in the right-most column, either by simply marking an answer to indicate a restricted choice (usually Yes, No, or Not Applicable), or by entering a value or a set or range of values. (Note that there are some items where two or more choices from a set of possible answers can apply; all relevant choices are to be marked.)

Each item is identified by an item reference in the first column; the second column contains the question to be answered; the third column contains the reference or references to the material that specifies the item in the main body of the standard; the fourth column contains values and/or comments pertaining to the question to be answered. The remaining columns record the status of the items—whether the support is mandatory, optional or conditional—and provide the space for the answers.

The supplier may also provide, or be required to provide, further information, categorized as either Additional Information or Exception Information. When present, each kind of further information is to be

provided in a further subclause of items labeled A<i> or X<i>, respectively, for cross-referencing purposes, where <i> is any unambiguous identification for the item (e.g., simply a numeral); there are no other restrictions on its format or presentation.

A completed PICS proforma, including any Additional Information and Exception Information, is the protocol implementation conformance statement for the implementation in question.

Note that where an implementation is capable of being configured in more than one way, according to the items listed under Major Capabilities/Options, single PICS may be able to describe all such configurations. However, the supplier has the choice of providing more than one PICS, each covering some subset of the implementation's configuration capabilities, if that would make presentation of the information easier and clearer.

3.5.3 Additional information

Items of Additional Information allow a supplier to provide further information intended to assist the interpretation of the PICS. It is not intended or expected that a large quantity be supplied, and the PICS can be considered complete without any such information. Examples might be an outline of the ways in which a (single) implementation can be set up to operate in a variety of environments and configurations; or a brief rationale, based perhaps upon specific application needs, for the exclusion of features that, although optional, are nonetheless commonly present in implementations.

References to items of Additional Information may be entered next to any answer in the questionnaire, and may be included in items of Exception Information.

3.5.4 Exception information

It may occasionally happen that a supplier wishes to answer an item with mandatory or prohibited status (after any conditions have been applied) in a way that conflicts with the indicated requirement. No pre-printed answer is found in the Support column for this; instead, the supplier is required to write into the Support column an X<i> reference to an item of Exception Information, and to provide the appropriate rationale in the Exception item itself.

An implementation for which an Exception item is required in this way does not conform to this standard. Note that a possible reason for the situation described above is that a defect in the standard has been reported, a correction for which is expected to change the requirement not met by the implementation.

3.5.5 Conditional items

The PICS proforma may contain conditional items. These are items for which both the applicability of the item itself, and its status if it does apply—mandatory, optional, or prohibited—are dependent upon whether or not certain other items are supported.

Individual conditional items are indicated by a conditional symbol of the form "<item>:<s>" in the Status column, where "<item>" is an item reference that appears in the first column of the table for some other item, and "<s>" is a status symbol, M (Mandatory), O (Optional), or X (Not Applicable).

If the item referred to by the conditional symbol is marked as supported, then:

a) the conditional item is applicable,

b) its status is given by "<s>", and

c) the support column is to be completed in the usual way.

Each item whose reference is used in a conditional symbol is indicated by an asterisk in the Item column.

4 Universal Management Tunnel (UMT) Architecture

Editorial Note: this Clause will describe te UMT architecture, showing a single UMT domain interconnecting multiple L2 domains with UMT switches, and showing UMT instance between two UMT end-points. Description of the individual device functions follows (tentative names are used)

