ATM-Based xDSL Bonded Interfaces MIB

Abstract

This document defines a Management Information Base (MIB) module for use with network management protocols in TCP/IP-based internets. This document proposes an extension to the GBOND-MIB module with a set of objects for managing ATM-based multi-pair bonded xDSL interfaces, as defined in ITU-T Recommendation G.998.1.

Status of This Memo

This is an Internet Standards Track document.

Information about the current status of this document, any errata, and how to provide feedback on it may be obtained at http://www.rfc-editor.org/info/rfc6768.

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1. Introduction

ATM-Based Multi-Pair Bonding, a.k.a. G.Bond/ATM, is specified in ITU-T Recommendation G.998.1 [G.998.1], which defines a method for bonding (or aggregating) multiple xDSL lines (or individual bearer channels in multiple xDSL lines) into a single bidirectional logical link carrying an ATM stream.

This specification can be viewed as an evolution of the legacy Inverse Multiplexing for ATM (IMA) technology [AF-PHY-0086], applied to xDSL with variable rates on each line/bearer channel. As with the other bonding schemes, ATM bonding also allows bonding of up to 32 individual sub-layers with variable rates, providing common functionality for the configuration, initialization, operation, and monitoring of the bonded link.

The MIB module defined in this document defines a set of managed objects for the management of G.998.1 bonded interfaces, extending the common objects specified in the GBOND-MIB module [RFC6765].
2. The Internet-Standard Management Framework

For a detailed overview of the documents that describe the current Internet-Standard Management Framework, please refer to section 7 of RFC 3410 [RFC3410].

Managed objects are accessed via a virtual information store, termed the Management Information Base or MIB. MIB objects are generally accessed through the Simple Network Management Protocol (SNMP). Objects in the MIB are defined using the mechanisms defined in the Structure of Management Information (SMI). This memo specifies a MIB module that is compliant to the SMIv2, which is described in STD 58, RFC 2578 [RFC2578], STD 58, RFC 2579 [RFC2579] and STD 58, RFC 2580 [RFC2580].

The key words "MUST", "MUST NOT", "REQUIRED", "SHALL", "SHALL NOT", "SHOULD", "SHOULD NOT", "RECOMMENDED", "NOT RECOMMENDED", "MAY", and "OPTIONAL" in this document are to be interpreted as described in BCP 14, RFC 2119 [RFC2119].

3. The Broadband Forum Management Framework for xDSL Bonding

This document makes use of the Broadband Forum technical report "Management Framework for xDSL Bonding" [TR-159], defining a management model and a hierarchy of management objects for the bonded xDSL interfaces.

4. Relationship to Other MIB Modules

This section outlines the relationship of the MIB modules defined in this document with other MIB modules described in the relevant RFCs. Specifically, the following MIB modules are discussed: the Interfaces Group MIB (IF-MIB) and the G.Bond MIB (GBOND-MIB).

4.1. Relationship to Interfaces Group MIB Module

A G.Bond/ATM port is a private case of a bonded multi-pair xDSL interface and as such is managed using generic interface management objects defined in the IF-MIB [RFC2863]. In particular, an interface index (ifIndex) is used to index instances of G.Bond/ATM ports, as well as xDSL lines/channels, in a managed system.

4.2. Relationship to G.Bond MIB Module

The GBOND-MIB module [RFC6765] defines management objects common for all bonded multi-pair xDSL interfaces. In particular, it describes the bonding management, bonded port and channel configuration, initialization sequence, etc.
Both the GBOND-MIB and G9981-MIB modules are REQUIRED to manage a G.Bond/ATM port.

4.3. Relationship to ATM MIB Module

The ATM-MIB [RFC2515] module defines management objects for an ATM interface.

The ATM-MIB module can be used to manage the ATM aspects of a G.Bond/ATM port.

5. MIB Structure

5.1. Overview

All management objects defined in the G9981-MIB module are contained in a single group g9981Port. This group is further split into 4 sub-groups, structured as recommended by RFC 4181 [RFC4181]:

- g9981PortNotifications - containing notifications (Up/Downstream Differential Delay Tolerance Exceeded).
- g9981PortConfTable - containing objects for configuration of a G.Bond/ATM port.
- g9981PortStatusTable - containing objects providing overall status information of a G.Bond/ATM port, complementing the generic status information from the ifTable of the IF-MIB and the gBondFltStatus of the GBOND-MIB.
- g9981PM - containing objects providing historical Performance Monitoring (PM) information of a G.Bond/ATM port, complementing the PM information from the gBondPortPM of the GBOND-MIB.

Note that the rest of the objects for the Generic Bonding Sub-layer (GBS) port configuration, capabilities, status, notifications, and Performance Monitoring are located in the GBOND-MIB module.

5.2. Performance Monitoring

The OPTIONAL Performance Monitoring counters, thresholds, and history buckets (interval-counters) are implemented using the textual conventions defined in the HC-PerfHist-TC-MIB [RFC3705]. The HC-PerfHist-TC-MIB defines 64-bit versions of the textual conventions found in the PerfHist-TC-MIB [RFC3593].
The agent SHOULD align the beginning of each interval to a fifteen-minute boundary of a wall clock. Likewise, the beginning of each one-day interval SHOULD be aligned with the start of a day.

Counters are not reset when a GBS is re-initialized, but rather only when the agent is reset or re-initialized.

Note that the accumulation of certain performance events for a monitored entity is inhibited (counting stops) during periods of service unavailability on that entity. The DESCRIPTION clause of Performance Monitoring counters in this MIB module specifies which of the counters are inhibited during periods of service unavailability.

### 5.3. Mapping of Broadband Forum TR-159 Managed Objects

This section contains the mapping between relevant managed objects (attributes) defined in [TR-159] and the managed objects defined in this document.

