The ATM Forum

Technical Committee

M4 Interface Requirements and Logical MIB: ATM Network Element View

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1. Introduction

This document presents functional requirements for interfaces used to manage ATM networks. It specifies requirements for managing individual ATM Network Elements (NEs) using the interface labeled "M4" in the ATM Forum Management Interface Reference Architecture shown in Figure 1-1. This document also defines managed entities of a logical, protocol-independent Management Information Base (MIB) for the M4 Interface that models the exchange of information between ATM devices and the systems that manage them.

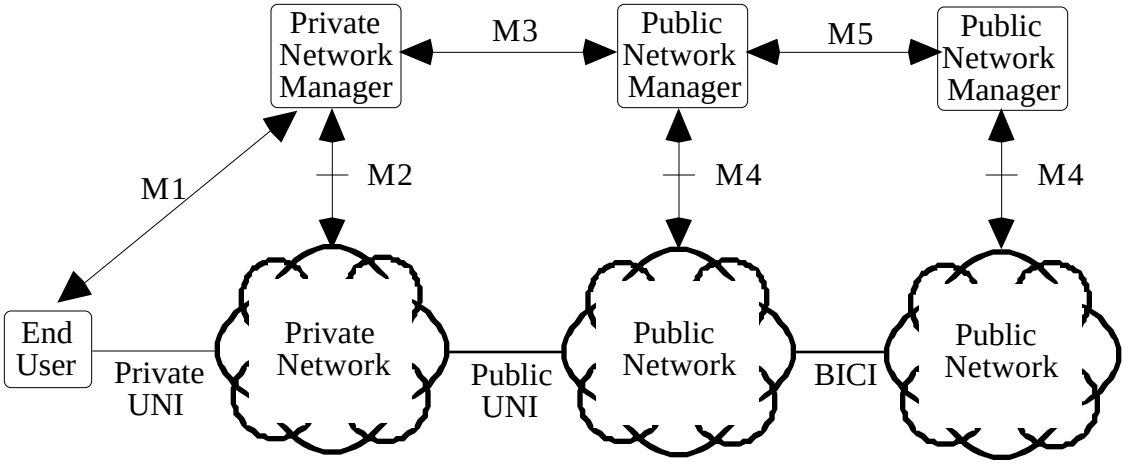


Figure 1-1 The ATM Forum Management Interface Reference Architecture

The management interface requirements and logical MIB outlined in this document are intended to guide the development of protocol-specific ATM NE management interface specifications in the ATM Forum. The purpose of defining a logical MIB is to provide a common frame of reference for the development of protocol-specific MIBs such as those based on CMIP or SNMP. The definition of protocol-specific MIBs from a common logical MIB should facilitate their potential coexistence within a public carrier's network.

1.1. Scope

This document addresses the following areas of ATM network management:

- Configuration Management

  The Configuration Management requirements covered in this document include (1) ATM NE configuration identification and change reporting; (2) the configuration of UNIs, V-UNIs, BICIs, and BISSIs; (3) the cross-connection of VP and VC links and the configuration of VPCs and VCCs; (4) the configuration of VPC and VCC segment end-points; (5) configuration of signaling channels and routing for SVC service, and (6) management system control (e.g., suppression) of automatically generated ATM NE reports.

- Fault Management

  The Fault Management requirements covered in this document include (1) the autonomous reporting of ATM NE component failures, physical facility failures, and ATM link/connection failures; (2) the initiation of ATM OAM cell loopback tests and (3) continuity checking with OAM cells.

- Performance Management

  The Performance Management requirements covered in this document include (1) physical layer (e.g., SONET and DS3 path level) performance monitoring; (2) Transmission Convergence Level performance monitoring; (3) ATM Layer protocol monitoring; (4) UPC/NPC violation monitoring, (5) signaling channel protocol

monitoring and (6) use of OAM cells for performance monitoring. Other Performance Management aspects such as ATM NE congestion monitoring, for real-time performance assessment; and ATM NE utilization monitoring and congestion monitoring, for network capacity planning, are for further study.

- Security Management

  The Security Management requirements will be covered in a separate M4 interface document.

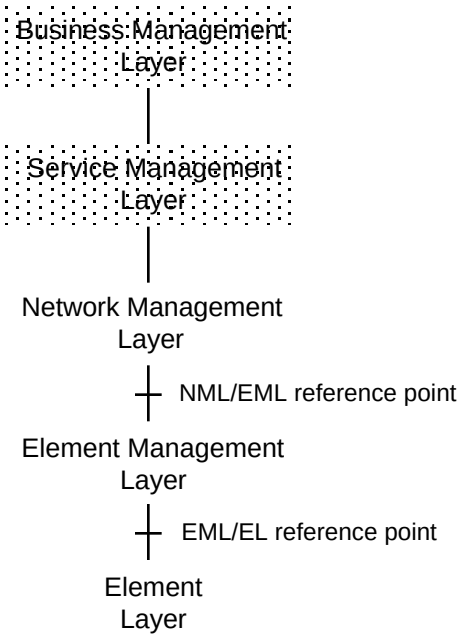
The M4 Interface requirements defined in this document are intended to support Permanent Virtual Connections (PVCs) and support Switched Virtual Connections (SVCs).

The focus of this specification is on the M4 Interface aspects needed to support ATM NE management, where an ATM NE may be realized as either a standalone device or geographically distributed system. M4 Interface aspects specific to managing NEs in aggregation (e.g., as a single ATM subnetwork entity) are not addressed in this document and are defined in the ATM Forum's M4 Network View documents [af-nm-0058.000] and [af-nm-0074.000].

1.2. Relationship to TMN

ITU-T Recommendation M.3010 [M.3010] defines a five layer model of operations (see Figure 1-2)[1]. The levels of this model are defined such that as one moves up the hierarchy, low-level detail is abstracted, and additional functionality is performed to ensure effective service and resource management. The definitions and views provided by each of the lower three layers are described in Section 1.3. The upper two layers, however, are beyond the scope of this document. Note that the layers in the model represent functional components, not physical systems, and the interactions between the layers are labeled as functional reference points which, in a physical implementation, may or may not be realized as open interfaces.