4.1 UMT frame format

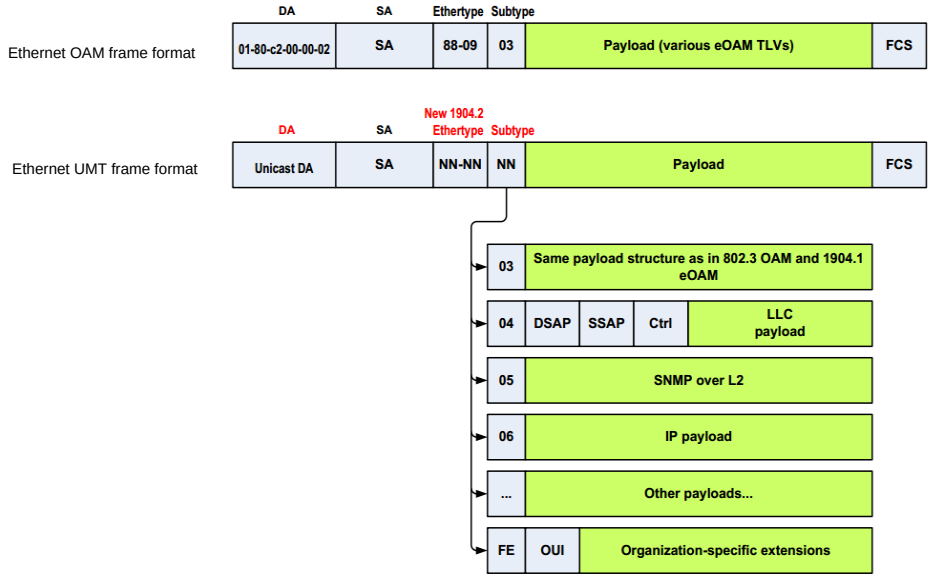

Figure ~~2~~2 -UMT frame format

Ethernet OAM protocol IEEE 802.3ah, slow protocol frame, defindes by a uniq Ethernet multicast destination address (01:80:C2:00:00:02) and a uniq Ethertype (88-09).

when moving to a UMT frame, the Ethernet destination address will be e unicast address (the L2 address of the destination device) and a new Ethertype, XX-XX.

Destination MAC Address- Media Access Control address of the destination entetiy. Most often assigned by the manufacturer.

Source MAC Address- Media Access Control address of the source entetiy. Most often assigned by the manufacturer.

Ethertype- Two octats field, to indicate which protocol is encapsulated in the payload.

Subtype – 02 till FE
payload-

subtype= 03- same payload structure as in 802.3 OAM and 1904.1 eOAM
subtype= 04 – LLC frame, LLC header (DSAP 0xE0, SSAP 0xE0, control 0x03- Access Point (SAP) is an identifying label for network endpoints used in Open Systems Interconnection (OSI) networking) followed by IPX data Service.

subtype= 05- SNMP over L2
subtype= 06- IP payload
….
subtype= FE- OUI and organization-specific extentaion

Payload- the frame payload information

FCS- Frame Check Sequence, refers to the extra error-detecting codeadded to a frame. The sending host computes a cyclic redundancy check on the entire frame and appends this as a trailer to the data. The receiving host recomputes the cyclic redundancy check on the frame using the same algorithm, and compares it to the received FCS

4.2 UMT Architecture

A typical PON is deployed with an OLT at the local Central Office (CO) and several ONUs which are connected to the Outside Distribution Network (ODN) comprising at least one fiber spliter. The OLT acts as the management master responsible for controlling individual connected ONUs, including MPCP / OAM registration, service provisioning, etc., as defined in IEEE Std 1904.1-2013.

4.2.1.Single hop between Management Master and OLT

In this scenario, the UMT Management Master is collocated with the OLT within the CO, and it is has access to all information within the OLT, such as status of individual ONUs, QoS profiles assigned to individual services, device status, etc.. Physically, the UMT Management Master in this architecture would have a form of a software agent running on the OLT hardware. This architecture example is shown in Figure 4.

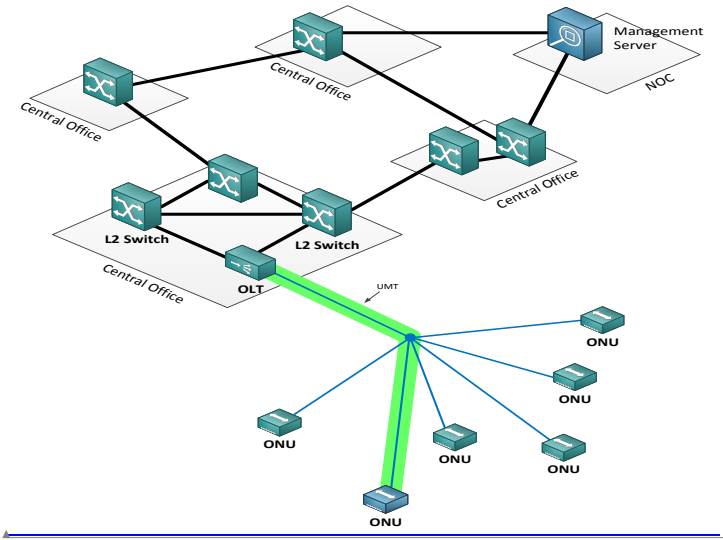

Figure 5 – Single hop between Management Master and OLT

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4.2.2 Multiple hops between Management Master and OLT

