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Managed Objects for ATM over Packet Switched Networks (PSNs)

Abstract

This memo defines a portion of the Management Information Base (MIB) for use with network management protocols in the Internet community. In particular, it describes managed objects for modeling ATM Pseudowire (PW) carrying ATM cells over Packet Switched Networks (PSNs).

Status of This Memo

This document specifies an Internet standards track protocol for the Internet community, and requests discussion and suggestions for improvements. Please refer to the current edition of the "Internet Official Protocol Standards" (STD 1) for the standardization state and status of this protocol. Distribution of this memo is unlimited.

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1. Introduction

This document describes a model for managing "emulated" ATM services over a Packet Switched Network (PSN).

The document follows the requirements for Pseudowire Emulation Edge-to-Edge [PWREQ]; it is closely related to [ATMENCAP] and [ATMTRANS], which describe the encapsulation of ATM signals and provide the Emulation Service over a Packet Switched Network.

The ATM management model consists of several MIB modules, following the layering model described in the PWE3 Architecture [PWARCH] document. The ATM MIB module described in this document works closely with the MIB modules described in [AToMTC], [AToM], [IFMIB], [PWMIB], and the textual conventions defined in [PWTC]. The conceptual layering and relationship among all of those is described in Figure 1 and in the "Relation to Other PW-MIB Modules" section listed below. An ATM connection will be a pseudowire (PW) connection. It will not be treated as an interface and will therefore not be represented in the ifTable.

Figure 1: Conceptual Layering

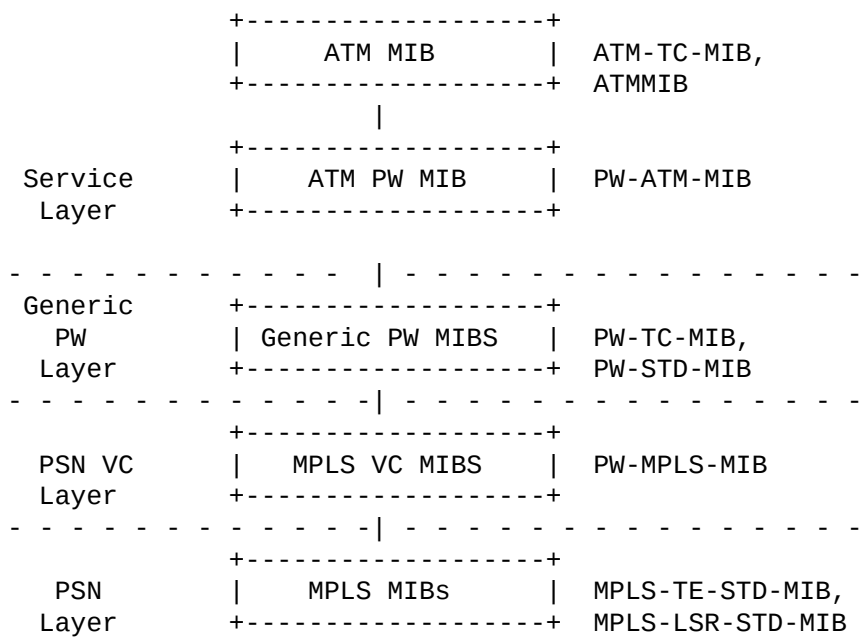

Figure 1

2. Conventions

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 [BCP14].

3. Terminology

This document follows the terminology used in PW Architecture [PWARCH].

PSN-bound References the traffic direction where an ATM Cell is received, adapted to the packet, assigned a PW label, and sent into the PSN. Within the MIB objects, it is called outbound.

CE-bound	The direction where packets are received from the PSN, cells are reconstructed from the packet payloads, and are sent into the ATM network as cells. Within the MIB objects, it is called inbound.
Adaptation	Refers to the method of adapting a "foreign" communications protocol such that it can be carried by a packet switched net (the PSN). For example, in an ATM service, the foreign protocol is ATM. The PSN may be MPLS.
PSN	Packet Switched Network.
PSN Tunnel	A general term indicating a virtual connection between the two PW edge devices. In practice, this connection is not limited to path-oriented types of PSNs such as MPLS. An example of a non-path-oriented PSN is an IP PSN.

4. The Internet-Standard Management Framework

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

Managed objects are accessed via a virtual information store, termed the Management Information Base or MIB. MIB objects are generally accessed through the Simple Network Management Protocol (SNMP).

Objects in the MIB are defined using the mechanisms defined in the Structure of Management Information (SMI). This memo specifies a MIB module that is compliant to the SMIv2, which is described in STD 58, RFC 2578 [RFC2578], STD 58, RFC 2579 [RFC2579] and STD 58, RFC 2580 [RFC2580].

5. Overview

This MIB module is designed to satisfy the following requirements and constraints:

- Fit within the architecture defined by [PWARCH] and [PWMIB].
- Fit within the model for Virtual Path/Virtual Circuit (VP/VC) definitions and management concept as defined in the [AToM] MIB.
- Support manually configured ATM PWs.

- Support automatically configured ATM PWs.
- Enable the use of any PSN type.
- Support point-to-point ATM PW connections. Point-to-multipoint and multipoint-to-point connections are for future study.
- Allow configuration of all the parameters needed to establish a PW to carry ATM cells.
- Report ATM performance metrics for the ATM PW. This includes cells transmit, Cells dropped, Cells received, and unknownCells. In addition, it reports performance metrics at packet level.
- Support ATM Operations, Administration, and Management (OAM) cells.
- Do not consider Integrated Local Management Interface (ILMI) support.

6. Relation to Other PW-MIB Modules

The MIB structure for defining a PW service is composed of three layers of MIB modules functioning together. This general model is defined in the PWE3 Architecture [PWARCH]. The layering model is intended to sufficiently isolate PW services from the underlying PSN layer that carries the emulated service. This is done at the same time as providing a standard means for connecting any supported services to any supported PSNs.

The first layer, known as the service layer, contains service-specific modules such as the one defined in this document. These modules define service-specific management objects that interface or collaborate with existing MIB modules for the native version of the service. The service-specific module "glues" the standard module to the PWE MIB framework.

The next layer of the PWE MIB framework is comprised of the PW-MIB module [PWMIB]. This module is used to configure general parameters of PW connections that are common to all types of emulated services and PSNs. This layer is connected to the service-specific layer above, and the PSN layer below.

The PSN layer provides PSN-specific modules for each type of PSN. These modules associate the PW with one or more "tunnels" that carry the service over the PSN. These modules are defined in other documents. This module is used to "glue" the PW service to the

underlying PSN-specific MIB modules. In the case of MPLS, for example, the PW-MPLS MIB [PWMPLSMIB] is used to connect the PW service to either the MPLS-LDP [LDPMIB] or MPLS-TE [TEMIB] MIBs.

[PWTC] defines some of the object types used in these modules.

7. ATM-PW MIB Usage

This section provides an example of using the MIB objects described in section 9 to set up an ATM PW. While this example is not meant to illustrate every permutation of the MIB, it is intended as an aid in the understanding of some key concepts. It is meant to be read after going through the MIB itself. See [PWMIB] for an example of setting up a PSN Tunnel.

The following example illustrates how a user will set up an ATM Adaptation Layer 5 (AAL5) ATM PW on a switch/router with cells entering the switch/router through ATM Interface with IfIndex 1000 [IFMIB], Virtual Path Identifier (VPI) 1 and Virtual Circuit Identifier (VCI) 100 (from an ATM network to a PSN -- outbound direction) and on the way back, it goes out of the switch/router through ATM Interface 1000 with VPI 1 and VCI 100 (PSN to ATM network -- inbound direction).

