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Internet-Draft   Actelis Networks
Intended status: Standards Track   M. Morgenstern
Expires: November 21, 2009   ECI Telecom
                                                       May 20, 2009

                xDSL multi-pair bonding (G.Bond) MIB
                draft-ietf-adslmib-gbond-mib-03.txt

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Abstract

   This document defines Management Information Base (MIB) module for
   use with network management protocols in TCP/IP-based internets.

   This document proposes an extension to the Interfaces Group MIB with
   a set of common objects for managing multi-pair bonded Digital
   Subscriber Line (xDSL) interfaces, defined in ITU-T recommendations
   G.998.1, G.998.2 and G.998.3. The MIB modules specific to each
   bonding technology are defined in GBOND-ATM-MIB, GBOND-ETH-MIB and
   GBOND-TDIM-MIB respectively.

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1. Introduction

The xDSL Multi-Pair Bonding, allows a service provider to provide
high bandwidth services to business and residential customers over
multiple xDSL lines, with greater speed and resiliency, than the
service over a single xDSL line, bridging the gap between xDSL and
fiber-based transport.

There are three xDSL Multi-Pair Bonding schemes, also known under
collective name G.Bond:

o The ATM-Based Multi-Pair Bonding, specified in ITU-T G.998.1
   recommendation [G.998.1], which defines a method for bonding (or
   aggregating) of multiple xDSL lines (or individual bearer channels
   in multiple xDSL lines) into a single bi-directional logical link
   carrying an ATM stream. This specification can be viewed as an
   evolution of the legacy Inverse Multiplexing over ATM (IMA)
   technology [af-phy-0086], applied to xDSL with variable rates on
   each line/bearer channel.

o The Ethernet-Based Multi-Pair Bonding, specified in ITU-T G.998.2
   recommendation [G.998.2], which defines a method for bonding (or
   aggregating) of multiple xDSL lines (or individual bearer channels
   in multiple xDSL lines) into a single bi-directional logical link
   carrying an Ethernet stream. This specification can be viewed as
   IEEE 802.3-2005 [802.3] Clause 61 Physical Medium Entity (PME)
   Aggregation, generalized to work over any xDSL technology.
   (2Base-TL and 10Pass-TS interfaces defined by IEEE use G.SHDSL and
   VDSL technology respectively).

o The Multi-pair bonding using time-division inverse multiplexing
   (TDIM), specified in ITU-T G.998.3 recommendation [G.998.3], which
   defines a method for bonding (or aggregating) of multiple xDSL
   lines into a single bi-directional logical link carrying a mix of
   various traffic streams (e.g., Ethernet, ATM, TDM).

Architecturally all three bonding schemes define a new "bonded"
Transport Protocol Specific - Transmission Convergence (TPS-TC) sub-
layer, stacked above multiple ATM-TC, Ethernet/PTM-TC or STM-TC
(clear channel) sub-layers for the ATM, Ethernet or TDIM bonding
respectively. Each underlying TPS-TC sub-layer represents a protocol
specific gamma-interface to an xDSL line or an individual bearer
channel of an xDSL line. Bonding of multiple bearer channels in the
same xDSL line is not allowed.

All schemes allow bonding of up to 32 individual line/channel sub-
layers with variable rates, providing common functionality for the
configuration, initialization, operation and monitoring of the bonded

link.

This document defines a MIB module common to all 3 schemes.
Additional managed objects, specific to each bonding technology, are
defined in GBOND-ATM-MIB [I-D.ietf-adslmib-gbond-atm-mib], GBOND-ETH-
MIB [I-D.ietf-adslmib-gbond-eth-mib] and GBOND-TDIM-MIB
[I-D.ietf-adslmib-gbond-tdim-mib] modules.

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 document 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", "MAY", and "OPTIONAL" in this
document are to be interpreted as described in RFC 2119 [RFC2119].

3. The DSL Forum Management Framework for xDSL Bonding

This document makes use of the DSL 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: Interfaces
Group MIB (IF-MIB), Inverse Stack Table MIB (IF-INVERTED-STACK-MIB)
Interface Stack Capability MIB (IF-CAP-STACK-MIB), G.Bond scheme
specific modules: G.Bond/ATM (GBOND-ATM-MIB), G.Bond/Ethernet (GBOND-
ETH-MIB) and G.Bond/TDIM (GBOND-TDIM-MIB), and DSL specific MIB
modules: ADSL (ADSL-LINE-EXT-MIB), ADSL2 (ADSL2-LINE-MIB), SHDSL
(HDSL2-SHDSL-LINE-MIB), VDSL (VDSL-LINE-MIB) and VDSL2 (VDSL2-LINE-
MIB).

4.1. Relationship to Interfaces Group MIB module

A bonded xDSL port is a stacked (a.k.a. aggregated or bonded) interface and as such is managed using generic interface management objects defined in the IF-MIB [RFC2863].

The stack management, i.e., actual connection of the sub-layers to the top layer interface, is done via the ifStackTable, as defined in the IF-MIB [RFC2863] and its inverse ifInvStackTable, as defined in the IF-INVERTED-STACK-MIB [RFC2864].

The ifCapStackTable and its inverse ifInvCapStackTable defined in the IF-CAP-STACK-MIB [RFC5066], extend the stack management with an ability to describe possible connections or cross-connect capability, when a flexible cross-connect matrix is present between the interface layers.

4.1.1. Layering Model

A G.Bond interface can aggregate up to 32 channel sub-layers, with each channel representing an xDSL line or an xDSL bearer channel. For the purpose of brevity we will refer to the bonded interface as Generic Bonded Sub-layer (GBS) and to the channel sub-layer as Bonding Channel Entity (BCE).

A generic G.Bond device can have a number of GBS ports, each connected to a particular upper layer (e.g., Media Access Control (MAC) interface for G.998.2 scheme), while simultaneously cross-connected to a number of underlying BCEs, with a single GBS per BCE relationship.

A GBS port is represented in the Interface table (ifTable) as a separate interface with an ifType of g9981, g9982 or g9983 for a particular bonding scheme.

Each BCE in the aggregated GBS port is represented in the ifTable as a separate interface with an ifType relevant to a particular xDSL technology, e.g., shdsl(169) or vdsl(97). The ifType values are defined in [IANAifType-MIB].

The following figure shows the layering diagram and corresponding use
of ifTable for the bonded xDSL interfaces:

```
 .-----------------------------.  -
 |           GBS               |  ^ 1 ifEntry
 |          (TPS-TC)           |  v     ifType: g9981, g9982 or g9983
 +----------------+---+-------+  -
 | TPS-TC \       |   |       |  ^
 +---------\      |   |       |  | N ifEntry  (N=1..32)
 | PMS-TC   )BCE 1|...| BCE N |  )     ifType: adsl(94), shdsl(169),
 +---------/      |   |       |  |             vdsl(97), vdsl2(251),
 | PMD    /       |   |       |  v               etc.
 '----------------+---+-------'  -


   BCE    - Bonding Channel Entity
   GBS    - Generic Bonded Sub-layer
   PMD    - Physical Medium Dependent
   TPS-TC - Transport Protocol Specific - Transmission Convergence
   PMS-TC - Physical Media Specific - Transmission Convergence
```
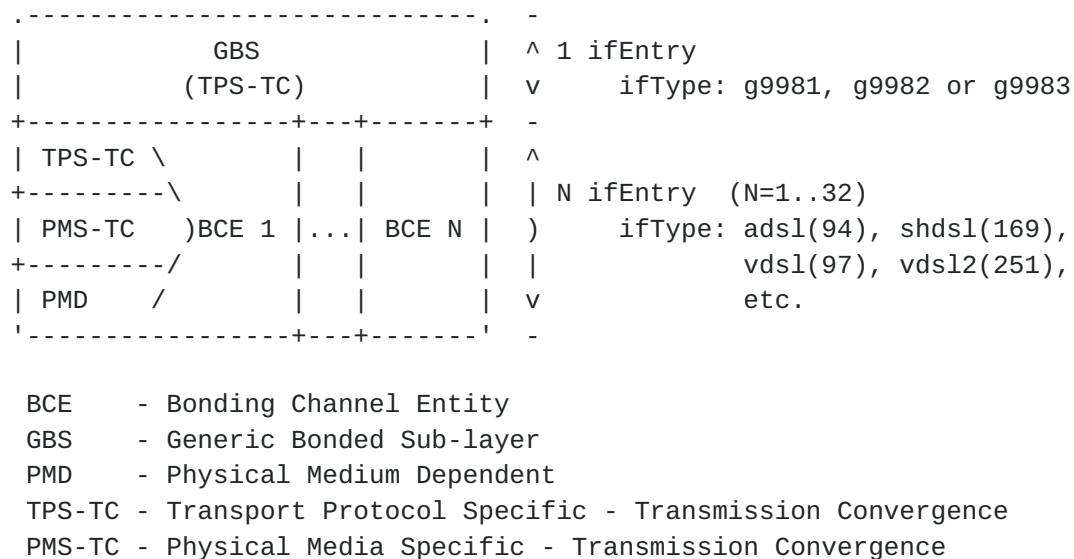
            Figure 1: Use of ifTable for bonded xDSL interfaces

The ifStackTable is indexed by the ifIndex values of the aggregated
G.Bond port (GBS) and the BCEs connected to it. ifStackTable allows a
Network Management application to determine which BCEs are connected
to a particular GBS and change connections (if supported by the
application). The ifInvStackTable, being an inverted version of the
ifStackTable, provides an efficient means for a Network Management
application to read a subset of the ifStackTable and thereby
determine which GBS runs on top of a particular BCE.

The ifCapStackTable defined in the IF-CAP-STACK-MIB module, specifies
for each higher-layer interface (e.g., GBS port) a list of lower-
layer interfaces (e.g., BCEs), which can possibly be cross-connected
to that higher-layer interface, determined by the cross-connect
capability of the device. This table, modeled after ifStackTable, is
read only, reflecting current cross-connect capability of a stacked
interface, which can be dynamic in some implementations (e.g., if
xDSL lines are located on a pluggable module and the module is pulled
out). Note that BCE availability per GBS, described by
ifCapStackTable, can be constrained by other parameters, for example
by aggregation capacity of a GBS or by the BCE in question being
already connected to another GBS. So, in order to ensure that a
particular BCE can be connected to the GBS, all respective parameters
(e.g., ifCapStackTable, ifStackTable and gBondCapacity) SHALL be
inspected.

The ifInvCapStackTable, also defined in the IF-CAP-STACK-MIB module,

describes which higher-layer interfaces (e.g., GBS ports) can
possibly be connected to a particular lower-layer interface (e.g.,
BCE), providing inverted mapping of ifCapStackTable. While it
contains no additional information beyond that already contained in
the ifCapStackTable, the ifInvCapStackTable has the ifIndex values in
its INDEX clause in the reverse order, i.e., the lower-layer
interface first, and the higher-layer interface second, providing an
efficient means for a Network Management application to read a subset
of the ifCapStackTable and thereby determine which interfaces can be
connected to run on top of a particular interface.

4.1.2. xDSL Bonding

The G.998.x Bonding allows a number of BCEs to be aggregated onto a
single logical GBS port, by splitting the incoming traffic into
multiple streams, transmitting each stream over a specific BCE and
combining the streams at the remote GBS port, preserving the original
traffic order.

Big Ethernet frames MAY be fragmented before the transmission and
reassembled at the remote end to minimize transportation delay.

The Bonding is OPTIONAL, meaning that a device with a single BCE MAY
perform fragmentation and re-assembly if this function is supported
by the device. The agent is REQUIRED to report on the Bonding
capability for all types of G.Bond ports (ATM, Ethernet and TDIM).

The GBOND-MIB module allows a Network Management application to query
Bonding capability and enable/disable it if supported. Note that
enabling Bonding effectively turns on fragmentation and re-assembly,
even on a single-BCE port.

4.1.3. Discovery Operation

The G.Bond ports may optionally support discovery operation, whereby
BCEs, during initialization, exchange information about their
respective aggregation groups (GBS), via xDSL handshake protocol.
This information can then be used to detect copper misconnections or
for an automatic assignment of the local BCEs into aggregation groups
instead of a fixed pre-configuration.

The MIB module defined in this document allow a Network Management
application to control G.Bond Discovery mechanism and query its
results. Note that the Discovery mechanism can work only if Bonding
is supported and enabled.