In that example, the UMT Mangment Master does not have a direct access to the OLT, but it shares the same L2 network, providing access to information stored within the OLT via standardized interfaces. The UMT Management Master and the OLT are separated by a number of layer 2 hops. Physically, the UMT Management Master in this architecture would have the form of a software agent running on either a dedicated or virtual machine, physically separate from the OLT, but otherwise connected to the same LAN. The UMT Management Master in this case can be shared by more that one OLT, provided that all these OLTs are connected to the same LAN. This arrangement is shown in Figure 5.

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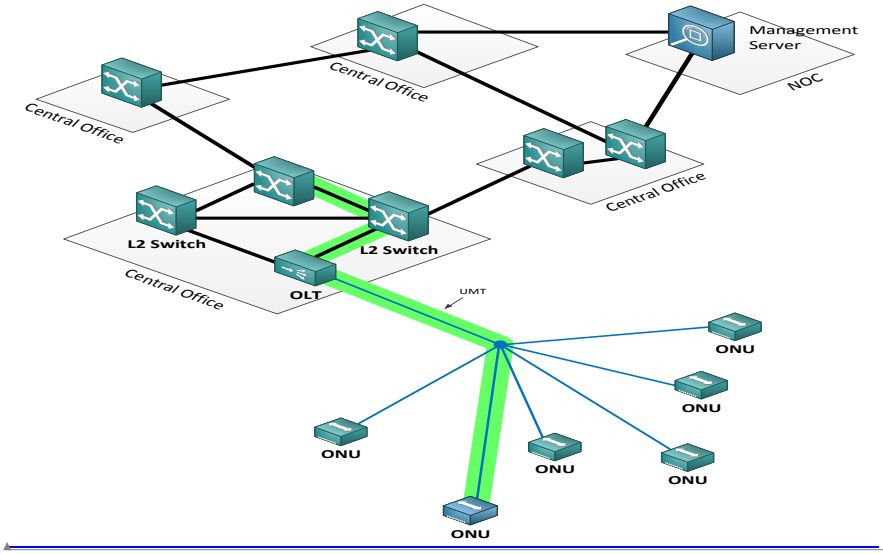

Figure 6 – Multiple hops between Management Master and OLT

4.2.3 Management Master sharing L3 network with EPON OLT

In that example, the UMT Mangment Master is connected (directly on indirectly) to the core transport network of the operator and manages a number of OLTs connected (directly or indirectly) to the same core transport network. The UMT Management Master is provided access to information stored within the OLT via standardized interfaces. Physically, the UMT Management Master in this architecture would have the form of a software agent running on either a dedicated or virtual machine, physically separate from the OLT, but otherwise reachable via IP level connectivity. The UMT Management Master in this case can be shared by more that one OLT, provided that all these OLTs are connected at the IP level. This arrangement is shown in Figure 6.

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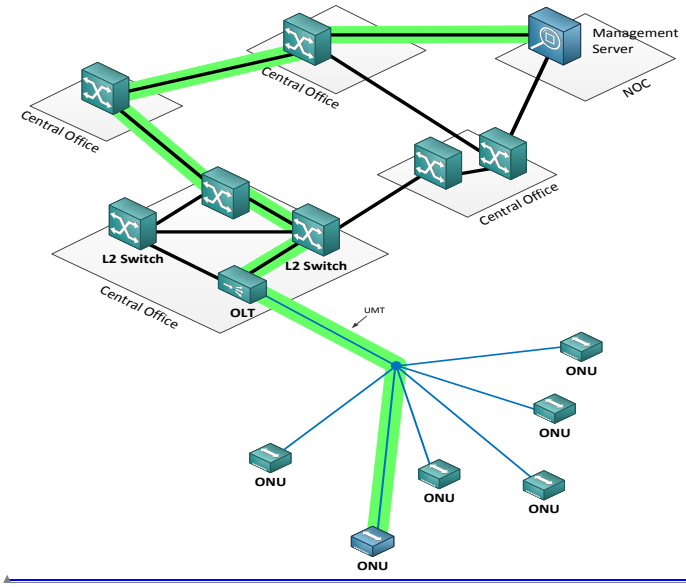