<table>
<thead>
<tr>
<th>TR-159 Managed Object</th>
<th>Corresponding SNMP Object</th>
</tr>
</thead>
<tbody>
<tr>
<td>oBondATM - Basic Package (Mandatory)</td>
<td></td>
</tr>
<tr>
<td>aIMARxLostCells</td>
<td>g9981PortStatRxLostCells</td>
</tr>
<tr>
<td>aIMAPeerRxLostCells</td>
<td>g9981PortStatTxLostCells</td>
</tr>
<tr>
<td>aIMAMaxUpDiffDelay</td>
<td>g9981PortStatMaxUpDiffDelay</td>
</tr>
<tr>
<td>aIMAMaxDownDiffDelay</td>
<td>g9981PortStatMaxDnDiffDelay</td>
</tr>
<tr>
<td>aIMAUpDiffDelayTolerance</td>
<td>g9981PortConfUpDiffDelayTolerance</td>
</tr>
<tr>
<td>aIMADownDiffDelayTolerance</td>
<td>g9981PortConfDnDiffDelayTolerance</td>
</tr>
<tr>
<td>aIMADiffDelayToleranceExceeded</td>
<td>g9981PortConfDiffDelayToleranceExceeded</td>
</tr>
<tr>
<td>nIMAUpDiffDelayToleranceExceeded</td>
<td>g9981UpDiffDelayToleranceExceeded</td>
</tr>
<tr>
<td>nIMADownDiffDelayToleranceExceeded</td>
<td>g9981DnDiffDelayToleranceExceeded</td>
</tr>
</tbody>
</table>

Table 1: Mapping of TR-159 Managed Objects
Note that some of the mapping between the objects defined in TR-159 and the ones defined in this MIB module is not one-to-one; for example, while TR-159 PM attributes aGroupPerf* map to the corresponding gBondPortPm* objects of the GBOND-MIB module, there are no dedicated PM attributes for the g9981PortPm* objects introduced in this MIB module. However, since their definition is identical to the definition of gBondPortPm* objects of the GBOND-MIB module, we can map g9981PortPm* to the relevant aGroupPerf* attributes of TR-159 and use the term 'partial mapping' to denote the fact that this mapping is not one-to-one.
6. G.Bond/ATM MIB Definitions

The G9981-MIB module IMPORTS objects from SNMPv2-SMI [RFC2578], SNMPv2-TC [RFC2579], SNMPv2-CONF [RFC2580], IF-MIB [RFC2863], and HC-PerfHist-TC-MIB [RFC3705]. The module has been structured as recommended by [RFC4181].

G9981-MIB DEFINITIONS ::= BEGIN

IMPORTS
  MODULE-IDENTITY, OBJECT-TYPE, NOTIFICATION-TYPE, mib-2, Unsigned32, Counter32
  FROM SNMPv2-SMI           -- RFC 2578
  TEXTUAL-CONVENTION, TruthValue
  FROM SNMPv2-TC            -- RFC 2579
  MODULE-COMPLIANCE, OBJECT-GROUP, NOTIFICATION-GROUP
  FROM SNMPv2-CONF          -- RFC 2580
  ifIndex
  FROM IF-MIB               -- RFC 2863
  HCPerfCurrentCount, HCPerfIntervalCount, HCPerfValidIntervals, HCPerfInvalidIntervals, HCPerfTimeElapsed
  FROM HC-PerfHist-TC-MIB   -- RFC 3705

------------------------------------------------------------------------
g9981MIB MODULE-IDENTITY
  LAST-UPDATED "201302200000Z" -- 20 February 2013
  ORGANIZATION "IETF ADSL MIB Working Group"
  CONTACT-INFO
    "WG charter:
     http://datatracker.ietf.org/wg/adslmib/charter/

Mailing Lists:
  General Discussion: adslmib@ietf.org
  To Subscribe: adslmib-request@ietf.org
  In Body: subscribe your_email_address
DESCRIPTION
"The objects in this MIB module are used to manage the multi-pair bonded xDSL interfaces using ATM inverse multiplexing, as defined in ITU-T Recommendation G.998.1 (G.Bond/ATM).

This MIB module MUST be used in conjunction with the GBOND-MIB module, common to all G.Bond technologies.

The following references are used throughout this MIB module:

[G.998.1] refers to:

[TR-159] refers to:

Naming Conventions:
ATM - Asynchronous Transfer Mode
BCE - Bonding Channel Entity
BTU - Bonding Terminating Unit
CO - Central Office
CPE - Customer Premises Equipment
GBS - Generic Bonding Sub-layer
GBS-C - Generic Bonding Sub-layer, CO side
GBS-R - Generic Bonding Sub-layer, RT (or CPE) side
PM - Performance Monitoring
RT - Remote Terminal
SNR - Signal to Noise Ratio  
SES - Severely Errored Seconds  
UAS - Unavailable Seconds

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REVISION "201302200000Z" -- 20 February 2013
DESCRIPTION "Initial version, published as RFC 6768."

::= { mib-2 208 }

-- Sections of the module
-- Structured as recommended by RFC 4181, Appendix D

g9981Objects OBJECT IDENTIFIER ::= { g9981MIB 1 }
g9981Conformance OBJECT IDENTIFIER ::= { g9981MIB 2 }

-- Groups in the module

g9981Port OBJECT IDENTIFIER ::= { g9981Objects 1 }

-- Textual Conventions

Milliseconds ::= TEXTUAL-CONVENTION
DISPLAY-HINT "d"
STATUS current
DESCRIPTION "Represents time unit value in milliseconds."
SYNTAX Unsigned32

-- Port Notifications group

g9981PortNotifications OBJECT IDENTIFIER ::= { g9981Port 0 }


g9981UpDiffDelayToleranceExceeded NOTIFICATION-TYPE
OBJECTS {
    -- ifIndex is not needed here, since we are under specific GBS
    g9981PortConfUpDiffDelayTolerance,
    g9981PortStatMaxUpDiffDelay
}
STATUS current
DESCRIPTION
"This notification indicates that the maximum upstream
differential delay has exceeded the max upstream differential
delay threshold, specified by
g9981PortConfUpDiffDelayTolerance.

This notification MAY be sent for the GBS-C ports while the
port is ‘up’, on the crossing event in both directions: from
normal (diff. delay is above the threshold) to low (diff.
delay equals the threshold or is below it) and from low to
normal. This notification is not applicable to the GBS-R
ports.

Generation of this notification is controlled by the
g9981PortConfDiffDelayToleranceExceededEnable attribute.

This object maps to the TR-159 notification
nIMAUpDiffDelayToleranceExceeded."
REFERENCE
"[TR-159], Section 5.5.2.8"
::= { g9981PortNotifications 1 }

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::= { g9981PortNotifications 1 }

g9981DnDiffDelayToleranceExceeded NOTIFICATION-TYPE
OBJECTS {
    -- ifIndex is not needed here, since we are under specific GBS
    g9981PortConfDnDiffDelayTolerance,
    g9981PortStatMaxDnDiffDelay
}
STATUS current
DESCRIPTION
"This notification indicates that the maximum downstream
differential delay has exceeded the max downstream
differential delay threshold, specified by
g9981PortConfDnDiffDelayTolerance.