First create an entry in the PW MIB with pwType atmAal5SduVcc(2), then create entries in the pwAtmCfg table, inbound and outbound tables.

```
In PW ATM MIB
In pwAtmCfgTable:

pwAtmCfgMaxCellConcatenation 29
pwAtmCfgTimeoutMode enabled(3)
pwAtmClpQosMapping false(0) --CLP will not be mapped to QoS
pwAtmOamCellSupported true(1)  --OAM cells will be supported

In pwAtmOutboundTable:
{
 pwAtmOutboundAtmIf             1000    --Outbound AtmIf
 pwAtmOutboundVpi               1       --Outbound VPI
 pwAtmOutboundVci               100     --Outbound VCI
 pwAtmOutboundTrafficParamDescr 0.0     --Best Effort
 pwAtmOutboundRowStatus         createAndGo
}

In pwAtmInboundTable
{
 pwAtmInboundAtmIf             1000 --Inbound AtmIf
 pwAtmInboundVpi               1    --Inbound VPI
 pwAtmInboundVci               100  --Inbound VCI
 pwAtmInboundTrafficParamDescr 0.0  --Best Effort
 pwAtmInboundRowStatus         createAndGo
}
```

8. Structure of the MIB Module

This MIB consists of 4 types of tables;

It is important to note that the TrafficParamDescr Table is not defined as part of this MIB, although an object pointing to such a table entry exists in all configuration tables of this MIB module. Users can refer to any ATM TrafficDescr (TD) Table if there is a need to overwrite the TD assigned to the ATM endpoint in the ATM service MIB [AToM].

- PW ATM Cfg Table: A table for generic parameters for ATM PW configuration that is applicable for each ATM PW.

- PW ATM Outbound Table: There are two tables to configure an outbound ATM PW depending on the type of service. One table for 1:1 service, and the other for N:1 service and transparent cell mode [ATMTRANS].

- PW ATM Inbound Table: There are two tables to configure an inbound ATM PW depending on the type of service. One table for 1:1 service, and the other for N:1 service and transparent cell mode.

- PW ATM Perf Table: There are three tables; each contains the relevant time-dependent statistics for an ATM PW Entry. There is a current table, a 15-minute interval table, and a one-day interval table. The tables are aligned with statistic models of other PW services.