Figure 7 – Management Master sharing L3 network with EPON OLT

~~4.2 UMT Architecture~~

4.3 UMT Interfaces

4.3.1 UMT Layering

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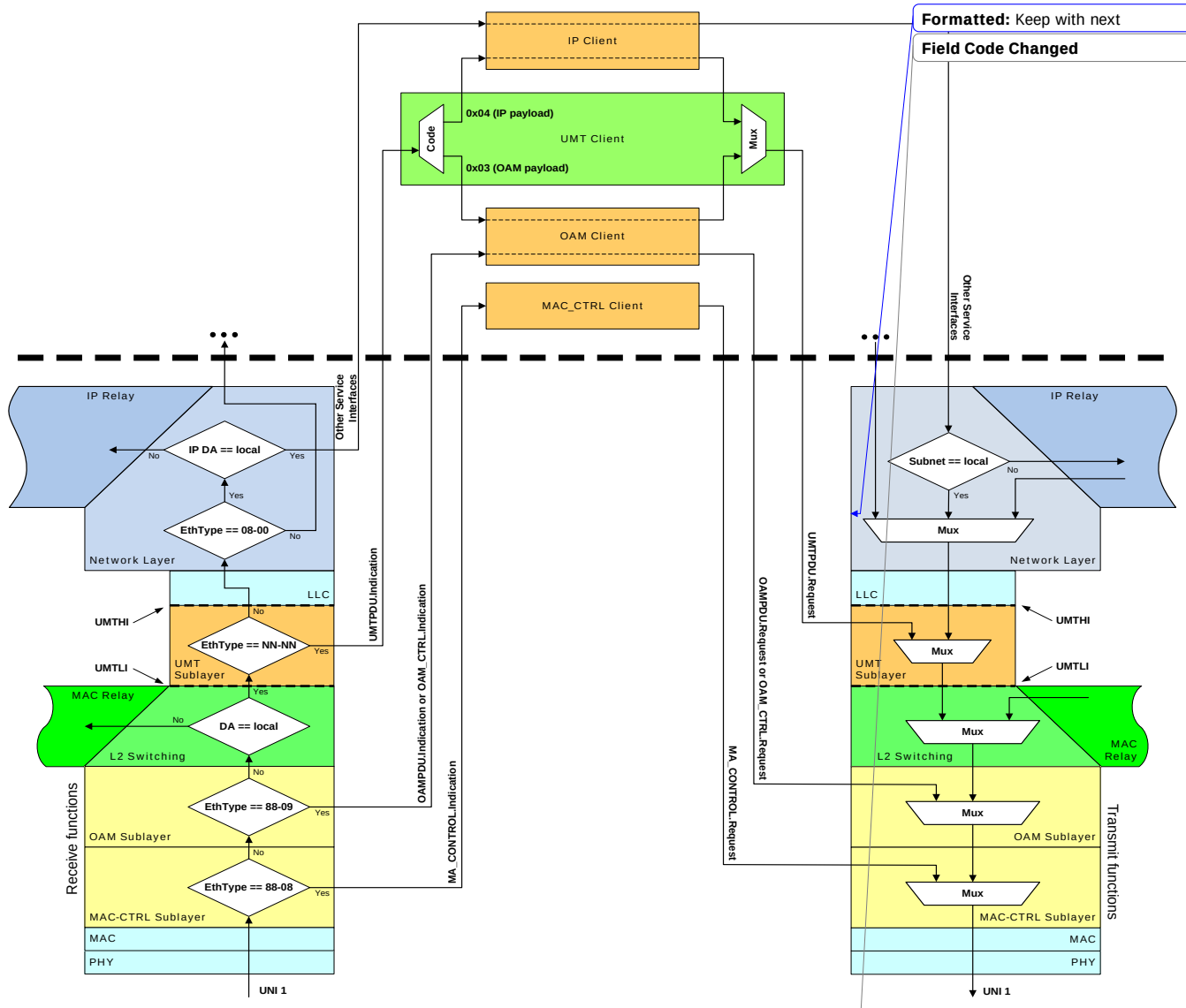