Two tables are used by the G.Bond Discovery mechanism: ifStackTable
and ifCapStackTable. The following pseudo-code gives an example of

the Discovery and automatic BCE assignment for a generic multi-GBS
G.Bond device, located at Central Office (CO), using objects defined
in this MIB module, IF-CAP-STACK-MIB and IF-MIB modules [Note that
automatic BCE assignment is only shown here for the purposes of the
example. Fixed BCE pre-assignment, manual assignment or auto-
assignment using an alternative internal algorithm may be chosen by a
particular implementation]:

```
// Go over all GBS ports in the CO device
FOREACH gbs[i] IN CO_device
{ // Perform discovery and auto-assignment on GBS ports
  // with room for more Channels
  IF ( gbs[i].NumBCEs < gbs[i].BondCapacity )
  { // Assign a unique 6-octets local discovery code to the GBS
    // e.g., MAC address
    dc = gbs[i].DiscoveryCode = MAC[i];
    // Go over all disconnected Channels, which can
    // pottentially be connected to the GBS
    FOREACH bce[j] IN ifCapStackTable[gbs[i]] AND
                   NOT IN ifStackTable[gbs[i]]  // not connected
    { // Try to grab the remote RT_device, by writing the value
      // of the local 6 Byte discovery code to the remote
      // discovery code register (via handshake mechanism).
      // This operation is atomic Set-if-Clear action, i.e., it
      // would succeed only if the remote discovery register was
      // zero. Read the remote discovery code register via Get
      // operation to see if the RT_device, attached via the BCE
      // is indeed marked as being the CO_device peer.
      bce[j].RemoteDiscoveryCode = dc;         // Set-if-Clear
      r = bce[j].RemoteDiscoveryCode;          // Get
      IF ( r == dc AND gbs[i].NumBCEs < gbs[i].BondCapacity)
      { // Remote RT_device connected via BCE[j] is/was a peer
        // for GBS[i] and there room for another BCE in the
        // GBS[i] aggregation group (max. Bonding capacity is
        // not reached yet).
        // Connect this BCE to the GBS (via ifStackTable,
        // ifInvStackTable being inverse of ifStackTable is
        // updated automatically, i.e., gbs[i] is auto-added
        // to ifInvStackTable[bce[j]])
        ADD bce[j] TO ifStackTable[gbs[i]];
        gbs[i].NumBCEs = gbs[i].NumBCEs + 1;
        // Discover all other disconnected BCEs,
        // attached to the same RT_device and connect them to
        // the GBS provided there is enough room for more BCEs.
        FOREACH bce[k] IN ifCapStackTable[gbs[i]] and
                     NOT IN ifStackTable[gbs[i]]
        { // Get Remote Discovery Code from the BCE to see if
          // it belongs to a connected RT_device "grabbed" by
```

```
            // the CO_device.
            r = bce[k].RemoteDiscoveryCode;
            IF ( r == dc AND gbs[i].NumBCEs < gbs[i].BondCapacity)
            { // Physically connect the BCE to the GBS
              // (gbs[i] is auto-added TO ifInvStackTable[bce[k]])
              ADD bce[k] TO ifStackTable[gbs[i]];
              gbs[i].NumBCEs = gbs[i].NumBCEs + 1;
            }
          }
        }
        // At this point we have discovered all local BCEs which
        // are physically connected to the same remote RT_device
        // and connected them to GBS[i]. Go to the next GBS.
        BREAK;
      }
    }
}
```

An SNMP Agent for a G.Bond device builds ifCapStackTable and its
inverse ifInvCapStackTable on device initialiation, according to the
cross-connect capabilities of the device.

Adding a BCE to the ifStackTable row for a specific GBS, involves
actual connection of the BCE to the GBS.

Note that GBS port does not have to be operationally 'down' for the
connection to succeed. In fact, a dynamic BCE addition (and removal)
MAY be implemented with an available BCE being initialized first (by
setting its ifAdminStatus to 'up') and then added to an operationally
'up' GBS port, by modifying a respective ifStackTable (and respective
ifInvStackTable) entry.

It is RECOMMENDED that a removal of the last operationally 'up' BCE
from an operationally 'up' GBS would be rejected by the
implementation, as this action would completely drop the link.

In addition to the standard handshake-based discovery described
above, [G.998.2] defines an optional frame-based discovery and pair
management. These frame-based methods are discussed in
[I-D.ietf-adslmib-gbond-eth-mib].

4.1.4. G.Bond ports initialization

G.Bond ports being built on top of xDSL technology, require a lengthy
initialization or 'training' process, before any data can pass.
During this initialization both ends of a link (peers) work
cooperatively to achieve required data rate on a particular copper
pair. Sometimes, when the copper line is too long or the noise on

   the line is too high, that 'training' process may fail to achieve a
   specific target rate with required characteristics.

   The ifAdminStatus object from the IF-MIB, controls the desired state
   of a GBS with all the BCEs connected to it or of an individual BCE
   port. Setting this object to 'up' instructs a particular GBS or a
   BCE to start initialization process, which may take tens of seconds
   for G.Bond ports. The ifOperStatus object shows the operational
   state of an interface (extended by ifMauMediaAvailable object from
   MAU-MIB [RFC4836] for GBS and *Status object from a relevant line MIB
   for BCE interfaces).

   A disconnected BCE may be initialized by changing the ifAdminState
   from 'down' to 'up'. Changing the ifAdminState to 'up' on the GBS
   initializes all BCEs connected to that particular GBS. Note that in
   case of bonding some interfaces may fail to initialize while others
   succeed. The GBS is considered operationally 'up' if at least one
   bonded BCE is operationally 'up'. When all BCEs connected to the GBS
   are 'down' the GBS SHALL be considered operationally
   'lowerLayerDown'. The GBS SHALL be considered operationally
   'notPresent' if it is not connected to any BCE. The GBS/BCE
   interface SHALL remain operationally 'down' during initialization.

4.1.5. Usage of ifTable

   Both BCE and GBS interfaces are managed using interface specific
   management objects defined in the GBOND-MIB module and generic
   interface objects from the ifTable of IF-MIB, with all management
   table entries referenced by the interface index ifIndex.

   The following table summarizes G.Bond specific interpretations for
   some of the ifTable objects specified by the mandatory
   ifGeneralInformationGroup:

   +---------------+--+
   | IF-MIB object | G.Bond interpretation |
   +---------------+--+
ifIndex	Interface index. Note that each BCE and each GBS
	in the G.Bond PHY MUST have a unique index, as
	there some GBS and BCE specific attributes
	accessible only on the GBS or BCE level.
   +---------------+--+
ifType	g9981, g9982 or g9982 for the ATM, Ethernet or
	TDIM GBS respectively, shdsl(169) for G.SHDSL
	BCE, vdsl(97) for VDSL BCE, etc.
   +---------------+--+

```
+---------------+----------------------------------------------------+
| ifSpeed       | Operating data rate for the BCE. For the GBS it    |
|               | is the sum of the current operating data rates of  |
|               | all BCEs in the aggregation group, without the     |
|               | encapsulation overhead and G.Bond overhead, but    |
|               | accounting for the Inter-Frame Gaps (IFG). When a  |
|               | GBS or a BCE is operating in an assymetrical       |
|               | fashion (upstream data rate differs from the       |
|               | downstream one) the lowest of the values is        |
|               | shown.                                             |
+---------------+----------------------------------------------------+
| ifAdminStatus | Setting this object to 'up' instructs a            |
|               | particular GBS (with all BCEs connected to it) or  |
|               | a BCE to start initialization process              |
+---------------+----------------------------------------------------+
| ifOperStatus  | a relevant *Status object from a particular line   |
|               | MIB supplements the 'down' value of ifOperStatus   |
|               | for BCEs.                                          |
+---------------+----------------------------------------------------+
```

             Table 1: G.Bond interpretation of IF-MIB objects

4.2. Relationship to xDSL MIB modules

   Each xDSL technology is described in a relevant xDSL line MIB module:
   e.g., HDSL2-SHDSL-LINE-MIB [RFC4319] for G.SHDSL, ADSL-LINE-EXT-MIB
   [RFC3440] for ADSL, ADSL2-LINE-MIB [RFC4706] for ADSL2, VDSL-LINE-MIB
   [RFC3728] for VDSL or VDSL2-LINE-MIB [I-D.ietf-adslmib-vdsl2-mib] for
   VDSL2.

   These MIBs are used to manage individual xDSL lines/channels (BCEs).

5. MIB Structure

5.1. Overview

   The main management objects defined in the GBOND-MIB module are split
   into 2 groups:

   o gBondPort - containing objects for configuration, capabilities,
      status and notifications, common to all G.Bond ports (GBS).

   o gBondBce - containing a single common object for configuration of
      the remote discovery code per BCE. Note that the rest of the
      objects for BCE configuration, capabilities, status and
      notifications, is located in relevant xDSL line MIB modules as
      well as in the bonding scheme specific MIB modules.

5.2. Performance Monitoring

The OPTIONAL performance monitoring counters, thresholds and history
buckets (interval-counters) defined in [TR-159] 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 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 intervals SHOULD be aligned with the start of a day.

Counters are not reset when a GBS is reinitialized, only when the
agent is reset or reinitialized (or under specific request outside
the scope of this MIB module).

5.3. Mapping of DSL Forum TR-159 Managed Objects

This section contains the mapping between relevant managed objects
(attributes) defined in [TR-159] and managed objects defined in this
document and in associated MIB modules, i.e., the IF-MIB [RFC2863].

G.Bond Managed Object	Corresponding SNMP Object
oBondingGroup - Basic Package (Mandatory)	
aGroupID	ifIndex (IF-MIB)
aGroupBondSchemesSupported	gBondSchemesSupported
aGroupPeerBondSchemesSupported	gBondPeerSchemesSupported
aGroupAdminBondScheme	gBondAdminScheme
aGroupPeerAdminBondScheme	gBondPeerAdminScheme
aGroupOperBondScheme	gBondOperScheme
aGroupPeerOperBondScheme	gBondPeerOperScheme
aGroupEnd	gBondPortSide
aGroupOperState	ifOperStatus (IF-MIB)
aGroupAdminState	ifAdminStatus (IF-MIB)

aGroupStatus	gBondFltStatus
aGroupCapacity	gBondCapacity
aGroupPeerCapacity	gBondPeerCapacity
aGroupNumChannels	gBondNumBCEs
aGroupName	ifName (IF-MIB)
aGroupDiscoveryCode	gBondDiscoveryCode
aGroupUpRate	gBondUpDataRate
aGroupDownRate	gBondDownDataRate
aGroupTargetUpRate	gBondTargetUpDataRate
aGroupTargetDownRate	gBondTargetDownDataRate
aGroupThreshLowUpRate	gBondThreshLowUpRate
aGroupThreshLowDownRate	gBondThreshLowDownRate
aGroupLowRateCrossingEnable	gBondLowRateCrossingEnable
nGroupLowUpRateCrossing	gBondLowUpRateCrossing
nGroupLowDownRateCrossing	gBondLowDownRateCrossing
aGroupLinkUpDownEnable	_EdNote: Currently IF-MIB doesn't provide a control for the linkUp/linkDown notifications. Can we define a control in one MIB module while the notifications are in another?_
nGroupLinkUp	linkDown (IF-MIB)
nGroupLinkDown	linkUp (IF-MIB)
oBondingGroup - PM Package (Optional)	
aGroupPerfES	gBondPerfES

aGroupPerfSES	gBondPerfSES
aGroupPerfUAS	gBondPerfUAS
aGroupPerf15MinValidIntervals	gBondPerf15MinValidIntervals
aGroupPerf15MinInvalidIntervals	gBondPerf15MinInvalidIntervals
aGroupPerfCurr15MinTimeElapsed	gBondPerfCurr15MinTimeElapsed
aGroupPerfCurr15MinES	gBondPerfCurr15MinES
aGroupPerfCurr15MinSES	gBondPerfCurr15MinSES
aGroupPerfCurr15MinUAS	gBondPerfCurr15MinUAS
aGroupPerfTcaEnable	gBondPerfTcaEnable
aGroupPerfThreshold15MinES	gBondPerfThereshold15MinES
aGroupPerfThreshold15MinSES	gBondPerfThereshold15MinSES
aGroupPerfThreshold15MinUAS	gBondPerfThereshold15MinUAS
nGroupPerfTca15MinES	gBondPerfTca15MinESCrossing
nGroupPerfTca15MinSES	gBondPerfTca15MinSESCrossing
nGroupPerfTca15MinUAS	gBondPerfTca15MinUASCrossing
aGroupPerf1DayValidIntervals	gBondPerf1DayValidIntervals
aGroupPerf1DayInvalidIntervals	gBondPerf1DayInvalidIntervals
aGroupPerfCurr1DayTimeElapsed	gBondPerfCurr1DayTimeElapsed
aGroupPerfCurr1DayES	gBondPerf1DayIntervalES
aGroupPerfCurr1DaySES	gBondPerf1DayIntervalSES
aGroupPerfCurr1DayUAS	gBondPerf1DayIntervalUAS
aGroupPerfThreshold1DayES	gBondPerfThreshold1DayES
aGroupPerfThreshold1DaySES	gBondPerfThreshold1DaySES
aGroupPerfThreshold1DayUAS	gBondPerfThreshold1DayUAS

```
| nGroupPerfTca1DayES            | gBondPerfTca1DayESCrossing     |
+-------------------------------+--------------------------------+
| nGroupPerfTca1DaySES           | gBondPerfTca1DaySESCrossing    |
+-------------------------------+--------------------------------+
| nGroupPerfTca1DayUAS           | gBondPerfTca1DayUASCrossing    |
+-------------------------------+--------------------------------+
| aGroupPerf15MinIntervalNumber  | gBondPerf15MinIntervalIndex    |
+-------------------------------+--------------------------------+
| aGroupPerf15MinIntervalValid   | gBondPerf15MinIntervalValid    |
+-------------------------------+--------------------------------+
| aGroupPerf15MinIntervalES      | gBondPerf15MinIntervalES       |
+-------------------------------+--------------------------------+
| aGroupPerf15MinIntervalSES     | gBondPerf15MinIntervalSES      |
+-------------------------------+--------------------------------+
| aGroupPerf15MinIntervalUAS     | gBondPerf15MinIntervalUAS      |
+-------------------------------+--------------------------------+
| aGroupPerf1DayIntervalNumber   | gBondPerf1DayIntervalIndex     |
+-------------------------------+--------------------------------+
| aGroupPerf1DayIntervalValid    | gBondPerf1DayIntervalValid     |
+-------------------------------+--------------------------------+
| aGroupPerf1DayIntervalMoniSecs | gBondPerf1DayIntervalMoniTime  |
+-------------------------------+--------------------------------+
| aGroupPerf1DayIntervalES       | gBondPerf1DayIntervalES        |
+-------------------------------+--------------------------------+
| aGroupPerf1DayIntervalSES      | gBondPerf1DayIntervalSES       |
+-------------------------------+--------------------------------+
| aGroupPerf1DayIntervalUAS      | gBondPerf1DayIntervalUAS       |
+-------------------------------+--------------------------------+
| oLine - Basic Package          |                                |
| (Mandatory)                    |                                |
+-------------------------------+--------------------------------+
| aLineID                        | ifIndex (IF-MIB)               |
+-------------------------------+--------------------------------+
| aLineType                      | ifType (IF-MIB)                |
+-------------------------------+--------------------------------+
| aLineOperState                 | ifOperStatus (IF-MIB)          |
+-------------------------------+--------------------------------+
| aLineStatus                    | *dsl*CurrStatus (*DSL-LINE-MIB) |
+-------------------------------+--------------------------------+
| aLineEnd                       | *dsl*Side (*DSL-LINE-MIB)      |
+-------------------------------+--------------------------------+
| aLineAdminState                | ifAdminStatus (IF-MIB)         |
+-------------------------------+--------------------------------+
| aLineRemoteDiscoveryCode       | gBondBceRemoteDiscoveryCode    |
+-------------------------------+--------------------------------+
```

```
    +------------------------------+------------------------------+
    | aLineUpDownEnable            | _EdNote: Currently IF-MIB    |
    |                              | doesn't provide a control for|
    |                              | the linkUp/linkDown          |
    |                              | notifications. Can we define a|
    |                              | control in one MIB module while|
    |                              | the notifications are in     |
    |                              | another?_                    |
    +------------------------------+------------------------------+
    | nLineUp                      | linkUp (IF-MIB)              |
    +------------------------------+------------------------------+
    | nLineDown                    | linkDown (IF-MIB)            |
    +------------------------------+------------------------------+
```

