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.

This document is a product of the Internet Engineering Task Force (IETF). It represents the consensus of the IETF community. It has received public review and has been approved for publication by the Internet Engineering Steering Group (IESG). Further information on Internet Standards is available in Section 2 of RFC 5741.

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.

Copyright Notice

Copyright (c) 2013 IETF Trust and the persons identified as the document authors. All rights reserved.

This document is subject to BCP 78 and the IETF Trust’s Legal Provisions Relating to IETF Documents (http://trustee.ietf.org/license-info) in effect on the date of publication of this document. Please review these documents carefully, as they describe your rights and restrictions with respect to this document. Code Components extracted from this document must include Simplified BSD License text as described in Section 4.e of the Trust Legal Provisions and are provided without warranty as described in the Simplified BSD License.
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>aIMA_RxLostCells</td>
<td>g9981_PortStat_RxLostCells</td>
</tr>
<tr>
<td>aIMA_PeerRxLostCells</td>
<td>g9981_PortStat_TxLostCells</td>
</tr>
<tr>
<td>aIMA_MaxUpDiffDelay</td>
<td>g9981_PortStat_MaxUpDiffDelay</td>
</tr>
<tr>
<td>aIMA_MaxDownDiffDelay</td>
<td>g9981_PortStat_MaxDnDiffDelay</td>
</tr>
<tr>
<td>aIMA_UpDiffDelayTolerance</td>
<td>g9981_PortConf_UpDiffDelayTolerance</td>
</tr>
<tr>
<td>aIMA_DownDiffDelayTolerance</td>
<td>g9981_PortConf_DnDiffDelayTolerance</td>
</tr>
<tr>
<td>aIMA_DiffDelayToleranceExceededEnable</td>
<td>g9981_PortConf_DiffDelayToleranceExceededEnable</td>
</tr>
<tr>
<td>nIMA_UpDiffDelayToleranceExceeded</td>
<td>g9981_UpDiffDelayToleranceExceeded</td>
</tr>
<tr>
<td>nIMA_DownDiffDelayToleranceExceeded</td>
<td>g9981_DnDiffDelayToleranceExceeded</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

Copyright (c) 2013 IETF Trust and the persons identified as authors of the code. All rights reserved.

Redistribution and use in source and binary forms, with or without modification, is permitted pursuant to, and subject to the license terms contained in, the Simplified BSD License set forth in Section 4.c of the IETF Trust’s Legal Provisions Relating to IETF Documents (http://trustee.ietf.org/license-info).

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

-- Port Notifications group
g9981PortNotifications OBJECT IDENTIFIER ::= { g9981Port 0 }
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 g9981PortConfUpDiffDelayToleranceExceededEnable attribute.

This object maps to the TR-159 notification nIMAUpDiffDelayToleranceExceeded.

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.
Generation of this notification is controlled by the 
g9981PortConfDiffDelayToleranceExceededEnable attribute.

This object maps to the TR-159 notification
nIMADownDiffDelayToleranceExceeded.

REFERENCE
"[TR-159], Section 5.5.2.9"
::= { g9981PortNotifications 2 }

-- G.Bond/ATM Port group

g9981PortConfTable OBJECT-TYPE
SYNTAX     SEQUENCE OF G9981PortConfEntry
MAX-ACCESS not-accessible
STATUS     current
DESCRIPTION
"Table for configuration of G.Bond/ATM ports. Entries in
this table MUST be maintained in a persistent manner."
::= { g9981Port 1 }

g9981PortConfEntry OBJECT-TYPE
SYNTAX     G9981PortConfEntry
MAX-ACCESS not-accessible
STATUS     current
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."
INDEX  { ifIndex }
::= { g9981PortConfTable 1 }

G9981PortConfEntry ::=  
SEQUENCE { 
  g9981PortConfUpDiffDelayTolerance MilliSeconds, 
g9981PortConfDnDiffDelayTolerance MilliSeconds, 
g9981PortConfDiffDelayToleranceExceededEnable TruthValue
} 

g9981PortConfUpDiffDelayTolerance OBJECT-TYPE
SYNTAX     MilliSeconds (0..2047)
UNITS      "milliseconds"
MAX-ACCESS read-write
STATUS     current

Beili Standards Track [Page 11]
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
"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."

"[TR-159], Section 5.5.2.3"
::= { g9981PortStatEntry 3 }

g9981PortStatMaxDnDiffDelay OBJECT-TYPE
SYNTAX Unsigned32
UNITS "0.1 ms"
MAX-ACCESS read-only
STATUS current
DESCRIPTION
"Current maximum downstream 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 aIMAMaxDownDiffDelay."

"[TR-159], Section 5.5.2.4"
::= { g9981PortStatEntry 4 }

-----------
-- 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
```

---

Beili                        Standards Track                   [Page 17]
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)."
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 6}

REFERENCE
"[TR-159], Section 5.5.2.3"
::= { g9981PortPmCurEntry 6}

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 7}

REFERENCE
"[TR-159], Section 5.5.2.4"
::= { g9981PortPmCurEntry 6}

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 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 1-day performance interval.

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

-- Port PM history: 15-min buckets

g9981PortPmCur1DayDnDiffDelay 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, 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 }

::= { g9981PortPm15MinEntry 4 }

REFERENCE
"[TR-159], Section 5.5.2.2"

::= { g9981PortPm15MinEntry 4 }

::= { g9981PortPm15MinEntry 4 }

REFERENCE
"[TR-159], Section 5.5.2.2"
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"
::= { g9981PortPm1DayEntry 1 }

g9981PortPm1DayIntervalMoniTime 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"
::= { g9981PortPm1DayEntry 2 }

g9981PortPm1DayIntervalRxLostCells 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)."
::= { g9981PortPm1DayEntry 3 }

g9981PortPm1DayIntervalTxLostCells 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)."
::= { g9981PortPm1DayEntry 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 }

Beili Standards Track [Page 27]
--
-- 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
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
}
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

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

---MANDATORY-GROUPS

GROUP g9981PerfCurrGroup

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

GROUP g9981Perf15MinGroup

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

GROUP g9981Perf1DayGroup

"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.

Special thanks to Dan Romascanu for his meticulous review of this
text.

10. References

10.1. Normative References

Recommendation G.998.1, January 2005,

[RFC2119] Bradner, S., "Key words for use in RFCs to Indicate

Schoenwaelder, Ed., "Structure of Management Information
Version 2 (SMIv2)", STD 58, RFC 2578, April 1999.

Schoenwaelder, Ed., "Textual Conventions for SMIv2",
STD 58, RFC 2579, April 1999.

[RFC2580] McCloghrie, K., Perkins, D., and J. Schoenwaelder,
"Conformance Statements for SMIv2", STD 58, RFC 2580,
April 1999.

[RFC2863] McCloghrie, K. and F. Kastenholz, "The Interfaces Group

(USM) for version 3 of the Simple Network Management


10.2. Informative References


Author’s Address

Edward Beili
Actelis Networks
25 Bazel St.
Petach-Tikva 49103
Israel

Phone: +972-3-924-3491
EMail: edward.beili@actelis.com