[1] Note that ITU Recommendation [M.3010] uses the terms Network Element Management Layer and Network Element Layer rather than Element Management Layer and Element Layer, respectively.



Shading is used to highlight layers of the model that are beyond the scope of this document.

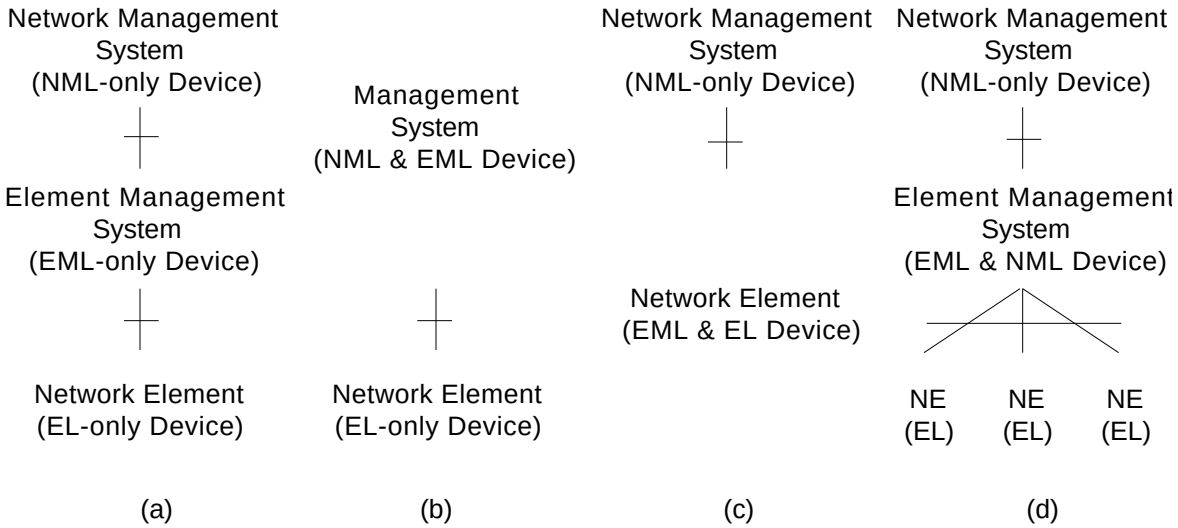
Figure 1-2 The Multi-Layered Reference Architecture for Operations

The reference architecture shown in Figure 1-2 may be realized in a number of different ways. Representative examples of four alternative physical realizations are shown in Figures 1-3a, b, c, and d. Figure 1-3 illustrates just a few examples of how the multi-layered model of operations may be realized. It by no means represents an exhaustive set.

The ATM NE management interface requirements defined in this document focus on EML-to-EL and NML-to-EML interactions needed to support ATM NE management, where an ATM NE may be realized as either a standalone device or geographically distributed system. With respect to Figure 1-3, the requirements defined in this document are relevant to ATM NEs supporting either EL functions or a combination of EL and EML functions as well as to the operations support system(s) that manage them.

1.3. Definitions

The primary focus of this document is on the interactions between the lower three layers of ITU-T's TMN Model (see Figure 1-2). A brief definition of each of these lower layers is provided in the subsections that follow. The reader, however, is advised to consult ITU Recommendation M.3010 for a more comprehensive description of these layers and their role in the overall multi-layered TMN Model.



— Identifies interfaces to which this specification applies.

* The ATM NEs in the above figures refer to ATM Switches, ATM Transport Devices (e.g., ATM Cross Connect Systems and ATM Concentrators), Remote ATM Switches, Distributed ATM Switching Systems, etc..

Figure 1-3 Physical Realization Examples of the Multi-Layered Model

1.3.1. Network Management Layer (NML)

The NML has responsibility for the management of all ATM NEs, as presented by their EML(s), both individually and as a set. The NML is not concerned with how a particular element provides services internally.

The NML contains those functions used to manage an end-to-end telecommunications network. NML access to the network is provided by the EML. The NML controls and coordinates the provision or modification of network resource capabilities in support of services to the customer through interactions with higher layer functions. It also provides higher layers with information such as the performance, availability, and usage data.

1.3.2. Element Management Layer (EML)

The EML manages each network element on an individual basis and supports an abstraction of the functions provided by the Element Layer.

1.3.3. Element Layer (EL)

The EL contains functions related specifically to the technology, vendor, and the network resources or network elements that provide basic communications services.

1.4. Management of SVC Capabilities

Management of SVCs is broken down into two areas:

1. Management of the *signaling channels*. These are used for exchanging signaling messages between signaling entities.

2. Management of the *call/ connection bearer channels* that result after the signaling entities have successfully exchanged their messages.

Figure 1-4 shows, at an abstract level, the VCC(s) used as signaling channels, and the VPCs that contain the "bearer channel" SVC VCCs for the calls/connections. The VPCs that are used for SVC VCCs must be assigned a VPCI.