            Table 2: Mapping of TR-159 Managed Objects

6. xDSL Multi-pair Bonding MIB Definitions

GBOND-MIB DEFINITIONS ::= BEGIN

   IMPORTS
     MODULE-IDENTITY,
     OBJECT-TYPE,
     NOTIFICATION-TYPE,
     mib-2,
     Unsigned32,
     Gauge32
       FROM SNMPv2-SMI   -- [RFC2578]
     TEXTUAL-CONVENTION,
     TruthValue,
     RowStatus,
     PhysAddress
       FROM SNMPv2-TC   -- [RFC2579]
     MODULE-COMPLIANCE,
     OBJECT-GROUP,
     NOTIFICATION-GROUP
       FROM SNMPv2-CONF   -- [RFC2580]
     SnmpAdminString
       FROM SNMP-FRAMEWORK-MIB -- [RFC3411]
     ifIndex
       FROM IF-MIB   -- [RFC2863]
     HCPerfCurrentCount,
     HCPerfIntervalCount,
     HCPerfIntervalThreshold,
     HCPerfValidIntervals,
     HCPerfInvalidIntervals,
     HCPerfTimeElapsed,
     HCPerfTotalCount
```

```
      FROM  HC-PerfHist-TC-MIB  -- [RFC3705]
    ;


  gBondMIB MODULE-IDENTITY
    LAST-UPDATED "200905200000Z"  -- May 20, 2009
    ORGANIZATION "IETF ADSL MIB Working Group"
    CONTACT-INFO
      "WG charter:
        http://www.ietf.org/html.charters/adslmib-charter.html

      Mailing Lists:
        General Discussion: adslmib@ietf.org
        To Subscribe: adslmib-request@ietf.org
        In Body: subscribe your_email_address

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              Israel
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    DESCRIPTION
      "The objects in this MIB module are used to manage the
      multi-pair bonded xDSL Interfaces, defined in ITU-T
      recommendations G.998.1, G.998.2 and G.998.3.

      This MIB module MUST be used in conjunction with a bonding
      scheme specific MIB module, that is, GBOND-ATM-MIB,
      GBOND-ETH-MIB or GBOND-TDIM-MIB.
```

The following references are used throughout this MIB module:

[G.998.1] refers to:
   ITU-T Recommendation G.998.1: 'ATM-based multi-pair bonding',
   January 2005.

[G.998.2] refers to:
   ITU-T Recommendation G.998.2: 'Ethernet-based multi-pair
   bonding', January 2005.

[G.998.3] refers to:
   ITU-T Recommendation G.998.3: 'Multi-pair bonding using
   time-division inverse multiplexing', January 2005.

[TR-159] refers to:
   Broadband Forum Technical Report: 'Management Framework for
   xDSL Bonding', December 2008.

Naming Conventions:
   BCE   - Bonding Channel Entity
   BTU   - Bonding Transmission Unit
   CO   - Central Office
   CPE   - Customer Premises Equipment
   GBS   - Generic Bonding Sublayer
   PM   - Performance Monitoring
   SNR   - Signal to Noise Ratio
   TCA   - Threshold Crossing Alert

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This version of this MIB module is part of RFC XXXX;
see the RFC itself for full legal notices."

 REVISION   "200905200000Z" -- May 20, 2009
 DESCRIPTION "Initial version, published as RFC XXXX."

   -- EdNote: Replace XXXX with the actual RFC number &
   -- remove this note

 ::= { mib-2 ZZZ }

   -- EdNote: Replace ZZZ with a real OID once it is
   -- allocated & remove this note.

-- Sections of the module
-- Structured as recommended by [RFC4181], Appendix D

gBondObjects   OBJECT IDENTIFIER ::= { gBondMIB 1 }

```
    gBondConformance OBJECT IDENTIFIER ::= { gBondMIB 2 }

    -- Groups in the module

    gBondPort         OBJECT IDENTIFIER ::= { gBondObjects 1 }

    gBondBce          OBJECT IDENTIFIER ::= { gBondObjects 2 }

    -- Textual Conventions

    GBondSchemeList ::= TEXTUAL-CONVENTION
      STATUS        current
      DESCRIPTION
        "This textual convention defines a bitmap of possible ITU-T
        G.998 (G.Bond) bonding schemes. Currently there are 3 bonding
        schemes defined: G.998.1, G.998.2 and G.998.3, identified by
        bit values g9981(1), g9982(2) and g9983(3), respectively.
        An additional value of unknown(0), can be returned as a result
        of GET operation, when an value of the object cannot be
        determined, for example a peer GBS cannot be reached or it
        does not support any kind of bonding."
      SYNTAX        BITS {
        unknown(0),
        g9981(1),
        g9982(2),
        g9983(3)
      }

    GBondScheme ::= TEXTUAL-CONVENTION
      STATUS        current
      DESCRIPTION
        "This textual convention defines ITU-T G.998 bonding scheme
        values. Possible values are:
          unknown(0) - undefined or unknown
          g9981(1)   - G.998.1 (G.Bond/ATM)
          g9982(2)   - G.998.2 (G.Bond/Ethernt)
          g9983(3)   - G.998.3 (G.Bond/TDIM)."
      SYNTAX        INTEGER {
        unknown(0),
        g9981(1),
        g9982(2),
        g9983(3)
      }

    GBondPerf1DayIntervalThreshold ::= TEXTUAL-CONVENTION
      DISPLAY-HINT "d"
      STATUS        current
      DESCRIPTION
```

```
      "This textual convention defines a range of values that may be
      set in a fault threshold alarm control for a 1-day interval.
      As the number of seconds in a 1-day interval numbers at most
      86400, objects of this type may have a range of 0...86400,
      where the value of 0 disables the alarm."
    SYNTAX       Unsigned32 (0..86400)



  -- Port Notifications Group

   gBondPortNotifications OBJECT IDENTIFIER ::= { gBondPort 0 }

   gBondLowUpRateCrossing NOTIFICATION-TYPE
     OBJECTS {
       -- ifIndex is not needed here since we are under specific GBS
       gBondUpDataRate,
       gBondThreshLowUpRate
     }
     STATUS      current
     DESCRIPTION
       "This notification indicates that the G.Bond port' upstream
       data rate has reached/dropped below or exceeded the low
       upstream rate threshold, specified by gBondThreshLowUpRate.

       This notification MAY be sent for the -O subtype ports
       while the port is up, on the crossing event in both
       directions: from normal (rate is above the threshold) to low
       (rate equals the threshold or below it) and from low to
       normal. This notification is not applicable to the -R
       subtypes.

       It is RECOMMENDED that a small debouncing period of 2.5 sec,
       between the detection of the condition and notification,
       is implemented to prevent simultaneous LinkUp/LinkDown and
       gBondLowUpRateCrossing notifications to be sent.

       The adaptive nature of the G.Bond technology allows the port
       to adapt itself to the changes in the copper environment,
       e.g., an impulse noise, alien crosstalk, or a
       micro-interruption may temporarily drop one or more BCEs in
       the aggregation group, causing a rate degradation of the
       aggregated G.Bond link. The dropped BCEs would then try to
       re-initialize, possibly at a lower rate than before, adjusting
       the rate to provide required target SNR margin.

       Generation of this notification is controlled by the
       gBondLowRateCrossingEnable object.
```

        This object maps to the TR-159 notification
        nGroupLowUpRateCrossing."
      REFERENCE
        "[TR-159] 5.5.1.24"
      ::= { gBondPortNotifications 1 }

    gBondLowDownRateCrossing NOTIFICATION-TYPE
      OBJECTS {
        -- ifIndex is not needed here since we are under specific GBS
        gBondDownDataRate,
        gBondThreshLowDownRate
      }
      STATUS   current
      DESCRIPTION
        "This notification indicates that the G.Bond port' downstream
        data rate has reached/dropped below or exceeded the low
        downstream rate threshold, specified by
        gBondThreshLowDownRate.

        This notification MAY be sent for the -O subtype ports
        while the port is up, on the crossing event in both
        directions: from normal (rate is above the threshold) to low
        (rate equals the threshold or below it) and from low to
        normal. This notification is not applicable to the -R
        subtypes.

        It is RECOMMENDED that a small debouncing period of 2.5 sec,
        between the detection of the condition and notification,
        is implemented to prevent simultaneous LinkUp/LinkDown and
        gBondLowDownRateCrossing notifications to be sent.

        The adaptive nature of the G.Bond technology allows the port
        to adapt itself to the changes in the copper environment,
        e.g., an impulse noise, alien crosstalk, or a
        micro-interruption may temporarily drop one or more BCEs in
        the aggregation group, causing a rate degradation of the
        aggregated G.Bond link. The dropped BCEs would then try to
        re-initialize, possibly at a lower rate than before,
        adjusting the rate to provide required target SNR margin.

        Generation of this notification is controlled by the
        gBondLowRateCrossingEnable object.

        This object maps to the TR-159 notification
        nGroupLowDownRateCrossing."
      REFERENCE
        "[TR-159] 5.5.1.25"
      ::= { gBondPortNotifications 2}

```
   gBondPerfTca15MinESCrossing NOTIFICATION-TYPE
     OBJECTS {
       -- ifIndex is not needed here since we are under specific GBS
       gBondPerfCurr15MinES,
       gBondPerfThreshold15MinES
     }
     STATUS      current
     DESCRIPTION
       "This notification indicates that the Errored Seconds threshold,
       specified by gBondPerfThreshold15MinES, has been reached or
       exceeded for the GPS port.

       Generation of this notification is controlled by
       gBondPerfTcaEnable and gBondPerfThreshold15MinES objects.

       This object maps to the TR-159 notification
       nGroupPerfTca15MinES."
     REFERENCE
       "[TR-159] 5.5.1.42"
     ::= { gBondPortNotifications 3}

   gBondPerfTca15MinSESCrossing NOTIFICATION-TYPE
     OBJECTS {
       -- ifIndex is not needed here since we are under specific GBS
       gBondPerfCurr15MinSES,
       gBondPerfThreshold15MinSES
     }
     STATUS      current
     DESCRIPTION
       "This notification indicates that the Severely Errored Seconds
       threshold, specified by gBondPerfThreshold15MinSES, has been
       reached or exceeded for the GPS port.

       Generation of this notification is controlled by
       gBondPerfTcaEnable and gBondPerfThreshold15MinSES objects.

       This object maps to the TR-159 notification
       nGroupPerfTca15MinSES."
     REFERENCE
       "[TR-159] 5.5.1.43"
     ::= { gBondPortNotifications 4}

   gBondPerfTca15MinUASCrossing NOTIFICATION-TYPE
     OBJECTS {
       -- ifIndex is not needed here since we are under specific GBS
       gBondPerfCurr15MinUAS,
       gBondPerfThreshold15MinUAS
     }
```

```
      STATUS      current
      DESCRIPTION
        "This notification indicates that the Unavailable Seconds
        threshold, specified by gBondPerfThreshold15MinES, has been
        reached or exceeded for the GPS port.

        Generation of this notification is controlled by
        gBondPerfTcaEnable and gBondPerfThreshold15MinUAS objects.