This notification MAY be sent for the GBS-C ports while the
port is ‘up’, on the crossing event in both directions: from
normal (diff. delay is above the threshold) to low (diff.
delay equals the threshold or is below it) and from low to
normal. This notification is not applicable to the GBS-R
ports.

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Generation of this notification is controlled by the
\texttt{g9981PortConfDiffDelayToleranceExceededEnable} attribute.

This object maps to the TR-159 notification
\texttt{nIMADownDiffDelayToleranceExceeded}.

\textbf{REFERENCE}

"[TR-159], Section 5.5.2.9"

\texttt{::=} \texttt{\{ g9981PortNotifications 2 \}}

-- G.Bond/ATM Port group

g9981PortConfTable \textbf{OBJECT-TYPE}

\textbf{SYNTAX} \textbf{SEQUENCE OF G9981PortConfEntry}

\textbf{MAX-ACCESS} not-accessible

\textbf{STATUS} current

\textbf{DESCRIPTION}

"Table for configuration of G.Bond/ATM ports. Entries in
this table MUST be maintained in a persistent manner."

\texttt{::=} \texttt{\{ g9981Port 1 \}}

g9981PortConfEntry \textbf{OBJECT-TYPE}

\textbf{SYNTAX} \texttt{G9981PortConfEntry}

\textbf{MAX-ACCESS} not-accessible

\textbf{STATUS} current

\textbf{DESCRIPTION}

"An entry in the G.Bond/ATM Port Configuration table.
Each entry represents a G.Bond/ATM port indexed by the
ifIndex. Additional configuration parameters are available
via the gBondPortConfEntry of the GBOND-MIB.
Note that a G.Bond/ATM port runs on top of a single or
multiple BCE port(s), which are also indexed by the ifIndex."

\textbf{INDEX} \{ ifIndex \}

\texttt{::=} \texttt{\{ g9981PortConfTable 1 \}}

G9981PortConfEntry \texttt{::=}

\textbf{SEQUENCE} \{

\texttt{g9981PortConfUpDiffDelayTolerance} \texttt{MilliSeconds},
\texttt{g9981PortConfDnDiffDelayTolerance} \texttt{MilliSeconds},
\texttt{g9981PortConfDiffDelayToleranceExceededEnable} \texttt{TruthValue}
\}

g9981PortConfUpDiffDelayTolerance \textbf{OBJECT-TYPE}

\textbf{SYNTAX} \texttt{MilliSeconds (0..2047)}

\textbf{UNITS} "milliseconds"

\textbf{MAX-ACCESS} read-write

\textbf{STATUS} current
DESCRIPTION
"A maximum tolerated upstream differential delay (among the member BCEs) of a G.Bond/ATM port, expressed in ms.

This object is read-write for the GBS-C ports. It is irrelevant for the GBS-R ports -- an attempt to read or change this object MUST be rejected (in the case of SNMP, with the error inconsistentValue).

This object maps to the TR-159 attribute aIMAUpDiffDelayTolerance."

REFERENCE
"[TR-159], Section 5.5.2.5; [G.998.1], Section 11.4.1 (6)"

::= { g9981PortConfEntry 1 }

g9981PortConfDnDiffDelayTolerance OBJECT-TYPE
SYNTAX MilliSeconds (0..2047)
UNITS "milliseconds"
MAX-ACCESS read-write
STATUS current
DESCRIPTION
"A maximum tolerated downstream differential delay (among the member BCEs) of a G.Bond/ATM port, expressed in ms.

This object is read-write for the GBS-C ports. It is irrelevant for the GBS-R ports -- an attempt to read or change this object MUST be rejected (in the case of SNMP, with the error inconsistentValue).

This object maps to the TR-159 attribute aIMADownDiffDelayTolerance."

REFERENCE
"[TR-159], Section 5.5.2.6; [G.998.1], Section 11.4.1 (6)"

::= { g9981PortConfEntry 2 }

g9981PortConfDiffDelayToleranceExceededEnable OBJECT-TYPE
SYNTAX TruthValue
MAX-ACCESS read-write
STATUS current
DESCRIPTION
"Indicates whether g9981UpDiffDelayToleranceExceeded and g9981DnDiffDelayToleranceExceeded notifications should be generated for G.Bond/ATM port.

A value of true(1) indicates that the notifications are enabled. A value of false(2) indicates that the notifications are disabled."
This object is read-write for the GBS-C. It is irrelevant for the GBS-R ports -- an attempt to read or change this object MUST be rejected (in the case of SNMP, with the error inconsistentValue).

This object maps to the TR-159 attribute aIMADiffDelayToleranceExceededEnable.

REFERENCE
"[TR-159], Section 5.5.5.7"

::= { g9981PortConfEntry 3 }

g9981PortStatTable OBJECT-TYPE
SYNTAX      SEQUENCE OF G9981PortStatEntry
MAX-ACCESS  not-accessible
STATUS      current
DESCRIPTION
"This table provides overall status information of G.Bond/ATM ports, complementing the generic status information from the ifTable of the IF-MIB and the gBondFltStatus of the GBOND-MIB. Additional status information about connected BCEs is available from the relevant line MIBs. This table contains live data from the equipment. As such, it is NOT persistent."

::= { g9981Port 2 }

g9981PortStatEntry OBJECT-TYPE
SYNTAX      G9981PortStatEntry
MAX-ACCESS  not-accessible
STATUS      current
DESCRIPTION
"An entry in the G.Bond/ATM Port Status table. Each entry represents a G.Bond/ATM port indexed by the ifIndex. Note that a GBS port runs on top of a single or multiple BCE port(s), which are also indexed by the ifIndex."

INDEX  { ifIndex }

::= { g9981PortStatTable 1 }

G9981PortStatEntry ::=  
SEQUENCE { 
  g9981PortStatRxLostCells        Counter32,
  g9981PortStatTxLostCells        Counter32,
  g9981PortStatMaxUpDiffDelay     Unsigned32,
  g9981PortStatMaxDnDiffDelay     Unsigned32
}
g9981PortStatRxLostCells  OBJECT-TYPE
SYNTAX       Counter32
UNITS        "cells"
MAX-ACCESS   read-only
STATUS       current
DESCRIPTION  
"The number of lost ATM cells detected by the G.Bond/ATM port in the receive direction (e.g., upstream direction for a GBS-C port).