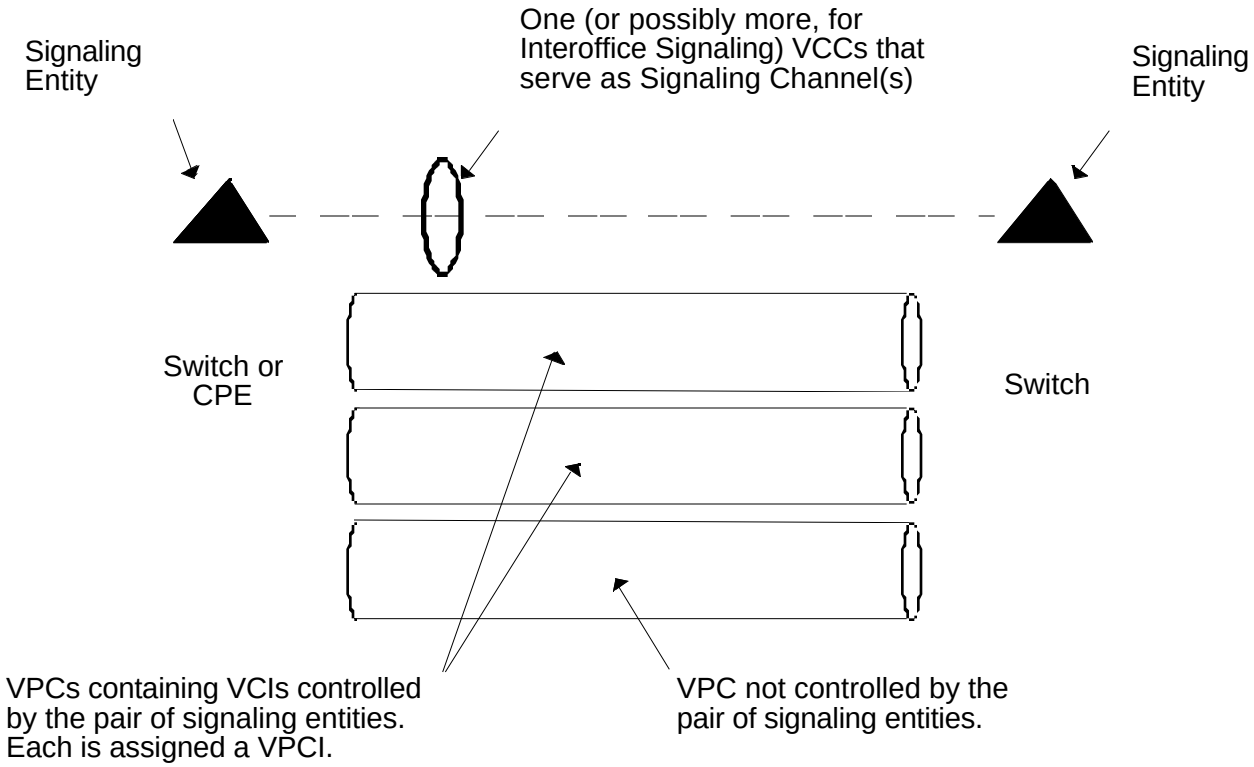


Figure 1-4 Signaling Channel(s) and VPCs Used as Bearer Channels

Management of *signaling channels* and management of *bearer channels* (i.e., call/connection management) is treated separately:

The treatment of *signaling channels* is divided according to items unique to access signaling and those unique to interoffice signaling. However, where access and interoffice features are similar, they are discussed in a common section.

The treatment of *call/connections* is divided according to features unique to UNIs and those unique to interoffice interfaces (e.g., BICIs). Common features are discussed in a common section.

2. ATM NE Management Interface Requirements

This section addresses M4 Interface requirements needed to manage ATM networks for the following areas of network management: Configuration Management, Fault Management, Performance Management, and Security Management.

The M4 Interface requirements defined in this document are intended to support Permanent Virtual Connections (PVCs) and to optionally support Switched Virtual Connections (SVCs).

Within the context of this document, specifications are presented as either *requirements*, denoted by **(R)**, *conditional requirements* denoted by **(CR)** or *objectives*, denoted by **(O)**. In this document, *requirements* are considered functions that are necessary for operational compatibility; while *objectives* are considered features that are viewed to be desirable but not essential for managing ATM networks. *Conditional requirements* are functions that are necessary for operational compatibility of an optional feature such as an E1 or T1 interface (i.e., If the feature is supported by the NE, then the CR is a requirement.)

This document is aimed at supporting versions of ATM Forum specifications that include both UNI version 3.1 and UNI version 4.0 and BICI version 1. However, some of the requirements and logical objects in this version of the document are useful in implementing versions prior to UNI version 3.1.

2.1. Configuration Management

Configuration management provides functions to exercise control over, identify, collect data from and provide data to NEs [M.3400]. From an ATM network management perspective, this involves the following:

- AAL Configuration
- ABR Service Configuration
- ATM NE Configuration Identification and Change Reporting
- ATM UNIs, V-UNIs, VbIs, BICIs, and BISSIs Configuration
- ATM VP/VC Link Termination Points and Cross Connections Configuration
- ATM VPC and VCC Termination Points Configuration
- ATM VPC and VCC OAM Segment End-Points Configuration
- Call/Connection Configuration
- CES Interworking Configuration
- Customer Subscription Administration
- Event Flow Control (i.e., Suppression of Autonomous Notifications)
- OAM Flow Configuration
- Physical port Configuration
- Signaling Channel Configuration
- Traffic Description

2.1.1. ATM NE Configuration Identification and Change Reporting

In order for a management system to effectively manage the ATM network, it's view of the various ATM NEs within it must be current. To ensure such accuracy, each ATM NE is expected to make available to the management system an abstract view of its current configuration and report to the management system all subsequent configuration changes that were not explicitly requested by the management system via the M4 interface. Such configuration changes may be the result of:

1. Operations performed over the craft interface
2. Human intervention (removal/insertion of equipment modules)
3. Customer control channels (e.g., ILMI)
4. Network failures
5. Protection switching events
6. Sub-ATM NE component initialization

7. Secondary effects of atomic operations performed by the management system

The following operations interface functions are required to support the automatic node configuration identification and change reporting capability:

(R) CM-1 The M4 Interface shall support ATM NE notifications that report when the ATM NE has been installed/initialized and is now available to the management system for subsequent provisioning. These notifications need only provide a simple indication that the installation/initialization of the ATM NE is complete. Information regarding the detailed configuration of the newly installed/initialized ATM NE need not be included as part of this notification.

(R) CM-2 The M4 Interface shall support management system requests for information that describes the current configuration of the ATM NE. Information that describes each externally manageable physical and logical component of the ATM NE (e.g., circuit packs, equipment, equipment holders, software, physical path termination points, performance/threshold data stores, and logs) and the inter-relationships between these components (e.g., rack/shelf/slot/line-card relationships) shall be logged and made available (on-demand) to the management system over the M4 Interface.