        This object maps to the TR-159 notification
        nGroupPerfTca15MinUAS."
      REFERENCE
        "[TR-159] 5.5.1.44"
      ::= { gBondPortNotifications 5}

   gBondPerfTca1DayESCrossing NOTIFICATION-TYPE
      OBJECTS {
        -- ifIndex is not needed here since we are under specific GBS
        gBondPerfCurr1DayES,
        gBondPerfThreshold1DayES
      }
      STATUS      current
      DESCRIPTION
        "This notification indicates that the Errored Seconds threshold,
        specified by gBondPerfThreshold1DayES, has been reached or
        exceeded for the GPS port.

        Generation of this notification is controlled by
        gBondPerfTcaEnable and gBondPerfThreshold1DayES objects.

        This object maps to the TR-159 notification
        nGroupPerfTca1DayES."
      REFERENCE
        "[TR-159] 5.5.1.54"
      ::= { gBondPortNotifications 6}

   gBondPerfTca1DaySESCrossing NOTIFICATION-TYPE
      OBJECTS {
        -- ifIndex is not needed here since we are under specific GBS
        gBondPerfCurr1DaySES,
        gBondPerfThreshold1DaySES
      }
      STATUS      current
      DESCRIPTION
        "This notification indicates that the Severely Errored Seconds
        threshold, specified by gBondPerfThreshold1DaySES, has been
        reached or exceeded for the GPS port.
```

```
      Generation of this notification is controlled by
      gBondPerfTcaEnable and gBondPerfThreshold1DaySES objects.

      This object maps to the TR-159 notification
      nGroupPerfTca1DaySES."
    REFERENCE
      "[TR-159] 5.5.1.55"
    ::= { gBondPortNotifications 7}

  gBondPerfTca1DayUASCrossing NOTIFICATION-TYPE
    OBJECTS {
      -- ifIndex is not needed here since we are under specific GBS
      gBondPerfCurr1DayUAS,
      gBondPerfThreshold1DayUAS
    }
    STATUS      current
    DESCRIPTION
      "This notification indicates that the Unavailable Seconds
      threshold, specified by gBondPerfThreshold1DayUAS, has been
      reached or exceeded for the GPS port.

      Generation of this notification is controlled by
      gBondPerfTcaEnable and gBondPerfThreshold1DayUAS objects.

      This object maps to the TR-159 notification
      nGroupPerfTca1DayUAS."
    REFERENCE
      "[TR-159] 5.5.1.56"
    ::= { gBondPortNotifications 8}

  -- G.Bond Port (GBS) group

  gBondPortConfTable OBJECT-TYPE
    SYNTAX      SEQUENCE OF GBondPortConfEntry
    MAX-ACCESS  not-accessible
    STATUS      current
    DESCRIPTION
      "Table for Configuration of G.Bond GBS ports. Entries in this
      table MUST be maintained in a persistent manner"
    ::= { gBondPort 1 }

  gBondPortConfEntry OBJECT-TYPE
    SYNTAX      GBondPortConfEntry
    MAX-ACCESS  not-accessible
    STATUS      current
    DESCRIPTION
      "An entry in the G.Bond Port Configuration table.
      Each entry represents an G.Bond port indexed by the ifIndex.
```

         Note that an G.Bond GBS port runs on top of a single
         or multiple BCE port(s), which are also indexed by ifIndex."
      INDEX { ifIndex }
      ::= { gBondPortConfTable 1 }

   GBondPortConfEntry ::=
      SEQUENCE {
         gBondAdminScheme   GBondScheme,
         gBondPeerAdminScheme   GBondScheme,
         gBondDiscoveryCode   PhysAddress,
         gBondTargetUpDataRate   Unsigned32,
         gBondTargetDownDataRate   Unsigned32,
         gBondThreshLowUpRate   Unsigned32,
         gBondThreshLowDownRate   Unsigned32,
         gBondLowRateCrossingEnable   TruthValue,
         gBondPerfTcaConfProfile   SnmpAdminString,
         gBondPerfTcaEnable   TruthValue
      }

   gBondAdminScheme OBJECT-TYPE
      SYNTAX   GBondScheme
      MAX-ACCESS read-write
      STATUS   current
      DESCRIPTION
        "A desired bonding scheme for a G.Bond GBS port.
        The following values instruct the port to use corresponding
        bonding scheme if supported:
          g9981(1)   - instructs the port to use G.998.1 bonding
          g9982(2)   - instructs the port to use G.998.2 bonding
          g9983(3)   - instructs the port to use G.998.3 bonding

        Changing of the gBondAdminScheme MUST be performed when the
        link is Down. Attempts to change this object MUST be rejected
        (in case of SNMP with the error inconsistentValue), if the
        link is Up or Initializing. Attempts to change this object to
        an unsupported bonding scheme (see gBondSchemesSupported)
        SHALL be rejected (in case of SNMP with the error wrongValue).

        This object MUST be maintained in a persistent manner.

        This object maps to the TR-159 attribute
        aGroupAdminBondScheme."
      REFERENCE
        "[TR-159] 5.5.1.6"
      ::= { gBondPortConfEntry 1 }

   gBondPeerAdminScheme OBJECT-TYPE
      SYNTAX   GBondScheme

      MAX-ACCESS read-write
      STATUS   current
      DESCRIPTION
        "A desired bonding scheme for a peer (link partner) G.Bond
        port (GBS).
        The following values instruct the peer port to use
        corresponding bonding scheme if supported:
          g9981(1)   - instructs the port to use G.998.1 bonding
          g9982(2)   - instructs the port to use G.998.2 bonding
          g9983(3)   - instructs the port to use G.998.3 bonding

        Changing of the gBondAdminScheme MUST be performed when the
        link is Down. Attempts to change this object MUST be rejected
        (in case of SNMP with the error inconsistentValue), if the
        link is Up or Initializing. Attempts to change this object to
        an unsupported bonding scheme (see gBondPeerSchemesSupported)
        SHALL be rejected (in case of SNMP with the error wrongValue).

        This object MUST be maintained in a persistent manner.

        This object maps to the TR-159 attribute
        aGroupPeerAdminBondScheme."
      REFERENCE
        "[TR-159] 5.5.1.7"
      ::= { gBondPortConfEntry 2 }

   gBondDiscoveryCode OBJECT-TYPE
      SYNTAX   PhysAddress (SIZE(6))
      MAX-ACCESS read-write
      STATUS   current
      DESCRIPTION
        "A Discovery Code of the G.Bond port (GBS).
        A unique 6 octet long code used by the Discovery function.
        This object MUST be instantiated for the -O subtype GBS before
        writing operations on the gBondBceRemoteDiscoveryCode
        (Set_if_Clear and Clear_if_Same) are performed by BCEs
        associated with the GBS.
        The initial value of this object for -R subtype ports after
        reset is all zeroes. For -R subtype ports, the value of this
        object cannot be changed directly. This value may be changed
        as a result of writing operation on the
        gBondBceRemoteDiscoveryCode object of remote BCE of -O
        subtype, connected to one of the local BCEs associated with
        the GBS.

        Discovery MUST be performed when the link is Down.
        Attempts to change this object MUST be rejected (in case of
        SNMP with the error inconsistentValue), if the link is Up or

        Initializing.

        This object maps to the TR-159 attribute
        aGroupDiscoveryCode."
      REFERENCE
        "[TR-159] 5.5.1.20; [802.3] 61.2.2.8.3, 61.2.2.8.4,
        45.2.6.6.1, 45.2.6.8, 61A.2"
      ::= { gBondPortConfEntry 3 }

    gBondTargetUpDataRate OBJECT-TYPE
      SYNTAX   Unsigned32(0|1..10000000)
      UNITS   "Kbps"
      MAX-ACCESS   read-write
      STATUS   current
      DESCRIPTION
        "A desired G.Bond port Data Rate in the upstream direction,
        in Kbps, to be achieved during initialization, under
        restrictions placed upon the member BCEs by their respective
        configuration settings.
        This object represents a sum of individual BCE upstream data
        rates, modified to compensate for fragmentation and
        encapsulation overhead (e.g., for an Ethernet service, the
        target data rate of 10Mbps SHALL allow lossless transmission
        of full-duplex 10Mbps Ethernet frame stream with minimal
        inter-frame gap).
        Note that the target upstream data rate may not be achieved
        during initialization (e.g., due to unavailability of required
        BCEs) or the initial bandwidth could deteriorate, so that the
        actual upstream data rate (gBondUpDataRate) could be less
        than gBondTargetUpDataRate.

        The value is limited above by 10 Gbps, to accomodate very
        high speed bonded xDSL interfaces (e.g. 32 x 100Mbps).

        The value between 1 and 10000000 indicates that the total
        upstream data rate of the G.Bond port after initialization
        SHALL be equal to the target data rate or less, if the target
        upstream data rate cannot be achieved under the restrictions
        configured for BCEs. In case the copper environment allows to
        achieve higher upstream data rate than that specified by this
        object, the excess capability SHALL be either converted to
        additional SNR margin or reclaimed by minimizing transmit
        power.

        The value of 0 means that the target data rate is not
        fixed and SHALL be set to the maximum attainable rate during
        initialization (Best Effort), under specified spectral
        restrictions and with desired SNR Margin per BCE.

        This object is read-write for the -O subtype G.Bond ports
        and irrelevant for the -R subtypes.

        Changing of the Target Upstream Data Rate MUST be performed
        when the link is Down. Attempts to change this object MUST be
        rejected (In case of SNMP with the error inconsistentValue),
        if the link is Up or Initializing.

        This object MUST be maintained in a persistent manner.

        This object maps to the TR-159 attribute
        aGroupTargetUpRate."
      REFERENCE
        "[TR-159] 5.5.1.17"
      ::= { gBondPortConfEntry 4 }

    gBondTargetDownDataRate OBJECT-TYPE
      SYNTAX   Unsigned32(0|1..10000000)
      UNITS   "Kbps"
      MAX-ACCESS   read-write
      STATUS   current
      DESCRIPTION
        "A desired G.Bond port Data Rate in the downstream direction,
        in Kbps, to be achieved during initialization, under
        restrictions placed upon the member BCEs by their respective
        configuration settings.
        This object represents a sum of individual BCE downstream data
        rates, modified to compensate for fragmentation and
        encapsulation overhead (e.g., for an Ethernet service, the
        target data rate of 10Mbps SHALL allow lossless transmission
        of full-duplex 10Mbps Ethernet frame stream with minimal
        inter-frame gap).
        Note that the target downstream data rate may not be achieved
        during initialization (e.g., due to unavailability of required
        BCEs) or the initial bandwidth could deteriorate, so that the
        actual downstream data rate (gBondDownDataRate) could be less
        than gBondTargetDownDataRate.

        The value is limited above by 10 Gbps, to accomodate very
        high speed bonded xDSL interfaces (e.g. 32 x 100Mbps).

        The value between 1 and 10000000 indicates that the total
        downstream data rate of the G.Bond port after initialization
        SHALL be equal to the target data rate or less, if the target
        downstream data rate cannot be achieved under the restrictions
        configured for BCEs. In case the copper environment allows to
        achieve higher downstream data rate than that specified by
        this object, the excess capability SHALL be either converted

      to additional SNR margin or reclaimed by minimizing transmit
      power.

      The value of 0 means that the target data rate is not
      fixed and SHALL be set to the maximum attainable rate during
      initialization (Best Effort), under specified spectral
      restrictions and with desired SNR Margin per BCE.

      This object is read-write for the -O subtype G.Bond ports
      and irrelevant for the -R subtypes.

      Changing of the Target Downstream Data Rate MUST be performed
      when the link is Down. Attempts to change this object MUST be
      rejected (In case of SNMP with the error inconsistentValue),
      if the link is Up or Initializing.

      This object MUST be maintained in a persistent manner.

      This object maps to the TR-159 attribute
      aGroupTargetDownRate."
    REFERENCE
      "[TR-159] 5.5.1.18"
    ::= { gBondPortConfEntry 5 }

  gBondThreshLowUpRate   OBJECT-TYPE
    SYNTAX   Unsigned32(1..10000000)
    UNITS   "Kbps"
    MAX-ACCESS   read-write
    STATUS   current
    DESCRIPTION
      "This object configures the G.Bond port low upstream rate
      crossing alarm threshold. When the current value of
      gBondUpDataRate for this port reaches/drops below or exceeds
      this threshold, an gBondLowUpRateCrossing notification MAY be
      generated if enabled by gBondLowRateCrossingEnable.

      This object is read-write for the -O subtype G.Bond ports
      and irrelevant for the -R subtypes.

      This object MUST be maintained in a persistent manner.

      This object maps to the TR-159 attribute
      aGroupthreshLowUpRate."
    REFERENCE
      "[TR-159] 5.5.1.21"
    ::= { gBondPortConfEntry 6 }

  gBondThreshLowDownRate   OBJECT-TYPE

```
        SYNTAX      Unsigned32(1..10000000)
        UNITS       "Kbps"
        MAX-ACCESS  read-write
        STATUS      current
        DESCRIPTION
          "This object configures the G.Bond port low downstream rate
          crossing alarm threshold. When the current value of
          gBondDownDataRate for this port reaches/drops below or exceeds
          this threshold, an gBondLowDownRateCrossing notification MAY
          be generated if enabled by gBondLowRateCrossingEnable.

          This object is read-write for the -O subtype G.Bond ports
          and irrelevant for the -R subtypes.