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Figure 6- UMT Layering diagram

4.3.2 4.2 Frame transformation architecture

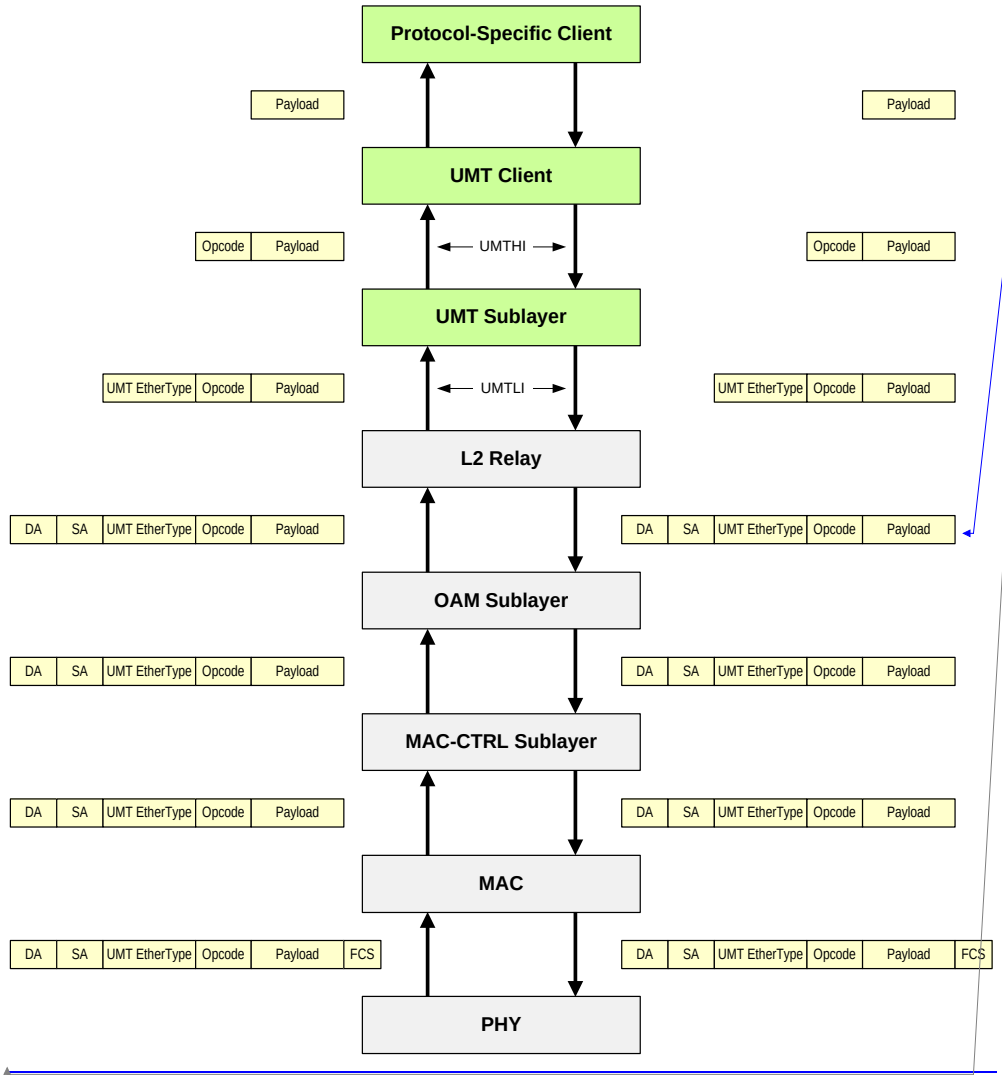

Figure 7- Frame Transformation layers architecture

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4.3.3 States Diagram

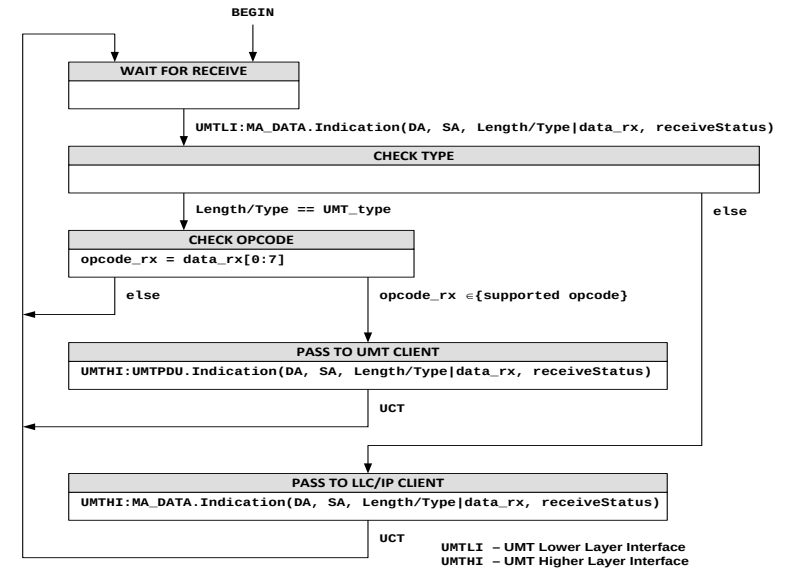

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Figure 3- Parser state diagram

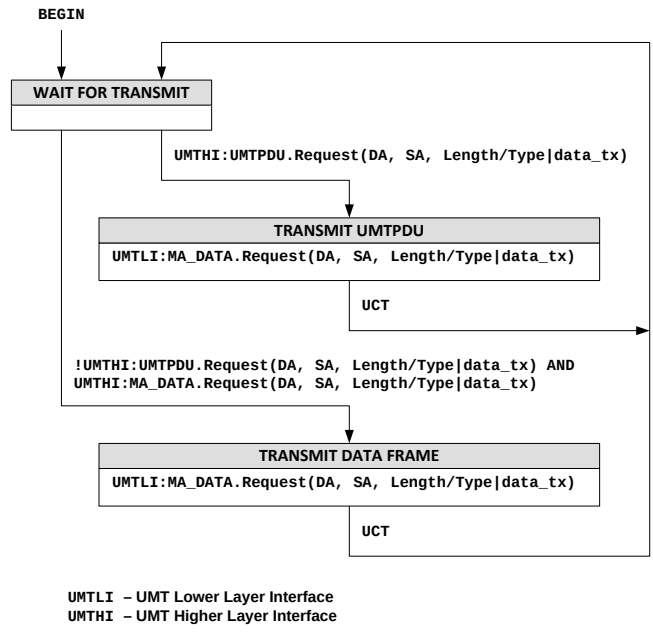

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Figure 4 - UMT Multiplexer state diagram

~~4.3~~

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4.4 UMT Device Functions

4.5 Examples of UMT Use Cases

5 UMT Discovery Protocol (UMTDP)