(R) CM-3 The M4 Interface shall support autonomous notifications that reflect recent changes in the configuration of the ATM NE, including those that were not directly initiated by the network management system over the M4 Interface (e.g., the insertion of a new plug-in unit).

(R) CM-4 The M4 Interface shall support notifications that reflect changes in the operational state of the various managed entities within the ATM NE. When possible, only the root operational state change shall be reported. Operational state changes that may be derived from the root state change should not be reported.

Note that this specification adopts the OSI state management model defined in ITU-T Recommendation X.731.

2.1.1.1. Related Managed Entities

Section 3 provides a logical model, based on the definition of Managed Entities, that further describes the exchange of information across the M4 Interface. The purpose of this sub-section and all sub-sections like it is to show how specific functional requirements relate to the Managed Entities in Section 3. The Managed Entities identified include both those that are directly involved in supporting the requirements as well as the Managed Entities that support those that are directly involved.

The managed entities defined in Section 3 that are required to support the ATM NE configuration identification and change reporting function are as follows:

- ATM Cross Connection Control
- ATM NE
- Attribute Value Change Record
- Equipment
- Equipment Holder
- Event Forwarding Discriminator
- Latest Occurrence Log
- Log
- Managed Entity Creation Log Record
- Managed Entity Deletion Log Record
- Physical Path Termination Point
- Plug-in Unit
- Software
- State Change Record
- TC Adaptor
- TC Adaptor PM Current Data

• Threshold Data

Figure 2-1 has been provided to illustrate how the Equipment Holder managed entity is used to model the rack/shelf/slot hierarchy of equipment within an ATM NE. Note that, in this figure, a box within a box represents a containment relationship between managed entities.

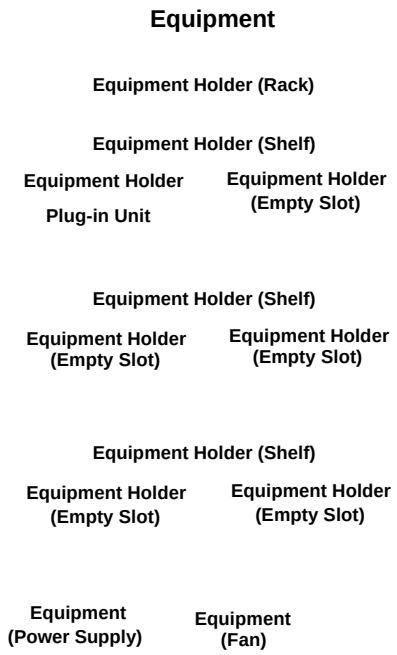


Figure 2-1 Modeling the Rack/Shelf/Slot Hierarchy

2.1.2. Configuration of UNIs, BICIs, BISSIs, VbIs and V-UNIs

The following M4 Interface functions are required to support the configuration of UNIs, BICIs, BISSIs, BICIs, VbIs and V-UNIs in an ATM NE. Section 2.1.2.1 provides descriptive material on special considerations for Vb Interfaces (VbIs) and Virtual UNIs (V-UNIs) , section 2.1.2.2 provides specific requirements, and section 2.1.2.3 lists the related managed entities defined in the logical MIB.

2.1.2.1. Configuration of Virtual UNIs and Vb Interfaces

The need for Virtual UNIs arises when there is an ATM multiplexer acting as a VP Multiplexer between a CPE device and a VC Switch (i.e., an ATM NE that supports SVCs). An example is shown in Figure 2-2. The UNI interface between the VP multiplexer and the VC Switch will be referred to as the Vb Interface. The VP multiplexer does not support signaling and does no assigning of VCIs for SVCs. The VP multiplexer maps VPIs from each UNI to unique VPI values on the Vb Interface. It does not change VCI values. In the general case, a connection's VPI value at the UNI will be different from the VPI at the Vb. (There are several reasons for this, although the primary one is that customers have shown a preference to use certain values in their CPE (e.g., all want to use VPI =0 for several functions), and they do not wish to be constrained in their use of VPI values by values that have been assigned to other customers.)

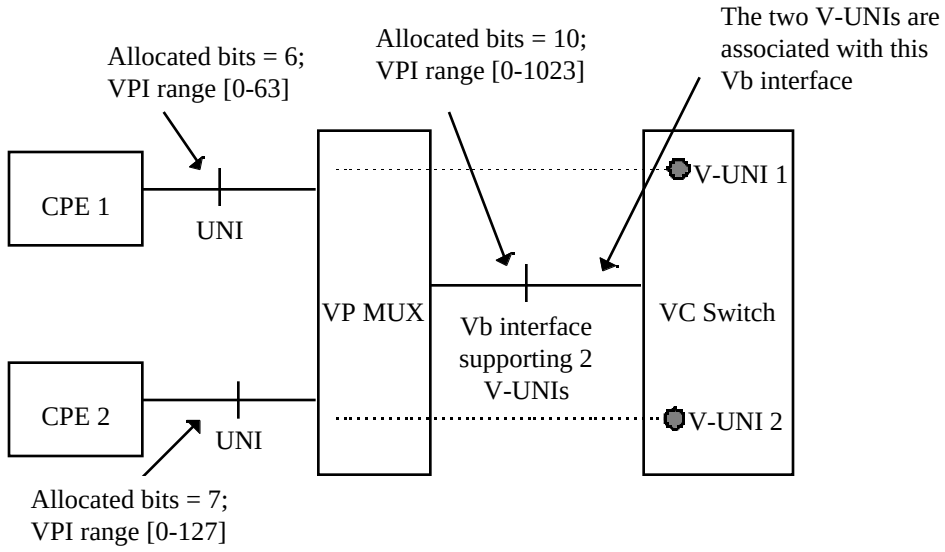


Figure 2-2 Example: Configuration of Two Virtual UNIs

In this configuration, the VP multiplexer performs physical and ATM-layer functions that must be coordinated with the CPE, while the VC Switch performs higher layer signaling functions to interact with the CPE of each UNI. In addition, the ILMI Management Entity (IME) in this case is defined so that the functions are performed at the VC Switch. Each IME at the VC Switch acts as a proxy agent for the corresponding UNI at the VP multiplexer (see Annex B of the ILMI version 4.0 specification).