          This object MUST be maintained in a persistent manner.

          This object maps to the TR-159 attribute
          aGroupThreshDownUpRate."
        REFERENCE
          "[TR-159] 5.5.1.22"
        ::= { gBondPortConfEntry 7 }

     gBondLowRateCrossingEnable  OBJECT-TYPE
        SYNTAX      TruthValue
        MAX-ACCESS  read-write
        STATUS      current
        DESCRIPTION
          "Indicates whether gBondLowUpRateCrossing and
          gBondLowDownRateCrossing notifications should be generated
          for this interface.

          Value of true(1) indicates that the notifications are enabled.
          Value of false(2) indicates that the notifications are
          disabled.

          This object is read-write for the -O subtype G.Bond ports
          and irrelevant for the -R subtypes.

          This object MUST be maintained in a persistent manner.

          This object maps to the TR-159 attribute
          aGroupLowRateCrossingEnable."
        REFERENCE
          "[TR-159] 5.5.1.23"
        ::= { gBondPortConfEntry 8 }

     gBondPerfTcaConfProfile  OBJECT-TYPE
        SYNTAX      SnmpAdminString (SIZE(1..32))
```

```
       MAX-ACCESS  read-write
       STATUS      current
       DESCRIPTION
         "The value of this object is the index of the row in the GBS
         port Alarm Configuration Profile Table for Performance Monitoring
         Threshold Crossing Alerts - gBondPortAlarmConfProfileTable,
         which applies to this GBS port.

          This object MUST be maintained in a persistent manner."
       DEFVAL  { "DEFVAL" }
       ::= { gBondPortConfEntry 9 }

     gBondPerfTcaEnable  OBJECT-TYPE
       SYNTAX      TruthValue
       MAX-ACCESS  read-write
       STATUS      current
       DESCRIPTION
         "Indicates whether gBondPerfTca*Crossing set of notifications
         should be generated for this interface.

         Value of true(1) indicates that the notifications are enabled.
         Value of false(2) indicates that the notifications are
         disabled.

         This object MUST be maintained in a persistent manner.

         This object maps to the TR-159 attribute aGroupPerfTcaEnable."
       REFERENCE
         "[TR-159] 5.5.1.38"
       ::= { gBondPortConfEntry 10 }



     gBondPortCapabilityTable OBJECT-TYPE
       SYNTAX      SEQUENCE OF GBondPortCapabilityEntry
       MAX-ACCESS  not-accessible
       STATUS      current
       DESCRIPTION
         "Table for Capabilities of G.Bond Ports. Entries in this table
         MUST be maintained in a persistent manner"
       ::= { gBondPort 2 }

     gBondPortCapabilityEntry OBJECT-TYPE
       SYNTAX      GBondPortCapabilityEntry
       MAX-ACCESS  not-accessible
       STATUS      current
       DESCRIPTION
         "An entry in the G.Bond Port Capability table.
```

       Each entry represents an G.Bond port indexed by the ifIndex.
       Note that a G.Bond GBS port runs on top of a single
       or multiple BCE port(s), which are also indexed by ifIndex."
     INDEX { ifIndex }
     ::= { gBondPortCapabilityTable 1 }

   GBondPortCapabilityEntry ::=
     SEQUENCE {
       gBondSchemesSupported   GBondSchemeList,
       gBondPeerSchemesSupported   GBondSchemeList,
       gBondCapacity   Unsigned32,
       gBondPeerCapacity   Unsigned32
     }

   gBondSchemesSupported OBJECT-TYPE
     SYNTAX   GBondSchemeList
     MAX-ACCESS read-only
     STATUS   current
     DESCRIPTION
       "Bonding Capability of the G.Bond port (GBS). This is a
       read-only bitmap of the possible bonding schemes supported by
       the GBS. The various bit-positions are:
         g9981(1)   - GBS is capable of G.998.1 bonding
         g9982(2)   - GBS is capable of G.998.2 bonding
         g9983(3)   - GBS is capable of G.998.3 bonding

       Note that for ports supporting multiple bonding schemes the
       actual administrative scheme is set via gBondAdminScheme
       object. The current operating bonding scheme is reflected in
       the gBondOperScheme.

       This object maps to the TR-159 attribute
       aGroupBondSchemesSupported."
     REFERENCE
       "[TR-159] 5.5.1.2"
     ::= { gBondPortCapabilityEntry 1 }

   gBondPeerSchemesSupported OBJECT-TYPE
     SYNTAX   GBondSchemeList
     MAX-ACCESS read-only
     STATUS   current
     DESCRIPTION
       "Bonding Capability of the peer G.Bond port (GBS). This is a
       read-only bitmap of the possible bonding schemes supported by
       the link partner GBS. The various bit-positions are:
         unknown(0)   - GBS does not support bonding or
                         the peer unit could not be reached.
         g9981(1)   - GBS is capable of G.998.1 bonding

```
      g9982(2)        - GBS is capable of G.998.2 bonding
      g9983(3)        - GBS is capable of G.998.3 bonding

   Note that for ports supporting multiple bonding schemes the
   actual administrative scheme is set via gBondPeerAdminScheme
   object. The current operating bonding scheme is reflected in
   the gBondPeerOperScheme.

   This object maps to the TR-159 attribute
   aGroupBondPeerSchemesSupported."
REFERENCE
   "[TR-159] 5.5.1.3"
::= { gBondPortCapabilityEntry 2 }

gBondCapacity  OBJECT-TYPE
   SYNTAX      Unsigned32 (1..32)
   MAX-ACCESS  read-only
   STATUS      current
   DESCRIPTION
     "Number of BCEs that can be aggregated by the local GBS.
     The number of BCEs currently assigned to a particular G.Bond
     port (gBondNumBCEs) is never greater than gBondCapacity.

     This object maps to the TR-159 attribute aGroupCapacity."
   REFERENCE
     "[TR-159] 5.5.1.12"
   ::= { gBondPortCapabilityEntry 3 }

gBondPeerCapacity  OBJECT-TYPE
   SYNTAX      Unsigned32 (0|1..32)
   MAX-ACCESS  read-only
   STATUS      current
   DESCRIPTION
     "Number of BCEs that can be aggregated by the peer GBS port.
     Value of 0 is returned when peer Bonding Capacity is unknown
     (peer cannot be reached).

     This object maps to the TR-159 attribute aGroupPeerCapacity."
   REFERENCE
     "[TR-159] 5.5.1.13"
   ::= { gBondPortCapabilityEntry 4 }


gBondPortStatusTable OBJECT-TYPE
   SYNTAX      SEQUENCE OF GBondPortStatusEntry
   MAX-ACCESS  not-accessible
   STATUS      current
   DESCRIPTION
```

```
      "This table provides overall status information of G.Bond
      ports, complementing the generic status information from the
      ifTable of IF-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."
   ::= { gBondPort 3 }

gBondPortStatusEntry OBJECT-TYPE
  SYNTAX      GBondPortStatusEntry
  MAX-ACCESS  not-accessible
  STATUS      current
  DESCRIPTION
    "An entry in the G.Bond Port Status table.
    Each entry represents an G.Bond port indexed by the ifIndex.
    Note that an G.Bond GBS port runs on top of a single
    or multiple BCE port(s), which are also indexed by ifIndex."
  INDEX  { ifIndex }
  ::= { gBondPortStatusTable 1 }

GBondPortStatusEntry ::=
  SEQUENCE {
     gBondOperScheme                 GBondScheme,
     gBondPeerOperScheme             GBondScheme,
     gBondUpDataRate                 Gauge32,
     gBondDownDataRate               Gauge32,
     gBondFltStatus                  BITS,
     gBondPortSide                   INTEGER,
     gBondNumBCEs                    Unsigned32
  }

gBondOperScheme  OBJECT-TYPE
  SYNTAX      GBondScheme
  MAX-ACCESS  read-only
  STATUS      current
  DESCRIPTION
    "Current operating bonding scheme of a G.Bond port.
    The possible values are:
      g9981(1)      - G.998.1 bonding
      g9982(2)      - G.998.2 bonding
      g9983(3)      - G.998.3 bonding

    This object maps to the TR-159 attribute
    aGroupOperBondScheme."
  REFERENCE
    "[TR-159] 5.5.1.4"
  ::= { gBondPortStatusEntry 1 }
```

```
    gBondPeerOperScheme  OBJECT-TYPE
      SYNTAX       GBondScheme
      MAX-ACCESS   read-only
      STATUS       current
      DESCRIPTION
        "Curent operating bonding scheme of a G.Bond port link
        partner.
        The possible values are:
          unknown(0)     - peer cannot be reached due to the link
                           state
          g9981(1)       - G.998.1 bonding
          g9982(2)       - G.998.2 bonding
          g9983(3)       - G.998.3 bonding

        This object maps to the TR-159 attribute
        aGroupPeerOperBondScheme."
      REFERENCE
        "[TR-159] 5.5.1.5"
      ::= { gBondPortStatusEntry 2 }

    gBondUpDataRate  OBJECT-TYPE
      SYNTAX       Gauge32
      UNITS        "bps"
      MAX-ACCESS   read-only
      STATUS       current
      DESCRIPTION
        "A current G.Bond port operational Data Rate in the upstream
        direction, in bps.
        This object represents an estimation of the sum of individual
        BCE upstream data rates, modified to compensate for
        fragmentation and encapsulation overhead (e.g., for an
        Ethernet service, the target data rate of 10Mbps SHALL allow
        lossless transmission of full-duplex 10Mbps Ethernet frame
        stream with minimal inter-frame gap).

        Note that for symmetrical interfaces gBondUpDataRate ==
        gBondDownDataRate == ifSpeed.

        This object maps to the TR-159 attribute aGroupUpRate."
      REFERENCE
        "[TR-159] 5.5.1.15"
      ::= { gBondPortStatusEntry 3 }

    gBondDownDataRate  OBJECT-TYPE
      SYNTAX       Gauge32
      UNITS        "bps"
      MAX-ACCESS   read-only
      STATUS       current
```

   DESCRIPTION
     "A current G.Bond port operational Data Rate in the downstream
     direction, in bps.
     This object represents an estimation of the sum of individual
     BCE downstream data rates, modified to compensate for
     fragmentation and encapsulation overhead (e.g., for an
     Ethernet service, the target data rate of 10Mbps SHALL allow
     lossless transmission of full-duplex 10Mbps Ethernet frame
     stream with minimal inter-frame gap).

     Note that for symmetrical interfaces gBondUpDataRate ==
     gBondDownDataRate == ifSpeed.

     This object maps to the TR-159 attribute aGroupDownRate."
   REFERENCE
     "[TR-159] 5.5.1.16"
   ::= { gBondPortStatusEntry 4 }

 gBondFltStatus OBJECT-TYPE
   SYNTAX   BITS {
     noPeer(0),
     peerPowerLoss(1),
     peerBondSchemeMismatch(2),
     bceSubTypeMismatch(3),
     lowRate(4)
   }
   MAX-ACCESS read-only
   STATUS   current
   DESCRIPTION
     "G.Bond (GBS) port Fault Status. This is a bitmap of possible
     conditions. The various bit positions are:
       noPeer   - peer GBS cannot be reached (e.g.,
                               no BCEs attached, all BCEs are Down
                               etc.).
       peerPowerLoss   - peer GBS has indicated impending unit
                               failure due to loss of local power
                               ('Dying Gasp').
       peerBondSchemeMismatch - operating bonding scheme of a peer
                               GBS is different from the local one.
       bceSubTypeMismatch   - local BCEs in the aggregation group
                               are not of the same sub-type, e.g.,
                               some BCEs in the local device are -O
                               while others are -R subtype.
       lowRate   - gBondUpRate/gBondDownRate of the port
                               has reached or dropped below
                               gBondThreshLowUpRate/
                               gBondThreshLowUpRate.

      This object is intended to supplement ifOperStatus object
      in IF-MIB and ifMauMediaAvailable in MAU-MIB.

      This object maps to the TR-159 attribute aGroupStatus."
    REFERENCE
      "[TR-159] 5.5.1.9; IF-MIB, ifOperStatus; MAU-MIB,
      ifMauMediaAvailable"
    ::= { gBondPortStatusEntry 5 }

  gBondPortSide OBJECT-TYPE
    SYNTAX   INTEGER {
      subscriber(1),
      office(2),
      unknown(3)
    }
    MAX-ACCESS read-only
    STATUS   current
    DESCRIPTION
      "G.Bond port mode of operation (subtype).
      The value of 'subscriber' indicates the port is designated as
      '-R' subtype (all BCEs assigned to this port are of subtype
      '-R').
      The value of the 'office' indicates that the port is
      designated as '-O' subtype (all BCEs assigned to this port are
      of subtype '-O').
      The value of 'unknown' indicates that the port has no assigned
      BCEs yet or that the assigned BCEs are not of the same side
      (subTypeBCEMismatch).

      This object maps to the TR-159 attribute aGroupEnd."
    REFERENCE
       "[TR-159] 5.5.1.11"
    ::= { gBondPortStatusEntry 6 }

  gBondNumBCEs OBJECT-TYPE
    SYNTAX   Unsigned32 (0..32)
    MAX-ACCESS read-only
    STATUS   current
    DESCRIPTION
      "Number of BCEs that is currently aggregated by the local GBS
      (assigned to the G.Bond port using ifStackTable).
      This number is never greater than gBondCapacity.

      This object SHALL be automatically incremented or decremented
      when a BCE is added or deleted to/from the G.Bond port using
      ifStackTable.

      This object maps to the TR-159 attribute aGroupNumChannels"

      REFERENCE
        "[TR-159] 5.5.1.14"
      ::= { gBondPortStatusEntry 7 }

   -- Performance Monitoring group

   gBondPortPM   OBJECT IDENTIFIER ::= { gBondPort 4 }

   gBondPortPerfCurrTable OBJECT-TYPE
     SYNTAX   SEQUENCE OF GBondPortPerfCurrEntry
     MAX-ACCESS   not-accessible
     STATUS   current
     DESCRIPTION
       "This table contains current Performance Monitoring information
       for GBS ports. This table contains live data from the equipment
       and as such is NOT persistent."
     ::= { gBondPortPM 1 }

   gBondPortPerfCurrEntry OBJECT-TYPE
     SYNTAX   GBondPortPerfCurrEntry
     MAX-ACCESS   not-accessible
     STATUS   current
     DESCRIPTION
       "An entry in the G.Bond Port PM table.
       Each entry represents an G.Bond port indexed by the ifIndex.
       Note that a G.Bond GBS port runs on top of a single
       or multiple BCE port(s), which are also indexed by ifIndex."
     INDEX { ifIndex }
     ::= { gBondPortPerfCurrTable 1 }

   GBondPortPerfCurrEntry ::=
     SEQUENCE {
       gBondPerfES   HCPerfTotalCount,
       gBondPerfSES   HCPerfTotalCount,
       gBondPerfUAS   HCPerfTotalCount,
       gBondPerf15MinValidIntervals   HCPerfValidIntervals,
       gBondPerf15MinInvalidIntervals HCPerfInvalidIntervals,
       gBondPerfCurr15MinTimeElapsed   HCPerfTimeElapsed,
       gBondPerfCurr15MinES   HCPerfCurrentCount,
       gBondPerfCurr15MinSES   HCPerfCurrentCount,
       gBondPerfCurr15MinUAS   HCPerfCurrentCount,
       gBondPerf1DayValidIntervals   Unsigned32,
       gBondPerf1DayInvalidIntervals   Unsigned32,
       gBondPerfCurr1DayTimeElapsed   HCPerfTimeElapsed,
       gBondPerfCurr1DayES   HCPerfCurrentCount,
       gBondPerfCurr1DaySES   HCPerfCurrentCount,
       gBondPerfCurr1DayUAS   HCPerfCurrentCount