5.1 Definition of UMTDP Data Unit

5.2 UMTDP Operation

5.3 State diagrams and variable definitions

5.3.1 Variables

5.3.2 Times

5.3.3 Functions

5.3.4 Primitives

5.3.5 State diagrams

6 PICS

7 Examples: Header 1

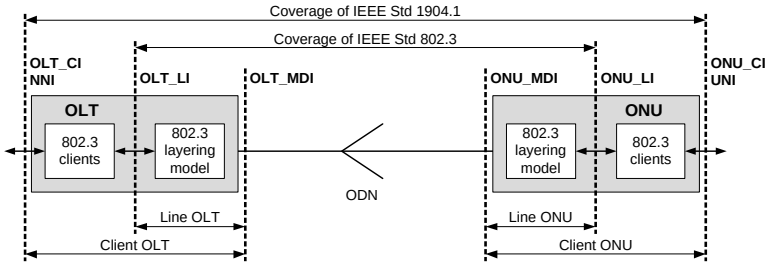
7.1 Examples: Header 2

Example of a paragraph of text.

Example of a table is shown below.

Table 7-1—Table Template

Column1	Column2	Column3
Value1	Value2	Value3
Value1	Value2	Value3
Value1	Value2	Value3



b) OLT and ONU without service-specific functions

Figure 8~~7-1~~—Example of a figure

Example of a bulleted list:

— Line 1; and

— Line 2.

7.1.1 Examples: Header 3

7.1.1.1 Examples: Header 4

7.1.1.1.1 Examples: Header 5