9. Object Definition

```
PW-ATM-MIB DEFINITIONS ::= BEGIN

    IMPORTS
    MODULE-IDENTITY, OBJECT-TYPE,
    Counter32, Unsigned32, mib-2
          FROM SNMPv2-SMI

    MODULE-COMPLIANCE, OBJECT-GROUP
          FROM SNMPv2-CONF

    TruthValue, RowStatus, RowPointer
          FROM SNMPv2-TC

    PerfCurrentCount, PerfIntervalCount
          FROM PerfHist-TC-MIB

    InterfaceIndex
          FROM IF-MIB

    pwIndex
          FROM PW-STD-MIB

    AtmVpIdentifier, AtmVcIdentifier
          FROM ATM-TC-MIB;

      pwAtmMIB MODULE-IDENTITY
      LAST-UPDATED "200906160000Z"  -- 16 June 2009
      ORGANIZATION "Pseudowire Emulation Edge-to-Edge (PWE3)
                    Working Group"
      CONTACT-INFO
          "Thomas D. Nadeau
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                   BT Centre
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                    Tel Aviv, Israel
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            Discussion and general questions should be posed to
            the PWE3 Working Group (pwe3@ietf.org)."

        DESCRIPTION
            "This MIB contains managed object definitions for
             pseudowire emulation of ATM over Packet Switched
             Networks (PSNs).

             This MIB supplements the PW-STD-MIB module.
             The PW-STD-MIB contains structures and MIB associations
             generic to pseudowire (PW) emulation.  PW-specific
             MIBs (such as this) contain config and stats for specific
             PW types.

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            OR OTHERWISE) ARISING IN ANY WAY OUT OF THE USE OF THIS
            SOFTWARE, EVEN IF ADVISED OF THE POSSIBILITY OF SUCH DAMAGE.

            This version of this MIB module is part of RFC 5605;
            see the RFC itself for full legal notices.
            "

      -- Revision history.

      REVISION "200906160000Z"  -- 16 June 2009
      DESCRIPTION "Initial version published as RFC 5605."

         ::= { mib-2 183 }

    -- Top-level components of this MIB

    pwAtmNotifications OBJECT IDENTIFIER ::= { pwAtmMIB 0 }
    pwAtmObjects       OBJECT IDENTIFIER ::= { pwAtmMIB 1 }
    pwAtmConformance   OBJECT IDENTIFIER ::= { pwAtmMIB 2 }

-- ATM PW PSN Bound(Outbound) Table for 1 to 1 connection

pwAtmOutboundTable OBJECT-TYPE
    SYNTAX    SEQUENCE OF PwAtmOutboundEntry
    MAX-ACCESS        not-accessible
    STATUS            current
    DESCRIPTION
        "This table specifies the information for an ATM PW to
        be carried over the PSN in the outbound direction.  An
        entry is created in this table for every entry in
        the pwTable with a pwType equal to one of the following:
        atmAal5SduVcc(2), atmCell1to1Vcc(12), atmCell1to1Vpc(13)
        or atmAal5PduVcc(14), or atmTransparent(3)."
    ::= { pwAtmObjects 1 }

pwAtmOutboundEntry OBJECT-TYPE
    SYNTAX        PwAtmOutboundEntry
    MAX-ACCESS    not-accessible
    STATUS        current
    DESCRIPTION
        "A row in this table represents an ATM PW that needs to be
         adapted and carried over the PSN.  This table is indexed by
```

```
          pwIndex from pwTable.  Unless otherwise specified, all
          writeable objects in this table MUST NOT be changed after
          row activation in the generic pwTable, and values must
          persist after reboot."
      REFERENCE
        "See [PWMIB]."

      INDEX { pwIndex }
      ::= { pwAtmOutboundTable 1 }

PwAtmOutboundEntry ::= SEQUENCE {
      pwAtmOutboundAtmIf                InterfaceIndex,
      pwAtmOutboundVpi                  AtmVpIdentifier,
      pwAtmOutboundVci                  AtmVcIdentifier,
      pwAtmOutboundTrafficParamDescr    RowPointer,
      pwAtmOutboundRowStatus            RowStatus
      }

pwAtmOutboundAtmIf OBJECT-TYPE
    SYNTAX        InterfaceIndex
    MAX-ACCESS    read-create
    STATUS        current
    DESCRIPTION
        "The ATM Interface that receives cells from the ATM
        network."
    ::= { pwAtmOutboundEntry 1 }

pwAtmOutboundVpi OBJECT-TYPE
    SYNTAX        AtmVpIdentifier
    MAX-ACCESS    read-create
    STATUS        current
    DESCRIPTION
        "VPI value of this ATM PW.  The value may indicate the
        translated value when egress generates new VPI."
    ::= { pwAtmOutboundEntry 2 }

pwAtmOutboundVci OBJECT-TYPE
    SYNTAX        AtmVcIdentifier
    MAX-ACCESS    read-create
    STATUS        current
    DESCRIPTION
        "VCI value of this ATM PW.  The value may indicate the
        translated value when egress generates new VCI."
    ::= { pwAtmOutboundEntry 3 }

pwAtmOutboundTrafficParamDescr OBJECT-TYPE
    SYNTAX        RowPointer
    MAX-ACCESS    read-create
```

```
    STATUS        current
    DESCRIPTION
        "This object represents a pointer to an ATM
         traffic-parameter-specific row in either a private or
         standard table that will be employed while receiving
         cells from the ATM network.  This row should contain a
         set of self-consistent ATM traffic parameters including
         the ATM traffic service category.
         A value of 0.0 indicates Best Effort."
     ::= { pwAtmOutboundEntry 4 }

pwAtmOutboundRowStatus OBJECT-TYPE
    SYNTAX        RowStatus
    MAX-ACCESS    read-create
    STATUS        current
    DESCRIPTION
        "This object is used to create, modify, or delete a row in
         this table.  Unless otherwise specified, all writeable
         objects in this table MUST NOT be changed after row
         activation as explained in the pwAtmOutboundEntry. "
    ::= { pwAtmOutboundEntry 5 }

-- End of ATM PW Outbound Table

-- ATM PW CE Bound(Inbound) Table for 1 to 1 mode

pwAtmInboundTable OBJECT-TYPE
    SYNTAX    SEQUENCE OF PwAtmInboundEntry
    MAX-ACCESS        not-accessible
    STATUS            current
    DESCRIPTION
        "This table specifies the information for an ATM PW in the
         inbound direction."
    ::= { pwAtmObjects 3 }

pwAtmInboundEntry OBJECT-TYPE
    SYNTAX    PwAtmInboundEntry
    MAX-ACCESS    not-accessible
    STATUS        current
    DESCRIPTION
        "A row in this table represents an ATM PW that needs to be
         sent into the ATM network after reconstructing cells from
         packets received from a PSN.  This table is indexed by
         pwIndex from pwTable.  An entry is created in this table
         for every entry in the pwTable with a
         pwType equal to one of the following:
         atmAal5SduVcc(2), atmCell1to1Vcc(12), atmCell1to1Vpc(13),
         atmAal5PduVcc(14), or atmTransparent(3).  Unless otherwise
```

```
         specified, all writeable objects in this table MUST NOT
         be changed after row activation in the generic pwTable,
         and values must persist after reboot."
    REFERENCE
      "See [PWMIB]."

    INDEX { pwIndex }
    ::= { pwAtmInboundTable 1 }

PwAtmInboundEntry ::= SEQUENCE {
      pwAtmInboundAtmIf                InterfaceIndex,
      pwAtmInboundVpi                  AtmVpIdentifier,
      pwAtmInboundVci                  AtmVcIdentifier,
      pwAtmInboundTrafficParamDescr    RowPointer,
      pwAtmInboundRowStatus            RowStatus
          }

pwAtmInboundAtmIf OBJECT-TYPE
    SYNTAX        InterfaceIndex
    MAX-ACCESS    read-create
    STATUS        current
    DESCRIPTION
        "The ATM Interface that sends cells into the ATM network
        after reconstructing cells from packets received from
        a PSN."
    ::= { pwAtmInboundEntry 1 }

pwAtmInboundVpi OBJECT-TYPE
    SYNTAX        AtmVpIdentifier
    MAX-ACCESS    read-create
    STATUS        current
    DESCRIPTION
        "VPI value of this ATM PW.
         If the pwType is atmTransparent, then the value will
         be set to zero."
        ::= { pwAtmInboundEntry 2 }

pwAtmInboundVci OBJECT-TYPE
    SYNTAX        AtmVcIdentifier
    MAX-ACCESS    read-create
    STATUS        current
    DESCRIPTION
        "VCI value of this ATM PW.
         If the pwType is atmTransparent, atmCell1to1Vpc, or
         atmCellNto1Vpc, then the value will be set to zero."
        ::= { pwAtmInboundEntry 3 }

pwAtmInboundTrafficParamDescr OBJECT-TYPE
```

```
    SYNTAX        RowPointer
    MAX-ACCESS    read-create