```
      }

   gBondPerfES  OBJECT-TYPE
     SYNTAX      HCPerfTotalCount
     MAX-ACCESS  read-only
     STATUS      current
     DESCRIPTION
       "A read-only count of Errored Seconds (ES) on the GBS since the
       BTU was last restarted.

       An Errored Second for a G.998.x interface is defined as a count
       of 1-second intervals during which one or more GBS errors are
       declared. The errors are specific for each bonding scheme, e.g.
         - lost cells for the ATM bonding;
         - lost or discarded (due to an error or a buffer overflow)
           fragments for the Ethernet bonding;
         - CRC4, CRC6 or CRC8 errors for the TDIM bonding
       This object is inhibited during Unavailable Seconds (UAS).

       This object maps to the TR-159 attribute aGroupPerfES."
     REFERENCE
       "[TR-159] 5.5.1.29"
     ::= { gBondPortPerfCurrEntry 1 }

   gBondPerfSES  OBJECT-TYPE
     SYNTAX      HCPerfTotalCount
     MAX-ACCESS  read-only
     STATUS      current
     DESCRIPTION
       "A read-only count of Severely Errored Seconds (SES) on the GBS
       since the BTU was last restarted.

       A Severely Errored Second for a G.998.x interface is defined as
       a count of 1-second intervals during which GBS errors cause at
       least 1% traffic loss of the nominal bonded link rate or at
       least 12ms for the TDM traffic. The exact definition is specific
       for each bonding scheme, e.g.
         - 234 lost cells for the ATM bonding with 10Mbps nominal link
           rate
         - 60 lost/discarded fragments for the Ethernet bonding with
           10Mbps nominal link rate and fixed 192 Byte-long fragment
           size.
         - 6 or more CRC4, one or more CRC6 or one or more CRC8 errors
           for the TDM bonding
       This object is inhibited during Unavailable Seconds (UAS).

       This object maps to the TR-159 attribute aGroupPerfSES."
     REFERENCE
```

```
           "[TR-159] 5.5.1.30"
        ::= { gBondPortPerfCurrEntry 2 }

    gBondPerfUAS  OBJECT-TYPE
       SYNTAX       HCPerfTotalCount
       MAX-ACCESS   read-only
       STATUS       current
       DESCRIPTION
         "A read-only count of Unavailable Seconds (UAS) on the GBS since
         the BTU was last restarted.

         An Unavailable Second for a G.998.x interface is defined as a
         count of 1-second intervals during which the bonded link is
         unavailable. The G.998.x link becomes unavailable at the onset
         of 10 contiguous SESs. The 10 SESs are included in the
         unavailable time. Once unavailable, the G.998.x line becomes
         available at the onset of 10 contiguous seconds with no SESs.
         The 10 seconds with no SESs are excluded from unavailable time.

         This object maps to the TR-159 attribute aGroupPerfUAS."
       REFERENCE
         "[TR-159] 5.5.1.31"
        ::= { gBondPortPerfCurrEntry 3 }

    gBondPerf15MinValidIntervals  OBJECT-TYPE
       SYNTAX       HCPerfValidIntervals
       MAX-ACCESS   read-only
       STATUS       current
       DESCRIPTION
         "A read-only number of 15-minute intervals for which 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
         minutes 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 maps to the TR-159 attribute
         aGroupPerf15MinValidIntervals."
       REFERENCE
         "[TR-159] 5.5.1.32"
        ::= { gBondPortPerfCurrEntry 4 }

    gBondPerf15MinInvalidIntervals  OBJECT-TYPE
       SYNTAX       HCPerfInvalidIntervals
       MAX-ACCESS   read-only
```

```
           STATUS       current
           DESCRIPTION
             "A read-only number of 15-minute 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.

             This object maps to the TR-159 attribute
             aGroupPerf15MinInvalidIntervals."
           REFERENCE
             "[TR-159] 5.5.1.33"
           ::= { gBondPortPerfCurrEntry 5 }

       gBondPerfCurr15MinTimeElapsed  OBJECT-TYPE
           SYNTAX       HCPerfTimeElapsed
           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 history interval.

             This object maps to the TR-159 attribute
             aGroupPerfCurr15MinTimeElapsed."
           REFERENCE
             "[TR-159] 5.5.1.34"
           ::= { gBondPortPerfCurrEntry 6 }

       gBondPerfCurr15MinES  OBJECT-TYPE
           SYNTAX       HCPerfCurrentCount
           MAX-ACCESS   read-only
           STATUS       current
           DESCRIPTION
             "A read-only count of Errored Seconds (ES) on the GBS in the
             current 15-minute performance history interval.

             This object maps to the TR-159 attribute aGroupPerfCurr15MinES."
           REFERENCE
             "[TR-159] 5.5.1.35"
           ::= { gBondPortPerfCurrEntry 7 }

       gBondPerfCurr15MinSES  OBJECT-TYPE
           SYNTAX       HCPerfCurrentCount
           MAX-ACCESS   read-only
           STATUS       current
           DESCRIPTION
             "A read-only count of Severely Errored Seconds (ES) on the GBS
             in the current 15-minute performance history interval.

             This object maps to the TR-159 attribute aGroupPerfCurr15MinSES."
```

      REFERENCE
        "[TR-159] 5.5.1.36"
      ::= { gBondPortPerfCurrEntry 8 }

   gBondPerfCurr15MinUAS OBJECT-TYPE
      SYNTAX   HCPerfCurrentCount
      MAX-ACCESS read-only
      STATUS   current
      DESCRIPTION
        "A read-only count of Unavailable Seconds (UAS) on the GBS in
        the current 15-minute performance history interval.

        This object maps to the TR-159 attribute aGroupPerfCurr15MinUAS."
      REFERENCE
        "[TR-159] 5.5.1.37"
      ::= { gBondPortPerfCurrEntry 9 }

   gBondPerf1DayValidIntervals OBJECT-TYPE
      SYNTAX   Unsigned32 (0..7)
      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.

        This object maps to the TR-159 attribute
        aGroupPerf1DayValidIntervals."
      REFERENCE
        "[TR-159] 5.5.1.45"
      ::= { gBondPortPerfCurrEntry 10 }

   gBondPerf1DayInvalidIntervals OBJECT-TYPE
      SYNTAX   Unsigned32 (0..7)
      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.

        This object maps to the TR-159 attribute

          aGroupPerf1DayInvalidIntervals."
        REFERENCE
          "[TR-159] 5.5.1.46"
        ::= { gBondPortPerfCurrEntry 11 }

    gBondPerfCurr1DayTimeElapsed OBJECT-TYPE
        SYNTAX   HCPerfTimeElapsed
        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 history interval.

          This object maps to the TR-159 attribute
          aGroupPerfCurr1DayTimeElapsed."
        REFERENCE
          "[TR-159] 5.5.1.47"
        ::= { gBondPortPerfCurrEntry 12 }

    gBondPerfCurr1DayES OBJECT-TYPE
        SYNTAX   HCPerfCurrentCount
        MAX-ACCESS read-only
        STATUS   current
        DESCRIPTION
          "A read-only count of Errored Seconds (ES) on the GBS in the
          current 1-day performance history interval.

          This object maps to the TR-159 attribute aGroupPerfCurr1DayES."
        REFERENCE
          "[TR-159] 5.5.1.48"
        ::= { gBondPortPerfCurrEntry 13 }

    gBondPerfCurr1DaySES OBJECT-TYPE
        SYNTAX   HCPerfCurrentCount
        MAX-ACCESS read-only
        STATUS   current
        DESCRIPTION
          "A read-only count of Severely Errored Seconds (ES) on the GBS
          in the current 1-day performance history interval.

          This object maps to the TR-159 attribute aGroupPerfCurr1DaySES."
        REFERENCE
          "[TR-159] 5.5.1.49"
        ::= { gBondPortPerfCurrEntry 14 }

    gBondPerfCurr1DayUAS OBJECT-TYPE
        SYNTAX   HCPerfCurrentCount
        MAX-ACCESS read-only

```
    STATUS      current
    DESCRIPTION
      "A read-only count of Unavailable Seconds (UAS) on the GBS in
      the current 1-day performance history interval.

      This object maps to the TR-159 attribute aGroupPerfCurr1DayUAS."
    REFERENCE
      "[TR-159] 5.5.1.50"
    ::= { gBondPortPerfCurrEntry 15 }

  -- PM history: 15-min buckets

  gBondPortPerf15MinTable OBJECT-TYPE
    SYNTAX      SEQUENCE OF GBondPortPerf15MinEntry
    MAX-ACCESS  not-accessible
    STATUS      current
    DESCRIPTION
      "This table contains historical 15-minute buckets of Performance
      Monitoring information for a GBS port (a raw for each 15-minute
      interval, up to 96 intervals).
      Entries in this table MUST be maintained in a persistent manner."
    ::= { gBondPortPM 2 }

  gBondPortPerf15MinEntry OBJECT-TYPE
    SYNTAX      GBondPortPerf15MinEntry
    MAX-ACCESS  not-accessible
    STATUS      current
    DESCRIPTION
      "An entry in the G.Bond Port historical 15-minute PM table.
      Each entry represents performance monitoring data for a GBS port,
      indexed by ifIndex, collected during a particular 15-minute
      interval, indexed by gBondPerf15MinIntervalIndex."
    INDEX  { ifIndex, gBondPerf15MinIntervalIndex }
    ::= { gBondPortPerf15MinTable 1 }

  GBondPortPerf15MinEntry ::=
    SEQUENCE {
      gBondPerf15MinIntervalIndex      Unsigned32,
      gBondPerf15MinIntervalMoniTime   HCPerfTimeElapsed,
      gBondPerf15MinIntervalES         HCPerfIntervalCount,
      gBondPerf15MinIntervalSES        HCPerfIntervalCount,
      gBondPerf15MinIntervalUAS        HCPerfIntervalCount,
      gBondPerf15MinIntervalValid      TruthValue
    }

  gBondPerf15MinIntervalIndex  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 maps to the TR-159 attribute
       aGroupPerf15MinIntervalNumber."
     REFERENCE
       "[TR-159] 5.5.1.57"
     ::= { gBondPortPerf15MinEntry 1 }

   gBondPerf15MinIntervalMoniTime  OBJECT-TYPE
     SYNTAX      HCPerfTimeElapsed
     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."
     ::= { gBondPortPerf15MinEntry 2 }

   gBondPerf15MinIntervalES  OBJECT-TYPE
     SYNTAX      HCPerfIntervalCount
     MAX-ACCESS  read-only
     STATUS      current
     DESCRIPTION
       "A read-only count of Errored Seconds (ES) on the GBS in the
       15-minute performance history interval.

       This object maps to the TR-159 attribute
       aGroupPerf15MinIntervalES."
     REFERENCE
       "[TR-159] 5.5.1.59"
     ::= { gBondPortPerf15MinEntry 3 }

   gBondPerf15MinIntervalSES  OBJECT-TYPE
     SYNTAX      HCPerfIntervalCount
     MAX-ACCESS  read-only
     STATUS      current
     DESCRIPTION
       "A read-only count of Severely Errored Seconds (ES) on the GBS
       in the 15-minute performance history interval.