Discontinuities in the value of this counter can occur at re-initialization of the management system, and at other times as indicated by the value of ifCounterDiscontinuityTime as defined in the IF-MIB.

This object maps to the TR-159 attribute aIMARxLostCells."
REFERENCE   
"[TR-159], Section 5.5.2.1; [G.998.1], Section 11.4.2 (4)"
::= { g9981PortStatEntry 1 }

g9981PortStatTxLostCells  OBJECT-TYPE
SYNTAX       Counter32
UNITS        "cells"
MAX-ACCESS   read-only
STATUS       current
DESCRIPTION  
"The number of lost ATM cells detected by the peer G.Bond/ATM port in the receive direction, i.e., downstream direction for a GBS-C port.

This object is irrelevant for the GBS-R ports -- an attempt to read it MUST be rejected (in the case of SNMP, with the error inconsistentValue).

Discontinuities in the value of this counter can occur at re-initialization of the management system, and at other times as indicated by the value of ifCounterDiscontinuityTime as defined in the IF-MIB.

This object maps to the TR-159 attribute aIMAPeerRxLostCells."
REFERENCE   
"[TR-159], Section 5.5.2.2; [G.998.1], Section 11.4.2 (4)"
::= { g9981PortStatEntry 2 }

g9981PortStatMaxUpDiffDelay  OBJECT-TYPE
SYNTAX       Unsigned32
UNITS        "0.1 ms"
MAX-ACCESS   read-only
STATUS current
DESCRIPTION
"Current maximum upstream differential delay between all
operational BCEs in the G.Bond/ATM bonding group, measured in
units of 0.1 ms.

This object is read-only for the GBS-C ports.
It is irrelevant for the GBS-R ports -- an attempt to read this
object MUST be rejected (in the case of SNMP, with the error
inconsistentValue).

This object maps to the TR-159 attribute aIMAMaxUpDiffDelay."
REFERENCE
"[TR-159], Section 5.5.2.3"
::= { g9981PortStatEntry 3 }

-------------------------------------------------------------
-- Performance Monitoring group
-------------------------------------------------------------

g9981PM    OBJECT IDENTIFIER ::= { g9981Port 3 }

g9981PortPmCurTable OBJECT-TYPE
SYNTAX    SEQUENCE OF G9981PortPmCurEntry
MAX-ACCESS not-accessible
STATUS    current
DESCRIPTION

"This table contains current Performance Monitoring information for a G.Bond/ATM port. This table contains live data from the equipment and as such is NOT persistent."

::= { g9981PM 1 }

g9981PortPmCurEntry OBJECT-TYPE
SYNTAX      G9981PortPmCurEntry
MAX-ACCESS  not-accessible
STATUS      current
DESCRIPTION
"An entry in the G.Bond/ATM Port PM table. Each entry represents a G.Bond/ATM port indexed by the ifIndex."
INDEX  { ifIndex }
::= { g9981PortPmCurTable 1 }

G9981PortPmCurEntry ::= 
SEQUENCE {
  g9981PortPmCur15MinValidIntervals   HCPerfValidIntervals,
  g9981PortPmCur15MinInvalidIntervals HCPerfInvalidIntervals,
  g9981PortPmCur15MinTimeElapsed      HCPerfTimeElapsed,
  g9981PortPmCur15MinRxLostCells      HCPerfCurrentCount,
  g9981PortPmCur15MinTxLostCells      HCPerfCurrentCount,
  g9981PortPmCur15MinUpDiffDelay      HCPerfCurrentCount,
  g9981PortPmCur15MinDnDiffDelay      HCPerfCurrentCount,
  g9981PortPmCur1DayValidIntervals    Unsigned32,
  g9981PortPmCur1DayInvalidIntervals  Unsigned32,
  g9981PortPmCur1DayTimeElapsed       HCPerfTimeElapsed,
  g9981PortPmCur1DayRxLostCells       HCPerfCurrentCount,
  g9981PortPmCur1DayTxLostCells       HCPerfCurrentCount,
  g9981PortPmCur1DayUpDiffDelay       HCPerfCurrentCount,
  g9981PortPmCur1DayDnDiffDelay       HCPerfCurrentCount
}

g9981PortPmCur15MinValidIntervals  OBJECT-TYPE
SYNTAX      HCPerfValidIntervals
MAX-ACCESS  read-only
STATUS      current
DESCRIPTION
"A read-only number of 15-minute intervals for which the performance data was collected. The value of this object will be 96 or the maximum number of 15-minute history intervals collected by the implementation, unless the measurement was (re)started recently, in which case the value will be the number of complete 15-minute intervals for which there are at least some data."
In certain cases, it is possible that some intervals are unavailable. In this case, this object reports the maximum interval number for which data is available.

This object partially maps to the TR-159 attribute aGroupPerf15MinValidIntervals.

REFERENCE
"[TR-159], Section 5.5.1.32"
::= { g9981PortPmCurEntry 1 }

g9981PortPmCur15MinInvalidIntervals OBJECT-TYPE
SYNTAX      HCPerfInvalidIntervals
MAX-ACCESS  read-only
STATUS      current
DESCRIPTION
"A read-only number of 15-minute intervals for which the performance data was not always available. The value will typically be zero, except in cases where the data for some intervals are not available.

This object partially maps to the TR-159 attribute aGroupPerf15MinInvalidIntervals."
REFERENCE
"[TR-159], Section 5.5.1.33"
::= { g9981PortPmCurEntry 2 }

g9981PortPmCur15MinTimeElapsed OBJECT-TYPE
SYNTAX      HCPerfTimeElapsed
UNITS       "seconds"
MAX-ACCESS  read-only
STATUS      current
DESCRIPTION
"A read-only count of seconds that have elapsed since the beginning of the current 15-minute performance interval.

This object partially maps to the TR-159 attribute aGroupPerfCurr15MinTimeElapsed."
REFERENCE
"[TR-159], Section 5.5.1.34"
::= { g9981PortPmCurEntry 3 }

g9981PortPmCur15MinRxLostCells OBJECT-TYPE
SYNTAX      HCPerfCurrentCount
UNITS       "cells"
MAX-ACCESS  read-only
STATUS      current
DESCRIPTION

"A read-only count of lost ATM cells detected by a G.Bond/ATM port (e.g., the GBS-C) in the receive direction, during the current 15-minute performance history interval.