    STATUS        current
    DESCRIPTION
        "This object represents a pointer to an ATM traffic-parameter-
         specific row in either a private or standard table that will
         be employed while transmitting into the ATM network.  This
         table contains a set of self-consistent ATM traffic parameters
         including the ATM traffic service category.  A value of 0.0
         indicates Best Effort."

        ::= { pwAtmInboundEntry 4 }

pwAtmInboundRowStatus OBJECT-TYPE
    SYNTAX        RowStatus
    MAX-ACCESS    read-create
    STATUS        current
        DESCRIPTION
        "This object is used to create, modify, or delete a row in
         this table.  Unless otherwise specified, all writeable
         objects in this table MUST NOT be changed after row
         activation as explained in the pwAtmInboundEntry. "
        ::= { pwAtmInboundEntry 5 }

-- End of ATM PW Inbound Table

--Generic ATM PW table for all types of ATM PW connection.

pwAtmCfgTable OBJECT-TYPE
    SYNTAX    SEQUENCE OF PwAtmCfgEntry
    MAX-ACCESS        not-accessible
    STATUS            current
    DESCRIPTION
        "This table specifies generic information for an ATM PW
         to be carried over PSN in any mode."
    ::= { pwAtmObjects 5 }

    pwAtmCfgEntry OBJECT-TYPE
    SYNTAX        PwAtmCfgEntry
    MAX-ACCESS    not-accessible
    STATUS        current
    DESCRIPTION
         "This table contains a set of parameters for
         the ATM PW that needs to be adapted and carried
         over the PSN.  This table is indexed by pwIndex from
         pwTable.  An entry is created for every new ATM
         type associated pwIndex in the pwTable.  Unless
         otherwise specified, all read-write objects in
```

```
         this table MAY be changed when the PW is defined
         as not active, and all RW objects values must
         persist after reboot."
    REFERENCE
      "See [PWMIB]."

    INDEX { pwIndex }
    ::= { pwAtmCfgTable 1 }

PwAtmCfgEntry ::= SEQUENCE {
        pwAtmCfgMaxCellConcatenation       Unsigned32,
        pwAtmCfgFarEndMaxCellConcatenation Unsigned32,
        pwAtmCfgTimeoutMode                INTEGER,
        pwAtmClpQosMapping                 TruthValue
                }

pwAtmCfgMaxCellConcatenation OBJECT-TYPE
     SYNTAX        Unsigned32 (1..29)
     MAX-ACCESS    read-write
     STATUS        current
     DESCRIPTION
         "The maximum number of ATM cells that can be
          concatenated into one PW packet towards the PSN.
          In a non-LDP or other signaling protocol environment,
          this object MAY be changed at anytime, but traffic
          might be interrupted; otherwise, it may be changed
          when PW is not active."
    ::= { pwAtmCfgEntry 1 }

pwAtmCfgFarEndMaxCellConcatenation OBJECT-TYPE
     SYNTAX        Unsigned32 (1..29)
     MAX-ACCESS    read-write
     STATUS        current
     DESCRIPTION
         "The maximum number of ATM cells that can be
          concatenated into one PW packet towards PSN as reported by
          the far end.  If there is no LDP in use, the object will
          either return a value of 0 or allow setting it for calculating
          protocol overhead."
    ::= { pwAtmCfgEntry 2 }

pwAtmCfgTimeoutMode OBJECT-TYPE
     SYNTAX        INTEGER
                       {
                        notApplicable (1),
                        disabled      (2),
                        enabled       (3)
                       }
```

```
     MAX-ACCESS    read-write
     STATUS        current
     DESCRIPTION
         "This object determines whether or not a packet can be
          transmitted to the PSN based on timeout expiration
          for collecting cells.  The actual handling of the
          timeout is implementation-specific; as such,
          this object may be changed at any time under proper
          consideration of the traffic interruption effect."
    ::= { pwAtmCfgEntry 3 }

pwAtmClpQosMapping OBJECT-TYPE
    SYNTAX        TruthValue
    MAX-ACCESS    read-write
    STATUS        current
    DESCRIPTION
        "This object indicates whether the Cell Loss Priority
         (CLP) bits should be considered when setting the
         value in the Quality-of-Service fields of the
         encapsulating protocol (e.g., EXP fields of the
         MPLS Label Stack).  Selecting True allows the drop
         precedence to be preserved across the PSN.  In
         transparent cell transport, the value of this object
         MUST be false(2); in other cases, it can be changed
         at any time."
    REFERENCE
      "See section 12 of [ATMENCAP]."
    ::= { pwAtmCfgEntry 4 }

-- Device capable of implementing N:1, 1:1, and transparent cell
-- mode assumes to support the N:1 table for all
-- modes with respective applicable setting.
-- In such implementation, user can create an entry for either
-- 1:1 or transparent cell transport modes only
-- in pwAtmInboundNto1Table. The side effect of such
-- will be an automatic create of the respective line in the
-- pwAtmOutboundNto1Table.

-- ATM PW Outbound Table for N to 1 connection

pwAtmOutboundNto1Table OBJECT-TYPE
    SYNTAX    SEQUENCE OF PwAtmOutboundNto1Entry
    MAX-ACCESS        not-accessible
    STATUS            current
    DESCRIPTION
        "This table specifies the information for an ATM PW to
        be carried over the PSN in the outbound direction.  Up to
        N entries can be created in this table for every
```

```
        entry in the pwTable with a pwType equal to:
        atmCellNto1Vcc(9) or atmCellNto1Vpc(10).
        An entry can be created only when the VP/VC are known.
        A single entry will be created in this table for every
        entry in the pwTable with a pwType equal to
        one of the following: atmCell1to1Vcc(12),
        atmCell1to1Vpc(13), atmAal5PduVcc(14),
        atmAal5SduVcc(2), or atmTransparent(3).
        "
    ::= { pwAtmObjects 6 }

pwAtmOutboundNto1Entry OBJECT-TYPE
    SYNTAX        PwAtmOutboundNto1Entry
    MAX-ACCESS    not-accessible
    STATUS        current
    DESCRIPTION
        "A row in this table represents an ATM PW that needs to be
         adapted and carried over PSN.  This table is indexed by
         pwIndex from pwTable and the ATM interface with VPL/VCLs.
         In atmTransparent(3), Vpi and VCi will be 0xFFFF
         during set operation.
         Unless otherwise specified, all read-create objects in this
         table MUST NOT be changed after row activation
         and SHOULD remain unchanged after reboot."
    INDEX { pwIndex, pwAtmOutboundNto1AtmIf ,
                        pwAtmOutboundNto1Vpi,
                        pwAtmOutboundNto1Vci  }
    ::= { pwAtmOutboundNto1Table 1 }

PwAtmOutboundNto1Entry ::= SEQUENCE {
      pwAtmOutboundNto1AtmIf                    InterfaceIndex,
      pwAtmOutboundNto1Vpi                      AtmVpIdentifier,
      pwAtmOutboundNto1Vci                      AtmVcIdentifier,
      pwAtmOutboundNto1RowStatus                RowStatus,
      pwAtmOutboundNto1TrafficParamDescr        RowPointer,
      pwAtmOutboundNto1MappedVpi                AtmVpIdentifier,
      pwAtmOutboundNto1MappedVci                AtmVcIdentifier
     }

pwAtmOutboundNto1AtmIf OBJECT-TYPE
    SYNTAX        InterfaceIndex
    MAX-ACCESS    not-accessible
    STATUS        current
    DESCRIPTION
        "The ATM Interface that receives cells from the ATM network."
    ::= { pwAtmOutboundNto1Entry 1 }

pwAtmOutboundNto1Vpi OBJECT-TYPE
```

```
    SYNTAX        AtmVpIdentifier
    MAX-ACCESS    not-accessible
    STATUS        current
    DESCRIPTION
        "VPI value of this ATM PW.  In atmTransparent(3),
         Vpi will be the equivalent of 0xFFFF."
    ::= { pwAtmOutboundNto1Entry 2 }

pwAtmOutboundNto1Vci OBJECT-TYPE
    SYNTAX        AtmVcIdentifier
    MAX-ACCESS    not-accessible
    STATUS        current
    DESCRIPTION
        "VCI value of this ATM PW.  In atmTransparent(3), or
         the VP case, the value will be the equivalent of
         0xFFFF."
    ::= { pwAtmOutboundNto1Entry 3 }

pwAtmOutboundNto1RowStatus OBJECT-TYPE
    SYNTAX        RowStatus
    MAX-ACCESS    read-create
    STATUS        current
    DESCRIPTION