The ATM layer configuration management requirements common to UNIs, BICIs, and BISSIs also apply to Vb interfaces. The ATM-layer requirements for configuring a V-UNI are similar to those for a UNI, except for the following differences:

- The V-UNI is associated with an underlying Vb Interface, instead of an underlying physical path termination point.
- The actual maximum number of simultaneously active VPCs supported, the number of allocated VPI bits, and the VPI for the (optional) ILMI all refer to values appropriate to the corresponding UNI at the VP multiplexer. (Recall that the V-UNI at the VC Switch is acting as a proxy for the UNI at the VP multiplexer.) Since a VP multiplexer does not terminate VPs, the actual maximum number of VCCs, and VCI bits depend on the limits at the ATM NE and not the VP multiplexer. All these values must also take into account any limitations of associated Vb interfaces.
- The identification of VPI and VCI ranges for SVCCs, which may be coordinated with ILMI applies to both UNIs and V-UNIs. The use of these ranges is explained in the ILMI 4.0 specification. However, in the case of V-UNIs, the VPI ranges refer to limits on the real UNI at a VP multiplexer.

In addition to the configuration shown in Figure 2-2, current ITU-T draft recommendations concerning access network interfaces allow an unrestricted cross connection capability in the access network. These include both virtual circuit level cross connects and multiple interfaces on the ATM NE serving a UNI. In these specifications , virtual circuit cross connections in the access network are for further study. Multiple Vb interfaces serving a UNI are supported in these requirements and in the associated logical MIB. However, they may be limited by other ATM Forum specifications , e.g., UNI Signaling 4.0 [af-sig-0061.00] and UNI Traffic Management 4.0 [af-tm-056.000]. Figure 2-3 shows an example of multiple Vb interfaces serving a single UNI.

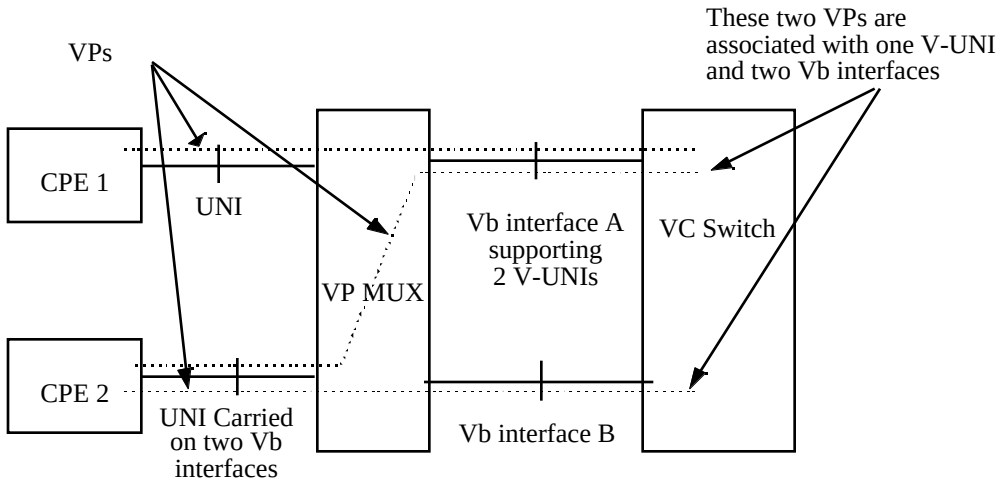


Figure 2-3 Example: Configuration of Two Virtual UNIs on Two Multiple Vb Interfaces

2.1.2.2. Interface Requirements

(R) CM-5 The M4 Interface shall support management system requests to configure physical path terminations on an ATM NE as either a User Network Interface (UNI), Vb Interface, Broadband Inter-Switching System Interface (BISSI), or Broadband Inter-Carrier Interface (BICI). The following information shall be provided with each configuration request:

1. Interface ID
2. ID of the Underlying Physical Path Termination Point
3. Local Maximum Number of VPCs Supportable: This parameter identifies the number of VPCs that can be supported by the ATM NE at this end of the interface.
4. Actual Number of VPCs Supportable: This parameter identifies the maximum number of VPCs that can be simultaneously supported on the interface. If an ILMI is active on a UNI, this value is calculated by ILMI as the smaller of the two local Maximum Number of VPCs at each end of the interface.
5. Local Maximum Number of VCCs Supportable: This parameter identifies the number of VCCs that can be supported by the ATM NE at this end of the interface.
6. Actual Number of VCCs Supportable: This parameter identifies the maximum number of VCCs that can be simultaneously supported on the interface. If an ILMI is active on a UNI, this value is calculated by ILMI as the smaller of the two local Maximum Number of VCCs at each end of the interface.
7. Local Maximum Number of Allocated VPI Bits: This parameter identifies the maximum number of allocated bits of the VPI sub-field that can be supported by the ATM NE at this end of the interface.
8. Actual Number of Allocated VPI Bits: This parameter identifies the number of allocated bits to be used on the interface. If an ILMI is active on a UNI, this value is calculated by the ILMI as the smaller of the Local Maximum Number of Allocated VPI Bits at each end of the UNI.
9. Local Maximum Number of Allocated VCI Bits: This parameter identifies the maximum number of allocated bits of the VCI sub-field that can be supported by the ATM NE at this end of the interface.
10. Actual Number of Allocated VCI Bits: This parameter identifies the number of allocated bits to be used on the interface. If an ILMI is active on a UNI, this value is calculated by the ILMI as the smaller of the Local Maximum Number of Allocated VCI Bits at each end of the UNI.
11. Far-End Carrier Network: (This parameter is needed if SVCs are supported on a BICI) This parameter identifies the adjacent carrier to which the BICI transmission path is connected. This parameter is only needed by the ATM NE to support SVCs.
12. Loopback Location Code: This parameter matches a corresponding parameter in incoming cells that are to be looped back at this interface. (optional)

13. UPC/NPC Information: This parameter determines whether or not policing shall be done for all connections at the interface (optional). If this parameter is not present at the M4 interface, policing is performed at UNIs and BICIs and not performed at BISSIs.
14. Total Ingress Bandwidth: This parameter identifies the total amount of ingress bandwidth for an ATM interface.
15. Total Egress Bandwidth: This parameter identifies the total amount of egress bandwidth for an ATM interface.