Note that the total number of lost ATM cells is indicated by the g9981PortStatRxLostCells object.

This object is inhibited during Severely Errored Seconds (SES) or Unavailable Seconds (UAS)."

REFERENCE

"[TR-159], Section 5.5.2.1"
::= { g9981PortPmCurEntry 4}

g9981PortPmCur15MinTxLostCells  OBJECT-TYPE
SYNTAX      HCPerfCurrentCount
UNITS       "cells"
MAX-ACCESS  read-only
STATUS      current
DESCRIPTION

"A read-only count of lost ATM cells detected by the peer G.Bond/ATM port (e.g., by the GBS-R for the GBS-C) during the current 15-minute performance history interval.

Note that the total number of lost ATM cells is indicated by the g9981PortStatTxLostCells object.

This object is inhibited during Unavailable Seconds (UAS)."

REFERENCE

"[TR-159], Section 5.5.2.2"
::= { g9981PortPmCurEntry 5}

g9981PortPmCur15MinUpDiffDelay  OBJECT-TYPE
SYNTAX      HCPerfCurrentCount
UNITS       "0.1 ms"
MAX-ACCESS  read-only
STATUS      current
DESCRIPTION

"A read-only value specifying the maximum upstream differential delay between all operational BCEs in the GBS-C, measured in units of 0.1 ms, during the current 15-minute performance interval.

Note that the current max upstream differential delay is indicated by the g9981PortStatMaxUpDiffDelay object.

This object is inhibited during Unavailable Seconds (UAS)."
REFERENCE

"[TR-159], Section 5.5.2.3"

::= { g9981PortPmCurEntry 6}

g9981PortPmCur15MinDnDiffDelay  OBJECT-TYPE
SYNTAX      HCPerfCurrentCount
UNITS       "0.1 ms"
MAX-ACCESS  read-only
STATUS      current
DESCRIPTION
"A read-only value specifying the maximum downstream
differential delay between all operational BCEs in the GBS-C
(as perceived by the GBS-R), measured in units of 0.1 ms,
during the current 15-minute performance history interval.

Note that the current max downstream differential delay is
indicated by the g9981PortStatMaxDnDiffDelay object.

This object is inhibited during Unavailable Seconds (UAS)."

REFERENCE

"[TR-159], Section 5.5.2.4"

::= { g9981PortPmCurEntry 7}

g9981PortPmCur1DayValidIntervals  OBJECT-TYPE
SYNTAX      Unsigned32 (0..7)
UNITS       "days"
MAX-ACCESS  read-only
STATUS      current
DESCRIPTION
"A read-only number of 1-day intervals for which data was
collected. The value of this object will be 7 or the maximum
number of 1-day history intervals collected by the
implementation, unless the measurement was (re)started recently,
in which case the value will be the number of complete 1-day
intervals for which there are at least some data.
In certain cases, it is possible that some intervals are
unavailable. In this case, this object reports the maximum
interval number for which data is available."

REFERENCE

"[TR-159], Section 5.5.1.45"

::= { g9981PortPmCurEntry 8 }

g9981PortPmCur1DayInvalidIntervals  OBJECT-TYPE
SYNTAX      Unsigned32 (0..7)
UNITS       "days"
MAX-ACCESS  read-only
STATUS      current
DESCRIPTION
"A read-only number of 1-day intervals for which data was
not always available. The value will typically be zero, except
in cases where the data for some intervals are not available."
REFERENCE
"[TR-159], Section 5.5.1.46"
::= { g9981PortPmCurEntry 9 }
g9981PortPmCur1DayTimeElapsed OBJECT-TYPE
SYNTAX     HCPerfTimeElapsed
UNITS       "seconds"
MAX-ACCESS  read-only
STATUS      current
DESCRIPTION
"A read-only count of seconds that have elapsed since the
beginning of the current 1-day performance interval."
REFERENCE
"[TR-159], Section 5.5.1.47"
::= { g9981PortPmCurEntry 10 }
g9981PortPmCur1DayRxLostCells OBJECT-TYPE
SYNTAX      HCPerfCurrentCount
UNITS       "cells"
MAX-ACCESS  read-only
STATUS      current
DESCRIPTION
"A read-only count of lost ATM cells detected by the G.Bond/ATM
port (e.g., the GBS-C) during the current 1-day performance
interval.

This object is inhibited during Severely Errored Seconds (SES)
and Unavailable Seconds (UAS)."
::= { g9981PortPmCurEntry 11 }
g9981PortPmCur1DayTxLostCells OBJECT-TYPE
SYNTAX      HCPerfCurrentCount
UNITS       "cells"
MAX-ACCESS  read-only
STATUS      current
DESCRIPTION
"A read-only count of lost ATM cells detected by the peer
G.Bond/ATM port (e.g., by the GBS-R for the GBS-C) during the
current 1-day performance history interval.

This object is inhibited during Unavailable Seconds (UAS)."
::= { g9981PortPmCurEntry 12 }
g9981PortPmCur1DayUpDiffDelay OBJECT-TYPE
SYNTAX HCPefCurrentCount
UNITS "0.1 ms"
MAX-ACCESS read-only
STATUS current
DESCRIPTION
"A read-only value specifying the maximum upstream differential delay between all operational BCEs in the GBS-C, measured in units of 0.1 ms, during the current 1-day performance interval.

This object is inhibited during Unavailable Seconds (UAS)."
::= { g9981PortPmCurEntry 13 }

g9981PortPmCur1DayDnDiffDelay OBJECT-TYPE
SYNTAX HCPefCurrentCount
UNITS "0.1 ms"
MAX-ACCESS read-only
STATUS current
DESCRIPTION
"A read-only value specifying the maximum downstream differential delay between all operational BCEs in the GBS-C, measured in units of 0.1 ms, during the current 1-day performance interval.