        "This object is used to create, modify or delete a row in
         this table."
    ::= { pwAtmOutboundNto1Entry 4 }

pwAtmOutboundNto1TrafficParamDescr OBJECT-TYPE
    SYNTAX        RowPointer
    MAX-ACCESS    read-create
    STATUS        current
    DESCRIPTION
        "This object represents a pointer to an ATM traffic-parameter-
         specific row in either private or standard table that will
         be employed while receiving cells from the ATM network.
         This table should contain a set
         of self-consistent ATM traffic parameters including the ATM
         traffic service category.  A value of 0.0 indicates Best
         Effort."

    ::= { pwAtmOutboundNto1Entry 5 }

pwAtmOutboundNto1MappedVpi         OBJECT-TYPE
    SYNTAX        AtmVpIdentifier
    MAX-ACCESS    read-create
    STATUS        current
    DESCRIPTION
        "The egress-generated VPI value of this ATM PW.  The
```

```
        entry is valid for PW type of atmCellNto1Vcc(9),
        atmCellNto1Vpc(10), atmCell1to1Vcc(12), or
        atmCell1to1Vpc(13).  In other types, the value will be the
        equivalent of 0xFFFF.  Value MAY be changed when the
        PW is defined as not active. "
    ::= { pwAtmOutboundNto1Entry 6 }

pwAtmOutboundNto1MappedVci      OBJECT-TYPE
    SYNTAX        AtmVcIdentifier
    MAX-ACCESS    read-create
    STATUS        current
    DESCRIPTION
        "The egress-generated VCI value of this ATM PW.  The
        entry is valid for PW type of atmCellNto1Vcc(9),
        atmCellNto1Vpc(10), atmCell1to1Vcc(12), or
        atmCell1to1Vpc(13.  In the VP case or other types, the
        value will be the equivalent of 0xFFFF.
        Value MAY be changed when the PW is defined
        as not active."
    ::= { pwAtmOutboundNto1Entry 7 }

-- ATM PW Inbound Table for N to 1 connection

pwAtmInboundNto1Table OBJECT-TYPE
    SYNTAX    SEQUENCE OF PwAtmInboundNto1Entry
    MAX-ACCESS        not-accessible
    STATUS            current
    DESCRIPTION
        "This table specifies the information for an ATM PW to
        be carried over PSN in the Inbound direction.  Up to
        N entries can be created in this table for every
        entry in the pwTable with a pwType equal to:
        atmCellNto1Vcc(9) or atmCellNto1Vpc(10).
        An entry can be created only when the VP/VC are known.
        A single entry will be created in this table for every
        entry in the pwTable with a pwType equal to
        one of the following: atmCell1to1Vcc(12),
        atmCell1to1Vpc(13), atmAal5PduVcc(14),
        atmAal5SduVcc(2), or atmTransparent(3)."
    ::= { pwAtmObjects 7 }

pwAtmInboundNto1Entry OBJECT-TYPE
    SYNTAX        PwAtmInboundNto1Entry
    MAX-ACCESS    not-accessible
    STATUS        current
    DESCRIPTION
        "A row in this table represents an ATM PW that needs to be
         adapted and carried over PSN.  This table is indexed by
```

```
         pwIndex from pwTable and the ATM interface with VPL/VCLs.
         In atmTransparent(3), Vpi and VCi will be 0xFFFF
         during set operation.
         Unless otherwise specified, all Read-Create objects in this
         table MUST NOT be changed after row activation
         and SHOULD remain unchanged after reboot."
    INDEX { pwIndex, pwAtmInboundNto1AtmIf ,
                        pwAtmInboundNto1Vpi,
                        pwAtmInboundNto1Vci
                        }
    ::= { pwAtmInboundNto1Table 1 }

PwAtmInboundNto1Entry ::= SEQUENCE {
      pwAtmInboundNto1AtmIf               InterfaceIndex,
      pwAtmInboundNto1Vpi                 AtmVpIdentifier,
      pwAtmInboundNto1Vci                 AtmVcIdentifier,
      pwAtmInboundNto1RowStatus           RowStatus,
      pwAtmInboundNto1TrafficParamDescr   RowPointer,
      pwAtmInboundNto1MappedVpi           AtmVpIdentifier,
      pwAtmInboundNto1MappedVci           AtmVcIdentifier
    }

pwAtmInboundNto1AtmIf OBJECT-TYPE
    SYNTAX        InterfaceIndex
    MAX-ACCESS    not-accessible
    STATUS        current
    DESCRIPTION
        "The ATM Interface that receives cells from the ATM network."
    ::= { pwAtmInboundNto1Entry 1 }

pwAtmInboundNto1Vpi OBJECT-TYPE
    SYNTAX        AtmVpIdentifier
    MAX-ACCESS    not-accessible
    STATUS        current
    DESCRIPTION
        "VPI value of this ATM PW.  In atmTransparent(3),
         Vpi will be the equivalent of 0xFFFF."
    ::= { pwAtmInboundNto1Entry 2 }

pwAtmInboundNto1Vci OBJECT-TYPE
    SYNTAX        AtmVcIdentifier
    MAX-ACCESS    not-accessible
    STATUS        current
    DESCRIPTION
        "VCI value of this ATM PW.  In atmTransparent(3), or
         the VP case, the value will be the equivalent of
         0xFFFF."
    ::= { pwAtmInboundNto1Entry 3 }
```

```
pwAtmInboundNto1RowStatus OBJECT-TYPE
    SYNTAX        RowStatus
    MAX-ACCESS    read-create
    STATUS        current
    DESCRIPTION
        "This object is used to create, modify, or delete a row in
        this table."
    ::= { pwAtmInboundNto1Entry 4 }

pwAtmInboundNto1TrafficParamDescr OBJECT-TYPE
    SYNTAX        RowPointer
    MAX-ACCESS    read-create
    STATUS        current
    DESCRIPTION
        "This object represents a pointer to an ATM traffic-parameter-
         specific row in either a private or standard table that will
         be employed while receiving cells from the ATM network.
         This table should contain a set
         of self-consistent ATM traffic parameters including the ATM
         traffic service category.  A value of 0.0 indicates Best
         Effort."

    ::= { pwAtmInboundNto1Entry 5 }

pwAtmInboundNto1MappedVpi    OBJECT-TYPE
    SYNTAX        AtmVpIdentifier
    MAX-ACCESS    read-create
    STATUS        current
    DESCRIPTION
        "The generated VPI value of this ATM PW.  The
        entry is valid for PW type of atmCellNto1Vcc(9),
        atmCellNto1Vpc(10), atmCell1to1Vcc(12), or
        atmCell1to1Vpc(13).  In other types, the value will be the
        equivalent of 0xFFFF.  Value MAY be changed when the
        PW is defined as not active."
    ::= { pwAtmInboundNto1Entry 6 }

pwAtmInboundNto1MappedVci     OBJECT-TYPE
    SYNTAX        AtmVcIdentifier
    MAX-ACCESS    read-create
    STATUS        current
    DESCRIPTION
        "The generated VCI value of this ATM PW.  The
        entry is valid for PW type of atmCellNto1Vcc(9),
        atmCellNto1Vpc(10), atmCell1to1Vcc(12), or
        atmCell1to1Vpc(13.  In the VP case or other types, the
        value will be the equivalent of 0xFFFF.
        Value MAY be changed when the
```

```
        PW is defined as not active."
    ::= { pwAtmInboundNto1Entry 7 }

-- ATM PW Outbound Perf Table

-- The following supplement the counters presented in the
-- PW generic MIB

-- ATM PW Performance Current Table.

pwAtmPerfCurrentTable OBJECT-TYPE
  SYNTAX        SEQUENCE OF PwAtmPerfCurrentEntry
  MAX-ACCESS    not-accessible
  STATUS        current
  DESCRIPTION
      "The current 15-minute interval counts are in
       this table.
       This table provides performance information per ATM PW."
  ::= { pwAtmObjects 8 }

pwAtmPerfCurrentEntry OBJECT-TYPE
  SYNTAX        PwAtmPerfCurrentEntry
  MAX-ACCESS    not-accessible
  STATUS        current
  DESCRIPTION
      "An entry in this table is created by the agent for every
       pwAtmCfgTable entry.  After 15 minutes, the contents of this
       table entry are copied to a new entry in the
       pwAtmPerfInterval table and the counts in this entry
       are reset to zero."
  INDEX  { pwIndex }
  ::= { pwAtmPerfCurrentTable 1 }

PwAtmPerfCurrentEntry ::= SEQUENCE {
     pwAtmPerfCurrentMissingPkts    PerfCurrentCount,
     pwAtmPerfCurrentPktsReOrder    PerfCurrentCount,
     pwAtmPerfCurrentPktsMisOrder   PerfCurrentCount,
     pwAtmPerfCurrentPktsTimeout    PerfCurrentCount,
     pwAtmPerfCurrentCellsXmit      PerfCurrentCount,
     pwAtmPerfCurrentCellsDropped   PerfCurrentCount,
     pwAtmPerfCurrentCellsReceived  PerfCurrentCount,
     pwAtmPerfCurrentUnknownCells   PerfCurrentCount
  }

pwAtmPerfCurrentMissingPkts OBJECT-TYPE
  SYNTAX        PerfCurrentCount
  MAX-ACCESS    read-only
  STATUS        current
```

```
  DESCRIPTION
      "Number of missing packets (as detected via control word