(R) CM-6 The M4 Interface shall support management system requests to configure V-UNIs. The following information shall be provided with each configuration request. ILMI requires items 3 through 10.

1. Interface ID
2. ID of the associated Vb interface(s) at the ATM NE
3. Local Maximum Number of VPCs Supportable: This parameter identifies the number of VPCs that can be supported on the V-UNI by the ATM NE at its end of the interface and at associated VP multiplexer interfaces. It must be equal to or less than the sum of Actual Number of VPCs Supportable for associated Vb interfaces.
4. Actual Number of VPCs Supportable: This parameter identifies the maximum number of VPCs that can be simultaneously supported on the V-UNI interface. If an ILMI is active, this value is calculated by ILMI as the smaller of the two local Maximum Number of VPCs at each end of the interface.
5. Local Maximum Number of VCCs Supportable: This parameter identifies the number of VCCs that can be supported on the V-UNI by the ATM NE at its end of the interface. It must be equal to or less than the sum of Actual Number of VCCs Supportable for associated Vb interfaces.
6. Actual Number of VCCs Supportable: This parameter identifies the maximum number of VCCs that can be simultaneously supported on the V-UNI interface. If an ILMI is active, this value is calculated by ILMI as the smaller of the two local Maximum Number of VCCs at each end of the interface.
7. Network Maximum Number of Allocated VPI Bits: This parameter identifies the maximum number of allocated bits of the VPI sub-field that can be supported on the UNI at the VP multiplexer.
8. Actual Number of Allocated VPI Bits: This parameter identifies the number of allocated VPI bits to be used on the UNI interface. If an ILMI is active, this value is calculated by the ILMI as the smaller of the Network Maximum Number of Allocated VPI Bits and the user side Local Maximum Number of Allocated VPI Bits. . Note that the network side of the UNI is at a VP multiplexer.
9. Local Maximum Number of Allocated VCI Bits: This parameter identifies the maximum number of allocated bits of the VCI sub-field that can be supported by the ATM NE at its end of the interface. It must be equal to or less than the Actual Number of VCI Bits supportable for each associated Vb interface.
10. Actual Number of Allocated VCI Bits: This parameter identifies the number of allocated VCI bits to be used on the interface. If an ILMI is active, this value is calculated by the ILMI as the smaller of the Local Maximum Number of Allocated VCI Bits at each end of the interface.

(R) CM-7 The M4 Interface shall support management system requests to configure UNIs and V-UNIs that support ILMI with the following information in addition to CM-5 or CM-6. The following information shall be provided with each configuration request:

1. ILMI Channel Identifier: This parameter identifies the VPI/VCI pair used to support the ILMI across the UNI. The default value for this parameter is 0/16.
2. ILMI Establishment Connectivity Poll Interval: (parameter applies to UNIs only) This parameter defines the amount of time S between successive transmissions of ILMI messages on this interface for the purpose of detecting establishment of ILMI connectivity. The default value for this parameter is 1.
3. ILMI Check Connectivity Poll Interval: (parameter applies to UNIs only) This parameter defines the amount of time T between successive transmissions of ILMI messages on this interface for the purpose of detecting loss of ILMI connectivity. The value zero disables ILMI connectivity procedures on this interface. The default value for this parameter is 5.
4. ILMI Connectivity Poll Factor: (parameter applies to UNIs only) This parameter defines the number K of consecutive polls on this interface for which no ILMI response message is received before ILMI connectivity is declared lost. The default value for this parameter is 4.
5. ILMI Connectivity State: (parameter applies to UNIs only) This parameter shows the connectivity state of ILMI. The value could be “up” or “down”. If ILMI is not defined is the value “unknown”.

(R) CM-8 The M4 Interface shall support management system requests to configure UNIs and V-UNIs that support SVCs with the following information in addition to **CM-5** or **CM-6**, and **CM-7**. The following information shall be provided with each configuration request:

1. Charge Number: This parameter identifies the subscriber address that will be billed for SVC services provided to the associated UNI or V-UNI.
2. Originating Line Information: This parameter identifies the information needed to process charging information when interconnecting through an interexchange carrier in ANSI-based networks. This parameter is optional.

(R) CM-9 The M4 Interface shall support management system requests to configure UNIs that support SVCs with the following information in addition to CM-8. The following information shall be provided with each configuration request:

1. Local Maximum SVCC VPI: This parameter identifies the maximum VPI value that the ATM NE (i.e., the local end of the UNI) is willing to use for SVCCs on a UNI. This parameter is required if ILMI is supported. If ILMI is not supported, it is optional.
2. Actual Maximum SVCC VPI: This parameter identifies the maximum VPI to be used on a UNI for SVCCs. If an ILMI is active, this value is calculated by the ILMI as the smaller of the Local Maximum SVCC VPI values at each end of the UNI. This parameter is required if ILMI is supported. If ILMI is not supported, it is optional.
3. Local Minimum SVCC VCI: This parameter identifies the minimum VCI value that the ATM NE (i.e., the local end of the UNI) is willing to use for SVCCs on a UNI. This parameter is required if ILMI is supported. If ILMI is not supported, it is optional.
4. Actual Minimum SVCC VCI: This parameter identifies the minimum VCI to be used on a UNI for SVPCs. If an ILMI is active, this value is calculated by the ILMI as the larger of the Local Minimum SVCC VCI values at each end of the UNI. This parameter is required if ILMI is supported. If ILMI is not supported, it is optional.