This object is inhibited during Unavailable Seconds (UAS)."
::= { g9981PortPmCurEntry 14 }

-- Port PM history: 15-min buckets

g9981PortPm15MinTable OBJECT-TYPE
SYNTAX SEQUENCE OF G9981PortPm15MinEntry
MAX-ACCESS not-accessible
STATUS current
DESCRIPTION
"This table contains historical 15-minute buckets of Performance Monitoring information for a G.Bond/ATM port (a row for each 15-minute interval, up to 96 intervals). Entries in this table MUST be maintained in a persistent manner."
::= { g9981PM 2 }

g9981PortPm15MinEntry OBJECT-TYPE
SYNTAX G9981PortPm15MinEntry
MAX-ACCESS not-accessible
STATUS current
DESCRIPTION
"An entry in the G.Bond/ATM Port historical 15-minute PM table. Each entry represents Performance Monitoring data for a
G.Bond/ATM port, indexed by the ifIndex, collected during a particular 15-minute interval, indexed by the g9981PortPm15MinIntervalIndex.

INDEX { ifIndex, g9981PortPm15MinIntervalIndex }
::= { g9981PortPm15MinTable 1 }

G9981PortPm15MinEntry ::= SEQUENCE {
  g9981PortPm15MinIntervalIndex       Unsigned32,
  g9981PortPm15MinIntervalMoniTime    HCPerfTimeElapsed,
  g9981PortPm15MinIntervalRxLostCells HCPerfIntervalCount,
  g9981PortPm15MinIntervalTxLostCells HCPerfIntervalCount,
  g9981PortPm15MinIntervalUpDiffDelay HCPerfIntervalCount,
  g9981PortPm15MinIntervalDnDiffDelay HCPerfIntervalCount,
  g9981PortPm15MinIntervalValid       TruthValue
}

G9981PortPm15MinIntervalIndex  OBJECT-TYPE
SYNTAX      Unsigned32 (1..96)
MAX-ACCESS  not-accessible
STATUS      current
DESCRIPTION  "Performance data interval number. 1 is the most recent previous interval; interval 96 is 24 hours ago. Intervals 2..96 are OPTIONAL.

This object partially maps to the TR-159 attribute aGroupPerf15MinIntervalNumber."
REFERENCE   "[TR-159], Section 5.5.1.57"
::= { g9981PortPm15MinEntry 1 }

G9981PortPm15MinIntervalMoniTime  OBJECT-TYPE
SYNTAX      HCPerfTimeElapsed
UNITS       "seconds"
MAX-ACCESS  read-only
STATUS      current
DESCRIPTION  "A read-only count of seconds over which the performance data was actually monitored. This value will be the same as the interval duration (900 seconds), except in a situation where performance data could not be collected for any reason."
::= { g9981PortPm15MinEntry 2 }

G9981PortPm15MinIntervalRxLostCells  OBJECT-TYPE
SYNTAX      HCPerfIntervalCount
UNITS       "cells"
MAX-ACCESS  read-only
STATUS    current
DESCRIPTION
 "A read-only count of lost ATM cells detected by a G.Bond/ATM
port (e.g., the GBS-C) in the receive direction, during the
15-minute performance history interval.

Note that the total number of lost ATM cells is indicated by the
g9981PortStatRxLostCells object.

This object is inhibited during Severely Errored Seconds (SES)
or Unavailable Seconds (UAS)."
REFERENCE
   "[TR-159], Section 5.5.2.1"
::= { g9981PortPm15MinEntry 3 }

**g9981PortPm15MinIntervalTxLostCells** OBJECT-TYPE
SYNTAX    HCPeRFIntervalCount
UNITS      "cells"
MAX-ACCESS read-only
STATUS     current
DESCRIPTION
 "A read-only count of lost ATM cells detected by the peer
G.Bond/ATM port (e.g., by the GBS-R for the GBS-C) during the
15-minute performance history interval.

Note that the total number of lost ATM cells is indicated by the
g9981PortStatTxLostCells object.

This object is inhibited during Unavailable Seconds (UAS)."
REFERENCE
   "[TR-159], Section 5.5.2.2"
::= { g9981PortPm15MinEntry 4 }

**g9981PortPm15MinIntervalUpDiffDelay** OBJECT-TYPE
SYNTAX    HCPeRFIntervalCount
UNITS      "0.1 ms"
MAX-ACCESS read-only
STATUS     current
DESCRIPTION
 "A read-only value specifying the maximum upstream differential
delay between all operational BCEs in the GBS, measured in
units of 0.1 ms, during the 15-minute performance history
interval.

Note that the current max upstream differential delay is
indicated by the g9981PortStatMaxUpDiffDelay object.

This object is inhibited during Unavailable Seconds (UAS)."
REFERENCE
   "[TR-159], Section 5.5.2.3"
::= { g9981PortPm15MinEntry 5 }

g9981PortPm15MinIntervalDnDiffDelay  OBJECT-TYPE
SYNTAX      HCPerfIntervalCount
UNITS       "0.1 ms"
MAX-ACCESS  read-only
STATUS      current
DESCRIPTION
   "A read-only value specifying the maximum downstream
differential delay between all operational BCEs in the GBS,
as perceived by its peer port, measured in units of 0.1 ms,
during the 15-minute performance history interval.

   Note that the current max downstream differential delay is
   indicated by the g9981PortStatMaxDnDiffDelay object.

   This object is inhibited during Unavailable Seconds (UAS)."
REFERENCE
   "[TR-159], Section 5.5.2.4"
::= { g9981PortPm15MinEntry 6 }

g9981PortPm15MinIntervalValid  OBJECT-TYPE
SYNTAX      TruthValue
MAX-ACCESS  read-only
STATUS      current
DESCRIPTION
   "A read-only object indicating whether or not this history
bucket contains valid data. A valid bucket is reported as
true(1) and an invalid bucket as false(2).
If this history bucket is invalid, the BTU MUST NOT produce
notifications based upon the value of the counters in this
bucket.
Note that an implementation may decide not to store invalid
history buckets in its database. In such a case, this object
is not required, as only valid history buckets are available
while invalid history buckets are simply not in the database.