       sequence number gaps)."
  ::= { pwAtmPerfCurrentEntry 1 }

pwAtmPerfCurrentPktsReOrder OBJECT-TYPE
  SYNTAX        PerfCurrentCount
  MAX-ACCESS    read-only
  STATUS        current
  DESCRIPTION
      "Number of packets detected out of sequence (via control
       word sequence number), but successfully re-ordered.
       Note: some implementations may not support this feature."
  ::= { pwAtmPerfCurrentEntry 2 }

pwAtmPerfCurrentPktsMisOrder OBJECT-TYPE
  SYNTAX        PerfCurrentCount
  MAX-ACCESS    read-only
  STATUS        current
  DESCRIPTION
      "Number of packets detected out of order (via control word
       sequence numbers)."
   ::= { pwAtmPerfCurrentEntry 3 }

pwAtmPerfCurrentPktsTimeout OBJECT-TYPE
  SYNTAX        PerfCurrentCount
  MAX-ACCESS    read-only
  STATUS        current
  DESCRIPTION
      "Number of packets transmitted due to timeout expiration
       while attempting to collect cells."
   ::= { pwAtmPerfCurrentEntry 4 }

pwAtmPerfCurrentCellsXmit OBJECT-TYPE
  SYNTAX        PerfCurrentCount
  MAX-ACCESS    read-only
  STATUS        current
  DESCRIPTION
      "Number of transmitted cells."
   ::= { pwAtmPerfCurrentEntry 5 }

pwAtmPerfCurrentCellsDropped OBJECT-TYPE
  SYNTAX        PerfCurrentCount
  MAX-ACCESS    read-only
  STATUS        current
  DESCRIPTION
      "Number of dropped cells."
   ::= { pwAtmPerfCurrentEntry 6 }
```

```
pwAtmPerfCurrentCellsReceived OBJECT-TYPE
  SYNTAX        PerfCurrentCount
  MAX-ACCESS    read-only
  STATUS        current
  DESCRIPTION
      "Number of received cells."
   ::= { pwAtmPerfCurrentEntry 7 }

pwAtmPerfCurrentUnknownCells OBJECT-TYPE
  SYNTAX        PerfCurrentCount
  MAX-ACCESS    read-only
  STATUS        current
  DESCRIPTION
      "Number of cells received from the PSN with unknown VPI or
      VCI values.  This object is relevant only in N:1 mode."
   ::= { pwAtmPerfCurrentEntry 8 }

-- End ATM PW Performance Current Interval Table

-- ATM PW Performance Interval Table.

pwAtmPerfIntervalTable OBJECT-TYPE
  SYNTAX        SEQUENCE OF PwAtmPerfIntervalEntry
  MAX-ACCESS    not-accessible
  STATUS        current
  DESCRIPTION
      "This table provides performance information per ATM PW
       similar to the pwAtmPerfCurrentTable above.  However,
       these counts represent historical 15 minute intervals.
       Typically, this table will have a maximum of 96 entries
       for a 24 hour period. "
  ::= { pwAtmObjects 9 }

pwAtmPerfIntervalEntry OBJECT-TYPE
  SYNTAX        PwAtmPerfIntervalEntry
  MAX-ACCESS    not-accessible
  STATUS        current
  DESCRIPTION
      "An entry in this table is created by the agent for
       every pwAtmPerfCurrentEntry that is 15 minutes old.
       The contents of the Current entry are copied to the new
       entry here.  The Current entry then resets its counts
       to zero for the next current 15 minute interval. "
  INDEX  { pwIndex, pwAtmPerfIntervalNumber }
  ::= { pwAtmPerfIntervalTable 1 }

PwAtmPerfIntervalEntry ::= SEQUENCE {
     pwAtmPerfIntervalNumber         Unsigned32,
```

```
     pwAtmPerfIntervalValidData      TruthValue,
     pwAtmPerfIntervalDuration       Unsigned32,
     pwAtmPerfIntervalMissingPkts    PerfIntervalCount,
     pwAtmPerfIntervalPktsReOrder    PerfIntervalCount,
     pwAtmPerfIntervalPktsMisOrder   PerfIntervalCount,
     pwAtmPerfIntervalPktsTimeout    PerfIntervalCount,
     pwAtmPerfIntervalCellsXmit      PerfIntervalCount,
     pwAtmPerfIntervalCellsDropped   PerfIntervalCount,
     pwAtmPerfIntervalCellsReceived  PerfIntervalCount,
     pwAtmPerfIntervalUnknownCells   PerfIntervalCount
     }

pwAtmPerfIntervalNumber OBJECT-TYPE
  SYNTAX        Unsigned32 (1..96)
  MAX-ACCESS    not-accessible
  STATUS        current
  DESCRIPTION
      "A number (normally between 1 and 96 to cover a 24 hour
       period) that identifies the interval for which the set
       of statistics is available.  The interval identified by 1
       is the most recently completed 15 minute interval, and
       the interval identified by N is the interval immediately
       preceding the one identified by N-1.  The minimum range of
       N is 1 through 4.  The default range is 1 through 32.  The
       maximum value of N is 96."
  ::= { pwAtmPerfIntervalEntry 1 }

pwAtmPerfIntervalValidData OBJECT-TYPE
  SYNTAX        TruthValue
  MAX-ACCESS    read-only
  STATUS        current
  DESCRIPTION
      "This variable indicates if the data for this interval
       is valid."
  ::= { pwAtmPerfIntervalEntry 2 }

pwAtmPerfIntervalDuration OBJECT-TYPE
   SYNTAX      Unsigned32
   MAX-ACCESS  read-only
   STATUS      current
   DESCRIPTION
     "The duration of a particular interval in seconds.
      Adjustments in the system's time-of-day clock, may
      cause the interval to be greater or less than the
      normal value.  Therefore, this actual interval value
      is provided."
   ::= { pwAtmPerfIntervalEntry 3 }
```

```
pwAtmPerfIntervalMissingPkts OBJECT-TYPE
  SYNTAX        PerfIntervalCount
  MAX-ACCESS    read-only
  STATUS        current
  DESCRIPTION
      "Number of missing packets (as detected via control
       word sequence number gaps)."
  ::= { pwAtmPerfIntervalEntry 4 }

pwAtmPerfIntervalPktsReOrder OBJECT-TYPE
  SYNTAX        PerfIntervalCount
  MAX-ACCESS    read-only
  STATUS        current
  DESCRIPTION
      "Number of packets detected out of sequence (via control
       word sequence number), but successfully re-ordered.
       Note: some implementations may not support this
       feature."
  ::= { pwAtmPerfIntervalEntry 5 }

 pwAtmPerfIntervalPktsMisOrder OBJECT-TYPE
  SYNTAX        PerfIntervalCount
  MAX-ACCESS    read-only
  STATUS        current
  DESCRIPTION
      "Number of packets detected out of order (via control word
       sequence numbers)."
  ::= { pwAtmPerfIntervalEntry 6 }

pwAtmPerfIntervalPktsTimeout OBJECT-TYPE
  SYNTAX        PerfIntervalCount
  MAX-ACCESS    read-only
  STATUS        current
  DESCRIPTION
      "Number of packets transmitted due to timeout expiration."
   ::= { pwAtmPerfIntervalEntry 7 }

pwAtmPerfIntervalCellsXmit OBJECT-TYPE
  SYNTAX        PerfIntervalCount
  MAX-ACCESS    read-only
  STATUS        current
  DESCRIPTION
      "Number of transmitted cells."
   ::= { pwAtmPerfIntervalEntry 8 }

pwAtmPerfIntervalCellsDropped OBJECT-TYPE
  SYNTAX        PerfIntervalCount
  MAX-ACCESS    read-only
```

```
  STATUS        current
  DESCRIPTION
      "Number of dropped cells."
   ::= { pwAtmPerfIntervalEntry 9 }

pwAtmPerfIntervalCellsReceived OBJECT-TYPE
  SYNTAX        PerfIntervalCount
  MAX-ACCESS    read-only
  STATUS        current
  DESCRIPTION
      "Number of received cells."
   ::= { pwAtmPerfIntervalEntry 10 }

pwAtmPerfIntervalUnknownCells OBJECT-TYPE
  SYNTAX        PerfIntervalCount
  MAX-ACCESS    read-only
  STATUS        current
  DESCRIPTION
      "Number of cells received from the PSN with unknown VPI or
      VCI values.  This object is relevant only in N:1 mode."
   ::= { pwAtmPerfIntervalEntry 11 }

-- End ATM PW Performance Interval Table

-- ATM PW 1day Performance Table

pwAtmPerf1DayIntervalTable OBJECT-TYPE
  SYNTAX        SEQUENCE OF PwAtmPerf1DayIntervalEntry
  MAX-ACCESS    not-accessible
  STATUS        current
  DESCRIPTION
      "This table provides performance information per ATM PW
       similar to the pwAtmPerfIntervalTable above.  However,
       these counters represent historical one-day intervals up to
       one full month."
  ::= { pwAtmObjects 10 }

pwAtmPerf1DayIntervalEntry OBJECT-TYPE
  SYNTAX        PwAtmPerf1DayIntervalEntry
  MAX-ACCESS    not-accessible
  STATUS        current
  DESCRIPTION
      "An entry is created in this table by the agent
       for every entry in the pwAtmCfgTable table."
  INDEX  { pwIndex,pwAtmPerf1DayIntervalNumber }
     ::= { pwAtmPerf1DayIntervalTable 1 }

PwAtmPerf1DayIntervalEntry ::= SEQUENCE {
```

```
      pwAtmPerf1DayIntervalNumber          Unsigned32,
      pwAtmPerf1DayIntervalValidData       TruthValue,
      pwAtmPerf1DayIntervalDuration        Unsigned32,
      pwAtmPerf1DayIntervalMissingPkts     Counter32,
      pwAtmPerf1DayIntervalPktsReOrder     Counter32,
      pwAtmPerf1DayIntervalPktsMisOrder    Counter32,