(R) CM-10 The M4 Interface shall support management system requests to configure V-UNIs that support SVCs with the following information in addition to CM-8. The following information shall be provided with each configuration request:

1. Network Maximum SVCC VPI: This parameter identifies the maximum VPI value that the VP multiplexer (i.e., the network side of the UNI) is willing to use for SVCCs on a UNI. This parameter is required if ILMI is supported. If ILMI is not supported, it is optional. Note that the network side of the UNI is at a VP-multiplexer.
2. Actual Maximum SVCC VPI: This parameter identifies the maximum VPI to be used on a UNI for SVCCs. If an ILMI is active, this value is calculated by the ILMI as the smaller of the Network Maximum SVCC VPI values and the User's Local Maximum SVCC VPI value. This parameter is required if ILMI is supported. If ILMI is not supported, it is optional.
3. Local Minimum SVCC VCI: This parameter identifies the minimum VCI value that the ATM NE is willing to use for SVCCs on a V-UNI. This parameter is required if ILMI is supported. If ILMI is not supported, it is optional.
4. Actual Minimum SVCC VCI: This parameter identifies the minimum VCI to be used on a V-UNI for SVPCs. If an ILMI is active, this value is calculated by the ILMI as the *larger* of the Local Minimum SVCC VCI values at each end of the interface. This parameter is required if ILMI is supported. If ILMI is not supported, it is optional.

(R) CM-11 The M4 Interface shall support management system requests to retrieve configuration data associated with each UNI, BISSI, or BICI terminating on the ATM NE.

(R) CM-12 The M4 Interface shall support management system requests to reconfigure the data elements identified in **CM-5**.

2.1.2.3. Related Managed Entities

The managed entities defined in Section 3 that are required to support the configuration and reconfiguration of UNIs, BICIs, and BISSIs in an ATM NE are as follows:

- ATM NE
- ATM Access Profile
- BICI
- BISSI
- Physical Path Termination Point
- TC Adaptor
- UNI
- UNI Info

2.1.3. Configuration of VPL/VCL Termination Points and Cross-Connections

Figure 2-4 illustrates the hierarchical relationship between physical paths, ATM links, and ATM connections. This figure illustrates the following key points:

- A physical path, once terminated, may be channelized into one or more VPLs
- A VPC, once terminated, may be channelized into one or more VCLs
- VPCs are composed of one or more (cross-connected) VPLs
- VCCs are composed of one or more (cross-connected) VCLs

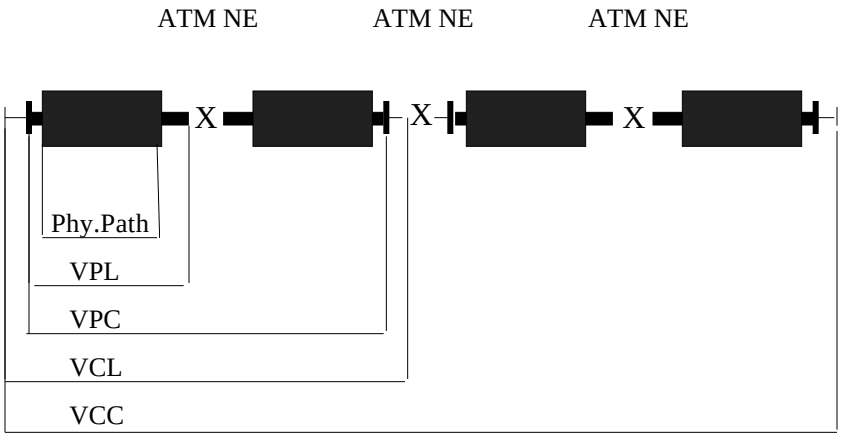


Figure 2-4 ATM Transport Network Hierarchy

These key points are reflected in the operations interface functions that follow:

When a VPL or VCL is configured, the set of traffic parameters that apply will depend on the service category and conformance definition specified by the used traffic descriptor (see section 2.1.8).

When a VPL is configured for use, it may support VP PVC service, VC PVC service or Switched VCC use. In the latter two cases, it is possible that traffic parameters would only apply at the VCC level. Therefore, for a VPL, traffic parameters are only mandatory when the VPL supports VP PVC service. Therefore, the specification of the

type of service that is supported (i.e., the "VPL Service Type") determines what future actions may be taken regarding adding VCLs at that ATM NE, and which traffic parameter combinations are valid.

(R) CM-13 The M4 Interface shall support management system requests to establish permanent VPL-to-VPL cross-connections and permanent VCL-to-VCL cross-connections in an ATM NE. In order to establish a point-to-point ATM cross-connection, the management system must supply the ATM NE with the following information and information as described in section 2.1.8, some of which may be "null":

1. Each end-point to cross connect, specified as (a) or (c) for VPL-to-VPL cross-connection, and (b) or (d) for VCL-to-VCL cross-connection:
   a. the VPI value of a VPL termination within a specific ATM Interface.
   b. the VCI value of a VCL termination within a specific VPC or the identity of an existing VCL termination point.
   c. the identity of the supporting ATM Interface termination point (ATM NE selects the VPI value within the ATM Interface)
   d. the identity of the supporting VPC termination point (ATM NE selects the VCI value within the VPC)
2. Indication whether or not frame discard is enabled/disabled for ingress and egress [applicable to VCLs only]. The frame discard indicator indicates whether the network is allowed to treat the cells of the associated connection as parts of higher-layer frames (specifically, AAL5 CPCS PDUs). (optional)
3. Indication of the traffic descriptors to be used (see section 2.1.8).

(R) CM-14 The M4 Interface shall support management system requests to tear-down existing VPL and VCL cross-connections in an ATM NE and release the resources (e.g., bandwidth) assigned to the individual VPLs or VCLs being cross-connected.

(R) CM-15 The M4 Interface shall support management system requests to inhibit and allow the switching of ATM cells through the fabric for a particular VP/VC cross connection. While cell flow is inhibited, the ATM NE shall continue to maintain the cross-connect relationship and resources assigned to the termination points.

(R) CM-16 The M4 Interface shall support management system requests to retrieve the following configuration data associated with previously configured VPL and VCL termination points in the ATM NE and information as described in section 2.1.8.