       This object maps to the TR-159 attribute
       aGroupPerf15MinIntervalSES."
     REFERENCE
```

```
      "[TR-159] 5.5.1.60"
   ::= { gBondPortPerf15MinEntry 4 }


gBondPerf15MinIntervalUAS  OBJECT-TYPE
  SYNTAX       HCPerfIntervalCount
  MAX-ACCESS   read-only
  STATUS       current
  DESCRIPTION
    "A read-only count of Unavailable Seconds (UAS) on the GBS in
    the current 15-minute performance history interval.

    This object maps to the TR-159 attribute aGroupPerfCurr15MinUAS."
  REFERENCE
    "[TR-159] 5.5.1.61"
   ::= { gBondPortPerf15MinEntry 5 }


gBondPerf15MinIntervalValid  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. Valid bucket is reported as true(1)
    and invalid bucket as false(2).
    If this history bucket is invalid the BTU-C 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 data base. In such case this object is
    not required as only valid history buckets are available while
    invalid history buckets are simply not in the data base.

    This object maps to the TR-159 attribute
    aGroupPerf15MinIntervalValid."
  REFERENCE
    "[TR-159] 5.5.1.58"
   ::= { gBondPortPerf15MinEntry 6 }

-- PM history: 1-day buckets

gBondPortPerf1DayTable OBJECT-TYPE
  SYNTAX       SEQUENCE OF GBondPortPerf1DayEntry
  MAX-ACCESS   not-accessible
  STATUS       current
  DESCRIPTION
    "This table contains historical 1-day buckets of Performance
    Monitoring information for a GBS port (a raw for each 1-day
    interval, up to 7 intervals).
```

```
      Entries in this table MUST be maintained in a persistent manner."
    ::= { gBondPortPM 3 }

  gBondPortPerf1DayEntry OBJECT-TYPE
    SYNTAX      GBondPortPerf1DayEntry
    MAX-ACCESS  not-accessible
    STATUS      current
    DESCRIPTION
      "An entry in the G.Bond Port historical 1-day PM table.
      Each entry represents performance monitoring data for a GBS port,
      indexed by ifIndex, collected during a particular 1-day
      interval, indexed by gBondPerf1DayIntervalIndex."
    INDEX  { ifIndex, gBondPerf1DayIntervalIndex }
    ::= { gBondPortPerf1DayTable 1 }

  GBondPortPerf1DayEntry ::=
    SEQUENCE {
      gBondPerf1DayIntervalIndex      Unsigned32,
      gBondPerf1DayIntervalMoniTime   HCPerfTimeElapsed,
      gBondPerf1DayIntervalES         HCPerfIntervalCount,
      gBondPerf1DayIntervalSES        HCPerfIntervalCount,
      gBondPerf1DayIntervalUAS        HCPerfIntervalCount,
      gBondPerf1DayIntervalValid      TruthValue
    }

  gBondPerf1DayIntervalIndex  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 maps to the TR-159 attribute
      aGroupPerf1DayIntervalNumber."
    REFERENCE
      "[TR-159] 5.5.1.62"
    ::= { gBondPortPerf1DayEntry 1 }

  gBondPerf1DayIntervalMoniTime  OBJECT-TYPE
    SYNTAX      HCPerfTimeElapsed
    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 (86400 seconds), except in a situation where
```

         performance data could not be collected for any reason.

         This object maps to the TR-159 attribute
         aGroupPerf1DayIntervalMoniSecs."
      REFERENCE
         "[TR-159] 5.5.1.64"
      ::= { gBondPortPerf1DayEntry 2 }

   gBondPerf1DayIntervalES OBJECT-TYPE
      SYNTAX   HCPerfIntervalCount
      MAX-ACCESS   read-only
      STATUS   current
      DESCRIPTION
         "A read-only count of Errored Seconds (ES) on the GBS in the
         1-day performance history interval.

         This object maps to the TR-159 attribute
         aGroupPerf1DayIntervalES."
      REFERENCE
         "[TR-159] 5.5.1.65"
      ::= { gBondPortPerf1DayEntry 3 }

   gBondPerf1DayIntervalSES OBJECT-TYPE
      SYNTAX   HCPerfIntervalCount
      MAX-ACCESS   read-only
      STATUS   current
      DESCRIPTION
         "A read-only count of Severely Errored Seconds (ES) on the GBS
         in the 1-day performance history interval.

         This object maps to the TR-159 attribute
         aGroupPerf1DayIntervalSES."
      REFERENCE
         "[TR-159] 5.5.1.66"
      ::= { gBondPortPerf1DayEntry 4 }

   gBondPerf1DayIntervalUAS OBJECT-TYPE
      SYNTAX   HCPerfIntervalCount
      MAX-ACCESS   read-only
      STATUS   current
      DESCRIPTION
         "A read-only count of Unavailable Seconds (UAS) on the GBS in
         the current 1-day performance history interval.

         This object maps to the TR-159 attribute aGroupPerfCurr1DayUAS."
      REFERENCE
         "[TR-159] 5.5.1.67"
      ::= { gBondPortPerf1DayEntry 5 }

```
   gBondPerf1DayIntervalValid  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. Valid bucket is reported as true(1)
       and invalid bucket as false(2).
       If this history bucket is invalid the BTU-C 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 data base. In such case this object is
       not required as only valid history buckets are available while
       invalid history buckets are simply not in the data base.

       This object maps to the TR-159 attribute
       aGroupPerf1DayIntervalValid."
     REFERENCE
       "[TR-159] 5.5.1.63"
     ::= { gBondPortPerf1DayEntry 6 }


   -- Performance Monitoring TCA Configuration profile

   gBondPortPerfTcaConfProfileTable OBJECT-TYPE
     SYNTAX       SEQUENCE OF GBondPortPerfTcaConfProfileEntry
     MAX-ACCESS   not-accessible
     STATUS       current
     DESCRIPTION
       "This table supports definitions of Performance Monitoring (PM)
       Threshold Crossing Alerts (TCA) configuration profiles for GBS
       ports.
       Entries in this table MUST be maintained in a persistent manner."
     ::= { gBondPortPM 4 }

   gBondPortPerfTcaConfProfileEntry OBJECT-TYPE
     SYNTAX       GBondPortPerfTcaConfProfileEntry
     MAX-ACCESS   not-accessible
     STATUS       current
     DESCRIPTION
       "An entry in the GBS PM TCA Configuration table.
        Each entry corresponds to a single TCA configuration profile.
        Each profile contains a set of parameters for setting alarm
        thresholds for various performance attributes monitored at GBS
        ports.  Profiles may be created/deleted using the row
        creation/deletion mechanism via
        gBondPerfTcaConfProfileRowStatus. If an active entry is
```

```
        referenced via gBondPerfTcaConfProfile, the entry MUST
        remain active until all references are removed.
        A default profile with an index of 'DEFVAL', will always exist
        and its parameters will be set to vendor specific values,
        unless otherwise specified in this document."
      INDEX  { gBondPerfTcaConfProfileName }
      ::= { gBondPortPerfTcaConfProfileTable 1 }

   GBondPortPerfTcaConfProfileEntry ::=
      SEQUENCE {
        gBondPerfTcaConfProfileName       SnmpAdminString,
        gBondPerfThreshold15MinES         HCPerfIntervalThreshold,
        gBondPerfThreshold15MinSES        HCPerfIntervalThreshold,
        gBondPerfThreshold15MinUAS        HCPerfIntervalThreshold,
        gBondPerfThreshold1DayES          GBondPerf1DayIntervalThreshold,
        gBondPerfThreshold1DaySES         GBondPerf1DayIntervalThreshold,
        gBondPerfThreshold1DayUAS         GBondPerf1DayIntervalThreshold,
        gBondPerfTcaConfProfileRowStatus RowStatus
      }

   gBondPerfTcaConfProfileName  OBJECT-TYPE
      SYNTAX       SnmpAdminString (SIZE(1..32))
      MAX-ACCESS  not-accessible
      STATUS       current
      DESCRIPTION
        "This object is a unique index (name) associated with this
        GBS PM TCA profile."
      ::= { gBondPortPerfTcaConfProfileEntry 1 }

   gBondPerfThreshold15MinES  OBJECT-TYPE
      SYNTAX       HCPerfIntervalThreshold
      MAX-ACCESS  read-create
      STATUS       current
      DESCRIPTION
        "A desired threshold for the number of Errored Seconds (ES)
        within any given 15-minute performance data collection interval.
        If the number of ESs in a particular 15-minute collection
        interval reaches or exceeds this value, a
        gBondPerfTca15MinESCrossing notification MAY be generated if
        enabled by gBondPerfTcaEnable.
        At most one notification can be sent per interval.
        Setting this attribute to zero (default) effectively disables
        gBondPerfTca15MinESCrossing notification.

        This object maps to the TR-159 attribute
        aGroupPerfThreshold15MinES."
      REFERENCE
        "[TR-159] 5.5.1.39"
```

```
        ::= { gBondPortPerfTcaConfProfileEntry 2 }

    gBondPerfThreshold15MinSES  OBJECT-TYPE
       SYNTAX       HCPerfIntervalThreshold
       MAX-ACCESS   read-create
       STATUS       current
       DESCRIPTION
         "A desired threshold for the number of Severely Errored Seconds
         (SES) within any given 15-minute performance data collection
         interval.
         If the number of SESs in a particular 15-minute collection
         interval reaches or exceeds this value, a
         gBondPerfTca15MinSESCrossing notification MAY be generated if
         enabled by gBondPerfTcaEnable.
         At most one notification can be sent per interval.
         Setting this attribute to zero (default) effectively disables
         gBondPerfTca15MinSESCrossing notification.

         This object maps to the TR-159 attribute
         aGroupPerfThreshold15MinSES."
       REFERENCE
         "[TR-159] 5.5.1.40"
       ::= { gBondPortPerfTcaConfProfileEntry 3 }

    gBondPerfThreshold15MinUAS  OBJECT-TYPE
       SYNTAX       HCPerfIntervalThreshold
       MAX-ACCESS   read-create
       STATUS       current
       DESCRIPTION
         "A desired threshold for the number of Unavailable Seconds (UAS)
         within any given 15-minute performance data collection interval.
         If the number of UASs in a particular 15-minute collection
         interval reaches or exceeds this value, a
         gBondPerfTca15MinUASCrossing notification MAY be generated if
         enabled by gBondPerfTcaEnable.
         At most one notification can be sent per interval.
         Setting this attribute to zero (default) effectively disables
         gBondPerfTca15MinUASCrossing notification.

         This object maps to the TR-159 attribute
         aGroupPerfThreshold15MinUAS."
       REFERENCE
         "[TR-159] 5.5.1.41"
       ::= { gBondPortPerfTcaConfProfileEntry 4 }

    gBondPerfThreshold1DayES  OBJECT-TYPE
       SYNTAX       GBondPerf1DayIntervalThreshold
       MAX-ACCESS   read-create
```

```
      STATUS      current
      DESCRIPTION
        "A desired threshold for the number of Errored Seconds (ES)
        within any given 1-day performance data collection interval.
        If the number of ESs in a particular 1-day collection interval
        reaches or exceeds this value, a gBondPerfTca1DayESCrossing
        notification MAY be generated if enabled by gBondPerfTcaEnable.
        At most one notification can be sent per interval.
        Setting this attribute to zero (default) effectively disables
        gBondPerfTca1DayESCrossing notification.

        This object maps to the TR-159 attribute
        aGroupPerfThreshold1DayES."
      REFERENCE
        "[TR-159] 5.5.1.51"
      ::= { gBondPortPerfTcaConfProfileEntry 5 }

    gBondPerfThreshold1DaySES  OBJECT-TYPE
      SYNTAX      GBondPerf1DayIntervalThreshold
      MAX-ACCESS  read-create
      STATUS      current
      DESCRIPTION
        "A desired threshold for the number of Severely Errored Seconds
        (SES) within any given 1-day performance data collection
        interval.
        If the number of SESs in a particular 1-day collection interval
        reaches or exceeds this value, a gBondPerfTca1DaySESCrossing
        notification MAY be generated if enabled by gBondPerfTcaEnable.
        At most one notification can be sent per interval.
        Setting this attribute to zero (default) effectively disables
        gBondPerfTca1DaySESCrossing notification.