      pwAtmPerf1DayIntervalPktsTimeout     Counter32,
      pwAtmPerf1DayIntervalCellsXmit       Counter32,
      pwAtmPerf1DayIntervalCellsDropped    Counter32,
      pwAtmPerf1DayIntervalCellsReceived   Counter32,
      pwAtmPerf1DayIntervalUnknownCells    Counter32
      }

pwAtmPerf1DayIntervalNumber OBJECT-TYPE
  SYNTAX        Unsigned32 (1..365)
  MAX-ACCESS    not-accessible
  STATUS        current
  DESCRIPTION
      "The number of intervals, where 1 indicates current day
       measured period and 2 and above indicate previous days,
       respectively."
  ::= { pwAtmPerf1DayIntervalEntry 1 }

pwAtmPerf1DayIntervalValidData OBJECT-TYPE
  SYNTAX        TruthValue
  MAX-ACCESS    read-only
  STATUS        current
  DESCRIPTION
      "This object indicates if the data for this interval
       is valid."
  ::= { pwAtmPerf1DayIntervalEntry 2 }

pwAtmPerf1DayIntervalDuration OBJECT-TYPE
  SYNTAX      Unsigned32
  MAX-ACCESS  read-only
  STATUS      current
  DESCRIPTION
    "The duration of a particular interval in seconds.
     Adjustments in the system's time-of-day clock may
     cause the interval to be greater or less than the
     normal value.  Therefore, this actual interval value
     is provided."
  ::= { pwAtmPerf1DayIntervalEntry 3 }

pwAtmPerf1DayIntervalMissingPkts OBJECT-TYPE
  SYNTAX        Counter32
  MAX-ACCESS    read-only
  STATUS        current
```

```
  DESCRIPTION
    "Number of missing packets (as detected via control word
     sequence number gaps)."
  ::= { pwAtmPerf1DayIntervalEntry 4 }

pwAtmPerf1DayIntervalPktsReOrder OBJECT-TYPE
  SYNTAX        Counter32
  MAX-ACCESS    read-only
  STATUS        current
  DESCRIPTION
      "Number of packets detected out of sequence (via control
       word sequence number), but successfully re-ordered.
       Note: some implementations may not support this
       feature."
  ::= { pwAtmPerf1DayIntervalEntry 5 }

pwAtmPerf1DayIntervalPktsMisOrder OBJECT-TYPE
  SYNTAX        Counter32
  MAX-ACCESS    read-only
  STATUS        current
  DESCRIPTION
      "Number of packets detected out of order (via control word
       sequence numbers) and that could not be re-ordered."
  ::= { pwAtmPerf1DayIntervalEntry 6 }

pwAtmPerf1DayIntervalPktsTimeout OBJECT-TYPE
  SYNTAX        Counter32
  MAX-ACCESS    read-only
  STATUS        current
  DESCRIPTION
      "Number of packets transmitted due to timeout expiration."
   ::= { pwAtmPerf1DayIntervalEntry 7 }

pwAtmPerf1DayIntervalCellsXmit OBJECT-TYPE
  SYNTAX        Counter32
  MAX-ACCESS    read-only
  STATUS        current
  DESCRIPTION
      "Number of transmitted cells."
   ::= { pwAtmPerf1DayIntervalEntry 8 }

pwAtmPerf1DayIntervalCellsDropped OBJECT-TYPE
  SYNTAX        Counter32
  MAX-ACCESS    read-only
  STATUS        current
  DESCRIPTION
      "Number of dropped cells."
   ::= { pwAtmPerf1DayIntervalEntry 9 }
```

```
pwAtmPerf1DayIntervalCellsReceived OBJECT-TYPE
  SYNTAX        Counter32
  MAX-ACCESS    read-only
  STATUS        current
  DESCRIPTION
      "Number of received cells."
   ::= { pwAtmPerf1DayIntervalEntry 10 }

pwAtmPerf1DayIntervalUnknownCells OBJECT-TYPE
  SYNTAX        Counter32
  MAX-ACCESS    read-only
  STATUS        current
  DESCRIPTION
      "Number of cells received from the PSN with unknown VPI
      or VCI values.  This object is relevant only in N:1 mode."
   ::= { pwAtmPerf1DayIntervalEntry 11 }

-- End of ATM PW Performance table

    pwAtmCompliances OBJECT IDENTIFIER ::= { pwAtmConformance 1 }
    pwAtmGroups      OBJECT IDENTIFIER ::= { pwAtmConformance 2 }
    pwAtmCompliance MODULE-COMPLIANCE
    STATUS  current
    DESCRIPTION
            "The compliance statement for agents that support
             ATM PW."
    MODULE  -- this module
        MANDATORY-GROUPS { pwAtmCfgGroup,
                           pwAtmPerfGroup
                         }

       OBJECT pwAtmCfgFarEndMaxCellConcatenation
       MIN-ACCESS read-only
       DESCRIPTION
        "The ability to set this object
        is not required."

       GROUP        pwAtmOutbound1to1Group
       DESCRIPTION "This group is mandatory only for implementations
                    that support the ATM PW 1:1 mode and not using
                    the Nto1 table."

       GROUP        pwAtmInbound1to1Group
       DESCRIPTION "This group is mandatory only for implementations
                    that support the ATM PW 1:1 mode and not using
                    the Nto1 table."

       GROUP        pwAtmOutboundNto1Group
```

```
       DESCRIPTION "This group is mandatory only for implementations
                    that support the ATM PW N:1 and transparent mode."

       GROUP        pwAtmInboundNto1Group
       DESCRIPTION "This group is mandatory only for implementations
                    that support the ATM PW N:1 and transparent mode."

    ::= { pwAtmCompliances 2 }

-- Units of conformance.

    pwAtmCfgGroup OBJECT-GROUP
    OBJECTS {pwAtmCfgMaxCellConcatenation,
             pwAtmCfgFarEndMaxCellConcatenation,
             pwAtmCfgTimeoutMode,
             pwAtmClpQosMapping
                     }

    STATUS  current
    DESCRIPTION
              "Collection of objects for basic ATM PW
               configuration."
    ::= { pwAtmGroups 5 }

    pwAtmPerfGroup OBJECT-GROUP
    OBJECTS {pwAtmPerfCurrentMissingPkts,
             pwAtmPerfCurrentPktsReOrder,
             pwAtmPerfCurrentPktsMisOrder,
             pwAtmPerfCurrentPktsTimeout,
             pwAtmPerfCurrentCellsXmit,
             pwAtmPerfCurrentCellsDropped,
             pwAtmPerfCurrentCellsReceived,
             pwAtmPerfCurrentUnknownCells,
             pwAtmPerfIntervalValidData,
             pwAtmPerfIntervalDuration,
             pwAtmPerfIntervalMissingPkts,
             pwAtmPerfIntervalPktsReOrder,
             pwAtmPerfIntervalPktsMisOrder,
             pwAtmPerfIntervalPktsTimeout,
             pwAtmPerfIntervalCellsXmit,
             pwAtmPerfIntervalCellsDropped,
             pwAtmPerfIntervalCellsReceived,
             pwAtmPerfIntervalUnknownCells,
             pwAtmPerf1DayIntervalValidData,
             pwAtmPerf1DayIntervalDuration,
             pwAtmPerf1DayIntervalMissingPkts,
             pwAtmPerf1DayIntervalPktsReOrder,
             pwAtmPerf1DayIntervalPktsMisOrder,
```

```
            pwAtmPerf1DayIntervalPktsTimeout,
            pwAtmPerf1DayIntervalCellsXmit,
            pwAtmPerf1DayIntervalCellsDropped,
            pwAtmPerf1DayIntervalCellsReceived,
            pwAtmPerf1DayIntervalUnknownCells
                        }
    STATUS current
    DESCRIPTION
             "Collection of objects for basic ATM PW Performance."
    ::= { pwAtmGroups 6 }

    pwAtmOutbound1to1Group OBJECT-GROUP
    OBJECTS {pwAtmOutboundAtmIf,
            pwAtmOutboundVpi,
            pwAtmOutboundVci,
            pwAtmOutboundTrafficParamDescr,
            pwAtmOutboundRowStatus
            }
    STATUS  current
    DESCRIPTION
             "Collection of objects for basic 1:1 ATM PW outbound
              configuration."
    ::= { pwAtmGroups 7 }

    pwAtmInbound1to1Group OBJECT-GROUP
    OBJECTS {pwAtmInboundAtmIf,
            pwAtmInboundVpi,
            pwAtmInboundVci,
            pwAtmInboundTrafficParamDescr,
            pwAtmInboundRowStatus
            }
    STATUS  current
    DESCRIPTION
          "Collection of objects for basic 1:1 ATM PW inbound
           configuration."
    ::= { pwAtmGroups 8 }

    pwAtmOutboundNto1Group OBJECT-GROUP
    OBJECTS {pwAtmOutboundNto1RowStatus,
            pwAtmOutboundNto1TrafficParamDescr,
            pwAtmOutboundNto1MappedVpi,
            pwAtmOutboundNto1MappedVci
                        }
    STATUS  current
    DESCRIPTION
          "Collection of objects for N:1, 1:1, or transparent
          ATM PW outbound configuration."
    ::= { pwAtmGroups 9 }
```

```
    pwAtmInboundNto1Group OBJECT-GROUP
    OBJECTS {pwAtmInboundNto1RowStatus,
             pwAtmInboundNto1TrafficParamDescr,
             pwAtmInboundNto1MappedVpi,
             pwAtmInboundNto1MappedVci
                 }
    STATUS current
    DESCRIPTION
          "Collection of objects for N:1, 1:1, or transparent
           ATM PW inbound configuration."
    ::= { pwAtmGroups 10 }

END
```