   This object partially maps to the TR-159 attribute
aGroupPerf15MinIntervalValid."
REFERENCE
   "[TR-159], Section 5.5.1.58"
::= { g9981PortPm15MinEntry 7 }
-- Port PM history: 1-day buckets

g9981PortPm1DayTable OBJECT-TYPE
SYNTAX       SEQUENCE OF G9981PortPm1DayEntry
MAX-ACCESS   not-accessible
STATUS       current
DESCRIPTION
 "This table contains historical 1-day buckets of Performance
 Monitoring information for a G.Bond/ATM port (a row for each
 1-day interval, up to 7 intervals).
 Entries in this table MUST be maintained in a persistent manner."
 ::= { g9981PM 3 }

g9981PortPm1DayEntry OBJECT-TYPE
SYNTAX       G9981PortPm1DayEntry
MAX-ACCESS   not-accessible
STATUS       current
DESCRIPTION
 "An entry in the G.Bond/ATM Port historical 1-day PM table. Each
 entry represents Performance Monitoring data for such a
 port, indexed by the ifIndex, collected during a particular
 1-day interval, indexed by the g9981PortPm1DayIntervalIndex."
INDEX      { ifIndex, g9981PortPm1DayIntervalIndex }
 ::= { g9981PortPm1DayTable 1 }

G9981PortPm1DayEntry ::= SEQUENCE {
    g9981PortPm1DayIntervalIndex        Unsigned32,
    g9981PortPm1DayIntervalMoniTime     HCPerfTimeElapsed,
    g9981PortPm1DayIntervalRxLostCells  HCPerfIntervalCount,
    g9981PortPm1DayIntervalTxLostCells  HCPerfIntervalCount,
    g9981PortPm1DayIntervalUpDiffDelay  HCPerfIntervalCount,
    g9981PortPm1DayIntervalDnDiffDelay  HCPerfIntervalCount,
    g9981PortPm1DayIntervalValid        TruthValue
 }

g9981PortPm1DayIntervalIndex  OBJECT-TYPE
SYNTAX       Unsigned32 (1..7)
MAX-ACCESS   not-accessible
STATUS       current
DESCRIPTION
 "Performance data interval number.  1 is the most recent previous
 interval; interval 7 is 24 hours ago.  Intervals 2..7 are OPTIONAL.

 This object partially maps to the TR-159 attribute
 aGroupPerf1DayIntervalNumber."
REFERENCE
  "[TR-159], Section 5.5.1.62"
::= { g9981PortPmiDayEntry 1 }

g9981PortPmiDayIntervalMoniTime  OBJECT-TYPE
SYNTAX      HCPerfTimeElapsed
UNITS       "seconds"
MAX-ACCESS  read-only
STATUS      current
DESCRIPTION
  "A count of seconds over which the performance data was actually
   monitored.  This value will be the same as the interval duration
   (86400 seconds), except in a situation where performance data
   could not be collected for any reason.

  This object partially maps to the TR-159 attribute
  aGroupPerf1DayIntervalMoniSecs."
REFERENCE
  "[TR-159], Section 5.5.1.64"
::= { g9981PortPmiDayEntry 2 }

g9981PortPmiDayIntervalRxLostCells  OBJECT-TYPE
SYNTAX      HCPerfIntervalCount
UNITS       "cells"
MAX-ACCESS  read-only
STATUS      current
DESCRIPTION
  "A count of lost ATM cells detected by the G.Bond/ATM port
  (e.g., the GBS-C) during the 1-day performance history interval.

  This object is inhibited during Severely Errored Seconds (SES)
  and Unavailable Seconds (UAS)."
::= { g9981PortPmiDayEntry 3 }

g9981PortPmiDayIntervalTxLostCells  OBJECT-TYPE
SYNTAX      HCPerfIntervalCount
UNITS       "cells"
MAX-ACCESS  read-only
STATUS      current
DESCRIPTION
  "A count of lost ATM cells detected by the peer G.Bond/ATM port
  (e.g., by the GBS-R for the GBS-C) during the 1-day performance
  history interval.

  This object is inhibited during Unavailable Seconds (UAS)."
::= { g9981PortPmiDayEntry 4 }
g9981PortPm1DayIntervalUpDiffDelay  OBJECT-TYPE
SYNTAX      HCPerfIntervalCount
UNITS       "0.1 ms"
MAX-ACCESS  read-only
STATUS      current
DESCRIPTION
  "A read-only value specifying the maximum upstream differential delay between all operational BCEs in the GBS-C, measured in units of 0.1 ms, during the 1-day performance history interval.

  This object is inhibited during Unavailable Seconds (UAS)."
 ::= ( g9981PortPm1DayEntry 5 )

g9981PortPm1DayIntervalDnDiffDelay  OBJECT-TYPE
SYNTAX      HCPerfIntervalCount
UNITS       "0.1 ms"
MAX-ACCESS  read-only
STATUS      current
DESCRIPTION
  "A read-only value specifying the maximum downstream differential delay between all operational BCEs in the GBS-C, measured in units of 0.1 ms, during the 1-day performance history interval.

  This object is inhibited during Unavailable Seconds (UAS)."
 ::= ( g9981PortPm1DayEntry 6 )

g9981PortPm1DayIntervalValid  OBJECT-TYPE
SYNTAX      TruthValue
MAX-ACCESS  read-only
STATUS      current
DESCRIPTION
  "A read-only object indicating whether or not this history bucket contains valid data. A valid bucket is reported as true(1) and an invalid bucket as false(2).
If this history bucket is invalid, the BTU MUST NOT produce notifications based upon the value of the counters in this bucket.
Note that an implementation may decide not to store invalid history buckets in its database. In such a case, this object is not required, as only valid history buckets are available while invalid history buckets are simply not in the database.

  This object partially maps to the TR-159 attribute aGroupPerf1DayIntervalValid."
REFERENCE
  "[TR-159], Section 5.5.1.63"
 ::= ( g9981PortPm1DayEntry 7 )
-- Conformance Statements
--

g9981Groups OBJECT IDENTIFIER ::= { g9981Conformance 1 }
g9981Compliances OBJECT IDENTIFIER ::= { g9981Conformance 2 }

-- Object Groups

g9981BasicGroup OBJECT-GROUP OBJECTS {
g9981PortStatRxLostCells,
g9981PortStatTxLostCells,
g9981PortStatMaxUpDiffDelay,
g9981PortStatMaxDnDiffDelay
}
STATUS current
DESCRIPTION "A collection of objects representing management information
for a G.Bond/ATM port."
 ::= { g9981Groups 1 }

g9981AlarmConfGroup OBJECT-GROUP OBJECTS {
g9981PortConfUpDiffDelayTolerance,
g9981PortConfDnDiffDelayTolerance,
g9981PortConfDiffDelayToleranceExceededEnable
}
STATUS current
DESCRIPTION "A collection of objects required for configuration of alarm
thresholds and notifications in G.Bond/ATM ports."
 ::= { g9981Groups 2 }

g9981NotificationGroup NOTIFICATION-GROUP NOTIFICATIONS {
g9981UpDiffDelayToleranceExceeded,
g9981DnDiffDelayToleranceExceeded
}
STATUS current
DESCRIPTION "This group supports notifications of significant conditions
associated with G.Bond/ATM ports."
 ::= { g9981Groups 3 }