        This object maps to the TR-159 attribute
        aGroupPerfThreshold1DaySES."
      REFERENCE
        "[TR-159] 5.5.1.52"
      ::= { gBondPortPerfTcaConfProfileEntry 6 }

    gBondPerfThreshold1DayUAS  OBJECT-TYPE
      SYNTAX      GBondPerf1DayIntervalThreshold
      MAX-ACCESS  read-create
      STATUS      current
      DESCRIPTION
        "A desired threshold for the number of Unavailable Seconds (UAS)
        within any given 1-day performance data collection interval.
        If the number of UASs in a particular 1-day collection interval
        reaches or exceeds this value, a gBondPerfTca1DayUASCrossing
        notification MAY be generated if enabled by gBondPerfTcaEnable.
```

        At most one notification can be sent per interval.
        Setting this attribute to zero (default) effectively disables
        gBondPerfTca1DayUASCrossing notification.

        This object maps to the TR-159 attribute
        aGroupPerfThreshold1DayUAS."
      REFERENCE
        "[TR-159] 5.5.1.53"
      ::= { gBondPortPerfTcaConfProfileEntry 7 }

   gBondPerfTcaConfProfileRowStatus OBJECT-TYPE
      SYNTAX   RowStatus
      MAX-ACCESS read-create
      STATUS   current
      DESCRIPTION
        "This object controls the creation, modification, or deletion
         of the associated entry in the gBondPortPerfTcaConfProfileTable
         per the semantics of RowStatus.

         If an 'active' entry is referenced via gBondPerfTcaConfProfile
         instance(s), the entry MUST remain 'active'.

         An 'active' entry SHALL NOT be modified. In order to modify an
         existing entry, it MUST be taken out of service (by setting
         this object to 'notInService'), modified, and set 'active'
         again."
      ::= { gBondPortPerfTcaConfProfileEntry 8 }

   -- The BCE group

   gBondBceConfTable OBJECT-TYPE
      SYNTAX   SEQUENCE OF GBondBceConfEntry
      MAX-ACCESS not-accessible
      STATUS   current
      DESCRIPTION
        "Table for Configuration of G.Bond common aspects for the
        Bonding Channel Entity (BCE) ports (modems/channels).

        Entries in this table MUST be maintained in a persistent
        manner."
      ::= { gBondBce 1 }

   gBondBceConfEntry OBJECT-TYPE
      SYNTAX   GBondBceConfEntry
      MAX-ACCESS not-accessible
      STATUS   current
      DESCRIPTION

```
     "An entry in the G.Bond BCE Configuration table.
     Each entry represents common aspects of a G.Bond BCE port
     indexed by the ifIndex. Note that an G.Bond BCE port can be
     stacked below a single GBS port, also indexed by ifIndex,
     possibly together with other BCE ports if GAF is enabled."
   INDEX  { ifIndex }
   ::= { gBondBceConfTable 1 }

 GBondBceConfEntry ::=
   SEQUENCE {
     gBondBceRemoteDiscoveryCode    PhysAddress
   }

 gBondBceRemoteDiscoveryCode  OBJECT-TYPE
   SYNTAX      PhysAddress (SIZE(0|6))
   MAX-ACCESS  read-write
   STATUS      current
   DESCRIPTION
     "A Remote Discovery Code of the BCE port at CO.
     A 6 octet long Discovery Code of the peer GBS connected via
     the BCE.
     Reading this object results in a Discovery Get operation.
     Setting this object to all zeroes results in a Discovery
     Clear_if_Same operation (the value of gBondDiscoveryCode
     at the peer GBS SHALL be the same as gBondDiscoveryCode of
     the local GBS associated with the BCE for the operation to
     succeed).
     Writing a non-zero value to this object results in a
     Discovery Set_if_Clear operation.
     A zero-length octet string SHALL be returned on an attempt to
     read this object when GAF aggregation is not enabled.

     This object is irrelevant in BCE-R port subtypes (CPE side):
     in this case a zero length octet string SHALL be returned on
     an attempt to read this object, writing to this object SHALL
     be rejected.

     Discovery MUST be performed when the link is Down.
     Attempts to change this object MUST be rejected (in case of
     SNMP with the error inconsistentValue), if the link is Up or
     Initializing.

     This object maps to the TR-159 attribute
     aLineRemoteDiscoveryCode."
   REFERENCE
     "[TR-159] 5.5.6.7"
   ::= { gBondBceConfEntry 1 }
```

```
   --
   -- Conformance Statements
   --

    gBondGroups      OBJECT IDENTIFIER ::= { gBondConformance 1 }

    gBondCompliances OBJECT IDENTIFIER ::= { gBondConformance 2 }

    -- Object Groups

    gBondBasicGroup OBJECT-GROUP
      OBJECTS {
        gBondOperScheme,
        gBondUpDataRate,
        gBondDownDataRate,
        gBondTargetUpDataRate,
        gBondTargetDownDataRate,
        gBondOperScheme,
        gBondCapacity,
        gBondNumBCEs,
        gBondPortSide,
        gBondFltStatus
      }
      STATUS      current
      DESCRIPTION
        "A collection of objects representing management information
        common to all types of G.Bond ports."
      ::= { gBondGroups 1 }

    gBondDiscoveryGroup OBJECT-GROUP
      OBJECTS {
        gBondPeerOperScheme,
        gBondPeerCapacity,
        gBondDiscoveryCode,
        gBondBceRemoteDiscoveryCode
      }
      STATUS      current
      DESCRIPTION
        "A collection of objects supporting OPTIONAL G.Bond discovery
        in G.Bond ports."
      ::= { gBondGroups 2 }

    gBondMultiSchemeGroup OBJECT-GROUP
      OBJECTS {
        gBondSchemesSupported,
        gBondPeerSchemesSupported,
        gBondAdminScheme,
        gBondPeerAdminScheme
```

```
      }
      STATUS      current
      DESCRIPTION
        "A collection of objects providing OPTIONAL management
        information for G.Bond ports supporting multiple bonding
        schemes."
      ::= { gBondGroups 3 }

   gBondTcaConfGroup OBJECT-GROUP
      OBJECTS {
        gBondThreshLowUpRate,
        gBondThreshLowDownRate,
        gBondLowRateCrossingEnable
      }
      STATUS      current
      DESCRIPTION
        "A collection of objects required for configuration of alarm
        thresholds and notifications in G.Bond ports."
      ::= { gBondGroups 4 }

   gBondTcaNotificationGroup NOTIFICATION-GROUP
      NOTIFICATIONS {
        gBondLowUpRateCrossing,
        gBondLowDownRateCrossing
      }
      STATUS      current
      DESCRIPTION
        "This group supports notifications of significant conditions
        (non-PM threshold crossing alerts) associated with G.Bond ports."
      ::= { gBondGroups 5 }

   gBondPerfCurrGroup OBJECT-GROUP
      OBJECTS {
        gBondPerfES,
        gBondPerfSES,
        gBondPerfUAS,
        gBondPerf15MinValidIntervals,
        gBondPerf15MinInvalidIntervals,
        gBondPerfCurr15MinTimeElapsed,
        gBondPerfCurr15MinES,
        gBondPerfCurr15MinSES,
        gBondPerfCurr15MinUAS,
        gBondPerf1DayValidIntervals,
        gBondPerf1DayInvalidIntervals,
        gBondPerfCurr1DayTimeElapsed,
        gBondPerfCurr1DayES,
        gBondPerfCurr1DaySES,
        gBondPerfCurr1DayUAS
```

```
          }
          STATUS      current
          DESCRIPTION
            "A collection of objects supporting OPTIONAL current Performance
            Monitoring information for G.Bond ports."
          ::= { gBondGroups 6 }

      gBondPerf15MinGroup OBJECT-GROUP
          OBJECTS {
            gBondPerf15MinIntervalMoniTime,
            gBondPerf15MinIntervalES,
            gBondPerf15MinIntervalSES,
            gBondPerf15MinIntervalUAS,
            gBondPerf15MinIntervalValid
          }
          STATUS      current
          DESCRIPTION
            "A collection of objects supporting OPTIONAL historical
            Performance Monitoring information for G.Bond ports, during
            previous 15-minute intervals ."
          ::= { gBondGroups 7 }

      gBondPerf1DayGroup OBJECT-GROUP
          OBJECTS {
            gBondPerf1DayIntervalMoniTime,
            gBondPerf1DayIntervalES,
            gBondPerf1DayIntervalSES,
            gBondPerf1DayIntervalUAS,
            gBondPerf1DayIntervalValid
          }
          STATUS      current
          DESCRIPTION
            "A collection of objects supporting OPTIONAL historical
            Performance Monitoring information for G.Bond ports, during
            previous 1-day intervals ."
          ::= { gBondGroups 8 }

      gBondPerfTcaConfGroup OBJECT-GROUP
          OBJECTS {
            gBondPerfTcaConfProfile,
            gBondPerfTcaEnable,
            gBondPerfThreshold15MinES,
            gBondPerfThreshold15MinSES,
            gBondPerfThreshold15MinUAS,
            gBondPerfThreshold1DayES,
            gBondPerfThreshold1DaySES,
            gBondPerfThreshold1DayUAS,
            gBondPerfTcaConfProfileRowStatus
```

```
      }
      STATUS       current
      DESCRIPTION
        "A collection of objects required for configuration of
        Performance Monitoring Threshold Crossing Alert notifications
        in G.Bond ports."
      ::= { gBondGroups 9 }

    gBondPerfTcaNotificationGroup NOTIFICATION-GROUP
      NOTIFICATIONS {
        gBondPerfTca15MinESCrossing,
        gBondPerfTca15MinSESCrossing,
        gBondPerfTca15MinUASCrossing,
        gBondPerfTca1DayESCrossing,
        gBondPerfTca1DaySESCrossing,
        gBondPerfTca1DayUASCrossing
      }
      STATUS       current
      DESCRIPTION
        "This group supports notifications of performance monitoring
        thresholds crossing alerts associated with G.Bond ports."
      ::= { gBondGroups 10 }

  -- Compliance Statements

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

        MIB Module              Compliance Statement
        ----------              --------------------
        IF-MIB                  ifCompliance3

        Compliance with the following external compliance statements
        is OPTIONAL for implementations supporting bonding with
        flexible cross-connect between the GBS and BCE ports:

        MIB Module              Compliance Statement
        ----------              --------------------
        IF-INVERTED-STACK-MIB   ifInvCompliance
        IF-CAP-STACK-MIB        ifCapStackCompliance"

      MODULE  -- this module
        MANDATORY-GROUPS {
          gBondBasicGroup,
```

```
              gBondTcaConfGroup,
              gBondTcaNotificationGroup
           }

         GROUP       gBondDiscoveryGroup
         DESCRIPTION
           "Support for this group is only required for implementations
           supporting G.Bond Discovery function."

         GROUP       gBondMultiSchemeGroup
         DESCRIPTION
           "Support for this group is only required for implementations
           supporting multiple bonding schemes."

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

         GROUP       gBondPerf15MinGroup
         DESCRIPTION
           "Support for this group is only required for implementations
           supporting historical Performance Monitoring."

         GROUP       gBondPerf1DayGroup
         DESCRIPTION
           "Support for this group is only required for implementations
           supporting historical Performance Monitoring."

         GROUP       gBondPerfTcaConfGroup
         DESCRIPTION
           "Support for this group is only required for implementations
           supporting Performance Monitoring Threshold Crossing Alert
           notifications."

         GROUP       gBondPerfTcaNotificationGroup
         DESCRIPTION
           "Support for this group is only required for implementations
           supporting Performance Monitoring Threshold Crossing Alert
           notifications."

       ::= { gBondCompliances 1 }
   END
```

7. Security Considerations

   There is a number of managed objects defined in the GBOND-MIB module
   that have a MAX-ACCESS clause of read-write or read-create. Most
   objects are writeable only when the link is Down. Writing to these
   objects can have potentially disruptive effects on network operation,
   for example:

   o Changing of gBondAdminScheme MAY lead to a potential locking of
      the link, if the peer device does not support desired bonding
      scheme.

   o Changing of gBondDiscoveryCode, before the discovery operation,
      MAY lead to a wrongful discovery, for example when two CO ports
      are connected to the same multi-channel RT port, while both CO
      ports have the same Discovery register value.

   o Changing GBS configuration parameters (e.g., profile of a GBS via
      gBondAdminProfile) MAY lead to anything from link quality and rate
      degradation to a complete link initialization failure, as ability
      of an G.Bond port to support a particular configuration depends on
      the copper environment.

   o Activation of a specific line/channel MAY cause a severe
      degradation of service for another G.Bond port, whose channel(s)
      MAY be affected by the cross-talk from the newly activated
      channel.

   o Removal of a channel from an operationally 'up' G.Bond port,
      aggregating several channels, MAY cause port's rate degradation

   The user of the GBOND-MIB module must therefore be aware that support
   for SET operations in a non-secure environment without proper
   protection can have a negative effect on network operations.

   The readable objects in the GBOND-MIB module (i.e., those with MAX-
   ACCESS other than not-accessible) may be considered sensitive in some
   environments since, collectively, they provide information about the
   performance of network interfaces and can reveal some aspects of
   their configuration. In particular, since a bonded xDSL port can be
   comprised of multiple Unshielded Twisted Pair (UTP) voice grade
   copper, located in the same bundle with other pairs belonging to
   another operator/customer, it is theoretically possible to evasdrop
   to a G.Bond transmission, simply by "listening" to a cross-talk from
   the bonded pairs, especially if the parameters of the G.Bond link in
   question are known.

   In such environments it is important to control also GET and NOTIFY

access to these objects and possibly even to encrypt their values
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),
even then, 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.

It is RECOMMENDED that implementers consider the security features as
provided by the SNMPv3 framework (see [RFC3410], section 8),
including full support for the SNMPv3 cryptographic mechanisms (for
authentication and privacy).

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

Three new values of IANAifType: g9981, g9982 and g9982 SHALL be
defined by the IANA [1] in the IANAifType-MIB module
[IANAifType-MIB], before this document is published as an RFC.

Additionally, an object identifier for gBondMIB MODULE-IDENTITY SHALL
be allocated by IANA in the MIB-2 transmission sub-tree, before this
document is published.

9. Acknowledgments

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

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