10. Security Considerations

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

The pwAtmOutboundTable, pwAtmInboundTable, pwAtmCfgTable, pwAtmOutboundNto1Table, and pwAtmInboundNto1Table contain objects of ATM PW parameters on a Provider Edge (PE) device. Unauthorized access to objects in these tables could result in disruption of traffic on the network.

The use of stronger mechanisms such as SNMPv3 security should be considered where possible. Specifically, SNMPv3 VACM and USM MUST be used with any SNMPV3 agent, which implements this MIB module. Administrators should consider whether read access to these objects should be allowed, since read access may be undesirable under certain circumstances.

Some of the readable objects in this MIB module (i.e., objects with a MAX-ACCESS other than not-accessible) may be considered sensitive or vulnerable in some network environments. It is thus important to control even GET and/or NOTIFY access to these objects and possibly to even encrypt the values of these objects when sending them over the network via SNMP. These are the tables and objects and their sensitivity/vulnerability:

The pwATMCfgTable, pwAtmPerfCurrentTable, pwAtmPerfIntervalTable, and pwAtmPerf1DayIntervalTable collectively show the ATM pseudowire connectivity topology and its performance characteristics.

If an Administrator does not want to reveal this information, then these tables should be considered sensitive/vulnerable.

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.

11. IANA Considerations

The MIB module in this document uses the following IANA-assigned OBJECT IDENTIFIER values recorded in the SMI Numbers registry:

Descriptor	OBJECT IDENTIFIER value
pwATMMIB	{ mib-2 183 }

12. References

12.1. Normative References

[PWTC] Nadeau, T., Ed., Zelig, D., Ed., and O. Nicklass, Ed., "Definitions of Textual Conventions for Pseudowire (PW) Management", RFC 5542, May 2009.

[PWMIB] Nadeau, T., Ed. and D. Zelig, Ed., "Pseudowire (PW) Management Information Base (MIB)", RFC 5601, July 2009.

[PWMPLSMIB] Zelig, D., Ed. and T. Nadeau, Ed., "Pseudowire (PW) over MPLS PSN Management Information Base (MIB)", RFC 5602, July 2009.

[ATMENCAP] Martini, L., Jayakumar, J., Bocci, M., El-Aawar, N., Brayley, J., and G. Koleyni, "Encapsulation Methods for Transport of Asynchronous Transfer Mode (ATM) over MPLS Networks", RFC 4717, December 2006.

[ATMTRANS] Malis, A., Martini, L., Brayley, J., and T. Walsh, "Pseudowire Emulation Edge-to-Edge (PWE3) Asynchronous Transfer Mode (ATM) Transparent Cell Transport Service", RFC 4816, February 2007.

[AToM] Tesink, K., "Definitions of Managed Objects for ATM Management", RFC 2515, February 1999.

[AToMTC] Noto, M., Spiegel, E., and K. Tesink, "Definitions of Textual Conventions and OBJECT-IDENTITIES for ATM Management", RFC 2514, February 1999.

[LDPMIB] Cucchiara, J., Sjostrand, H., and J. Luciani, "Definitions of Managed Objects for the Multiprotocol Label Switching (MPLS), Label Distribution Protocol (LDP)", RFC 3815, June 2004.

[TEMIB] Srinivasan, C., Viswanathan, A., and T. Nadeau, "Multiprotocol Label Switching (MPLS) Traffic Engineering (TE) Management Information Base (MIB)", RFC 3812, June 2004.

[IFMIB] McCloghrie, K. and F. Kastenholz, "The Interfaces Group MIB", RFC 2863, June 2000.

[RFC2578] McCloghrie, K., Ed., Perkins, D., Ed., and J. Schoenwaelder, Ed., "Structure of Management Information Version 2 (SMIv2)", STD 58, RFC 2578, April 1999.

[RFC2579] McCloghrie, K., Ed., Perkins, D., Ed., and J. Schoenwaelder, Ed., "Textual Conventions for SMIv2", STD 58, RFC 2579, April 1999.

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

[BCP14] Bradner, S., "Key words for use in RFCs to Indicate Requirement Levels", BCP 14, RFC 2119, March 1997.

12.2. Informative References

[PWREQ] Xiao, X., McPherson, D., and P. Pate, "Requirements for Pseudo-Wire Emulation Edge-to-Edge (PWE3)", RFC 3916, September 2004.

[PWARCH] Bryant, S. and P. Pate, "Pseudo Wire Emulation Edge-to-Edge (PWE3) Architecture", RFC 3985, March 2005.

[RFC3410] Case, J., Mundy, R., Partain, D., and B. Stewart, "Introduction and Applicability Statements for Internet-Standard Management Framework", RFC 3410, December 2002.

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