Beili Standards Track [Page 28]
g9981PerfCurrGroup OBJECT-GROUP
OBJECTS {
    g9981PortPmCur15MinValidIntervals,
    g9981PortPmCur15MinInvalidIntervals,
    g9981PortPmCur15MinTimeElapsed,
    g9981PortPmCur15MinRxLostCells,
    g9981PortPmCur15MinTxLostCells,
    g9981PortPmCur15MinUpDiffDelay,
    g9981PortPmCur15MinDnDiffDelay,
    g9981PortPmCur1DayValidIntervals,
    g9981PortPmCur1DayInvalidIntervals,
    g9981PortPmCur1DayTimeElapsed,
    g9981PortPmCur1DayRxLostCells,
    g9981PortPmCur1DayTxLostCells,
    g9981PortPmCur1DayUpDiffDelay,
    g9981PortPmCur1DayDnDiffDelay
}
STATUS current
DESCRIPTION
"A collection of objects supporting OPTIONAL current Performance
Monitoring information for G.Bond/ATM ports."
::= { g9981Groups 4 }

g9981Perf15MinGroup OBJECT-GROUP
OBJECTS {
    g9981PortPm15MinIntervalMoniTime,
    g9981PortPm15MinIntervalRxLostCells,
    g9981PortPm15MinIntervalTxLostCells,
    g9981PortPm15MinIntervalUpDiffDelay,
    g9981PortPm15MinIntervalDnDiffDelay,
    g9981PortPm15MinIntervalValid
}
STATUS current
DESCRIPTION
"A collection of objects supporting OPTIONAL historical
Performance Monitoring information for G.Bond/ATM ports, during
previous 15-minute intervals."
::= { g9981Groups 5 }

g9981Perf1DayGroup OBJECT-GROUP
OBJECTS {
    g9981PortPm1DayIntervalMoniTime,
    g9981PortPm1DayIntervalRxLostCells,
    g9981PortPm1DayIntervalTxLostCells,
    g9981PortPm1DayIntervalUpDiffDelay,
    g9981PortPm1DayIntervalDnDiffDelay,
    g9981PortPm1DayIntervalValid
}
STATUS       current
DESCRIPTION   "A collection of objects supporting OPTIONAL historical
Performance Monitoring information for G.Bond/ATM ports, during
previous 1-day intervals."
::= { g9981Groups 6 }

-- Compliance Statements

g9981Compliance MODULE-COMPLIANCE
STATUS       current
DESCRIPTION   "The compliance statement for G.Bond/ATM interfaces.
Compliance with the following external compliance statements
is REQUIRED:

MIB Module     Compliance Statement
--------     ---------------------
IF-MIB        ifCompliance3
GBOND-MIB     gBondCompliance"

MODULE       -- this module
MANDATORY-GROUPS { 
    g9981BasicGroup,
    g9981AlarmConfGroup,
    g9981NotificationGroup
}

GROUP       g9981PerfCurrGroup
DESCRIPTION   "Support for this group is only required for implementations
supporting Performance Monitoring."

GROUP       g9981Perf15MinGroup
DESCRIPTION   "Support for this group is only required for implementations
supporting historical Performance Monitoring."

GROUP       g9981Perf1DayGroup
DESCRIPTION   "Support for this group is only required for implementations
supporting 1-day historical Performance Monitoring."

::= { g9981Compliances 1 }
END
7. Security Considerations

There are a number of managed objects defined in this MIB module with a MAX-ACCESS clause of read-write. Such objects may be considered sensitive or vulnerable in some network environments. The support for SET operations in a non-secure environment without proper protection can have a negative effect on network operations. These are the tables and objects and their sensitivity/vulnerability:

- Changing of g9981PortConfTable configuration parameters MAY lead to a potential Service Level Agreement (SLA) breach, for example, if a traffic delay is increased as a result of the higher delay tolerance (increased g9981PortConfUpDiffDelayTolerance and/or g9981PortConfDnDiffDelayTolerance), or the differential delay tolerance notifications are disabled by manipulating the g9981PortConfDiffDelayToleranceExceededEnable parameter.

Some of the readable objects in this MIB module (i.e., objects with a MAX-ACCESS other than not-accessible) may be considered sensitive or vulnerable in some network environments since, collectively, they provide information about the performance of network interfaces and can reveal some aspects of their configuration.

It is thus important to control even GET and/or NOTIFY access to these objects and possibly to even encrypt the values of these objects when sending them over the network via SNMP.

SNMP versions prior to SNMPv3 did not include adequate security. Even if the network itself is secure (for example by using IPsec), there is no control as to who on the secure network is allowed to access and GET/SET (read/change/create/delete) the objects in this MIB module.

Implementations SHOULD provide the security features described by the SNMPv3 framework (see [RFC3410]), and implementations claiming compliance to the SNMPv3 standard MUST include full support for authentication and privacy via the User-based Security Model (USM) [RFC3414] with the AES cipher algorithm [RFC3826]. Implementations MAY also provide support for the Transport Security Model (TSM) [RFC5591] in combination with a secure transport such as SSH [RFC5592] or TLS/DTLS [RFC6353].

Further, deployment of SNMP versions prior to SNMPv3 is NOT RECOMMENDED. Instead, it is RECOMMENDED to deploy SNMPv3 and to enable cryptographic security. It is then a customer/operator responsibility to ensure that the SNMP entity giving access to an
instance of this MIB module is properly configured to give access to the objects only to those principals (users) that have legitimate rights to indeed GET or SET (change/create/delete) them.

8. IANA Considerations

IANA has assigned 208 as the object identifier for g9981MIB MODULE-IDENTITY in the MIB-2 transmission sub-tree <http://www.iana.org/>.

9. Acknowledgments

This document was produced by the [ADSLMIB] working group.

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10. References

10.1. Normative References


10.2.  Informative References

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