1. The ATM Interface Supporting the VPL or VCL being Terminated
2. VPI or VCI Value
   a. VPL Service Category (for VPLs only).
3. Identification of the traffic descriptors being used (See section 2.1.8).
4. Frame discard configuration (VCL only, and only if supported)

(R) CM-17 The M4 Interface shall support management system requests to establish multipoint VPL and VCL cross-connections in the ATM NE. Provided with each multipoint cross-connect request shall be the following information:

1. Multipoint Connection Type (multicast, merge, multicast/merge, full multipoint)
2. Primary VPL or VCL Termination Point For broadcast, merge, and multicast/merge cross-connect types, this parameter identifies the VPL or VCL termination point that generates traffic to be broadcasted and/or receives traffic that has been merged (see Figure 2-5). This parameter shall be set to NULL for full multipoint cross-connection types.
3. Traffic Descriptors for the Primary Termination Point (if one exists)
4. Common VPL or VCL Termination Points This parameter identifies all VPL or VCL termination points involved in the multipoint cross-connection except the primary VPL or VCL termination point (see Figure 2-5).
5. Traffic Descriptors for each Common Termination Point

NOTE: While Item 1 above has multiple values, allowing for several different forms of "multipoint" cross-connections, it should be noted that the ATM Forum UNI Specification only defines point-to-multipoint (i.e., multicast) connections at this time. Therefore, all other forms of multipoint support beyond point-to-multipoint arrangements are considered optional.

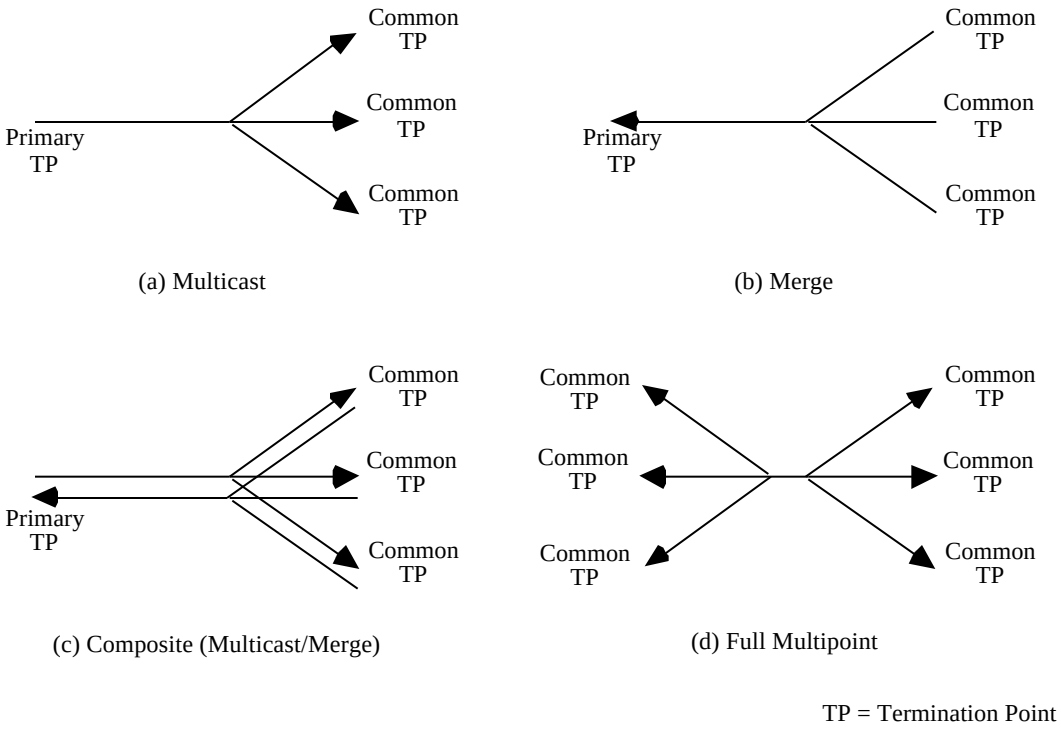


Figure 2-5 Multipoint Connection Types

(R) CM-18 The M4 Interface shall support management system requests to tear-down multipoint VPL and VCL cross-connections in an ATM NE.

(R) CM-19 The M4 Interface shall support management system requests to individually inhibit and allow the flow of ATM cells to and from each VPL or VCL termination of a multipoint cross-connection.

(R) CM-20 The M4 Interface shall support management system requests to add VPL or VCL termination points to an existing multipoint cross-connect arrangement.

(R) CM-21 The M4 Interface shall support management system requests to remove VPL or VCL termination points from an existing multipoint cross-connection.

(O) CM-22 The M4 Interface should support management system requests to configure specific ATM VP/VC cross-connect Relationships as either "recoverable" or "non-recoverable". Recoverable cross-connect Relationships remain intact regardless of the operational state of the supporting VP/VC. A non-recoverable cross-connection is one that is automatically torn down (i.e., released) by the ATM NE upon detection of a service affecting failure.

2.1.3.1. Related Managed Entities

The managed entities defined in Section 3 that are needed to support ATM VP/VC cross-connection are as follows:

- ATM NE
- ATM Cross Connection
- ATM Cross Connection Control
- Multipoint Bridge
- TC Adaptor
- Traffic Descriptor
- VCL Termination Point
- VPC Termination Point
- VPL Termination Point

2.1.4. Configuration of VPC and VCC OAM Segment End-points

This section defines the ATM NE management interface functions that enable management systems to configure VPL or VCL termination points as either a *segment* or *non-segment* end-point. The ATM Forum UNI Specification [af-uni-0011.000] and BICI Specification [af-bici-0013.002] documents define fixed single-link VPC and VCC segments across the UNI and BICI, respectively. Therefore, the management system need not request the ATM NEs to configure such link terminations as *segment* end points. Such assignments would be automatically performed by the ATM NEs terminating the UNIs and BICIs at the time the VPLs and/or VCLs are configured. The management system may, however, configure and reconfigure other VP/VC link terminations as *segment* end-points. Figure 2-6 shows some example scenarios of how segments may be configured in a carrier's network.

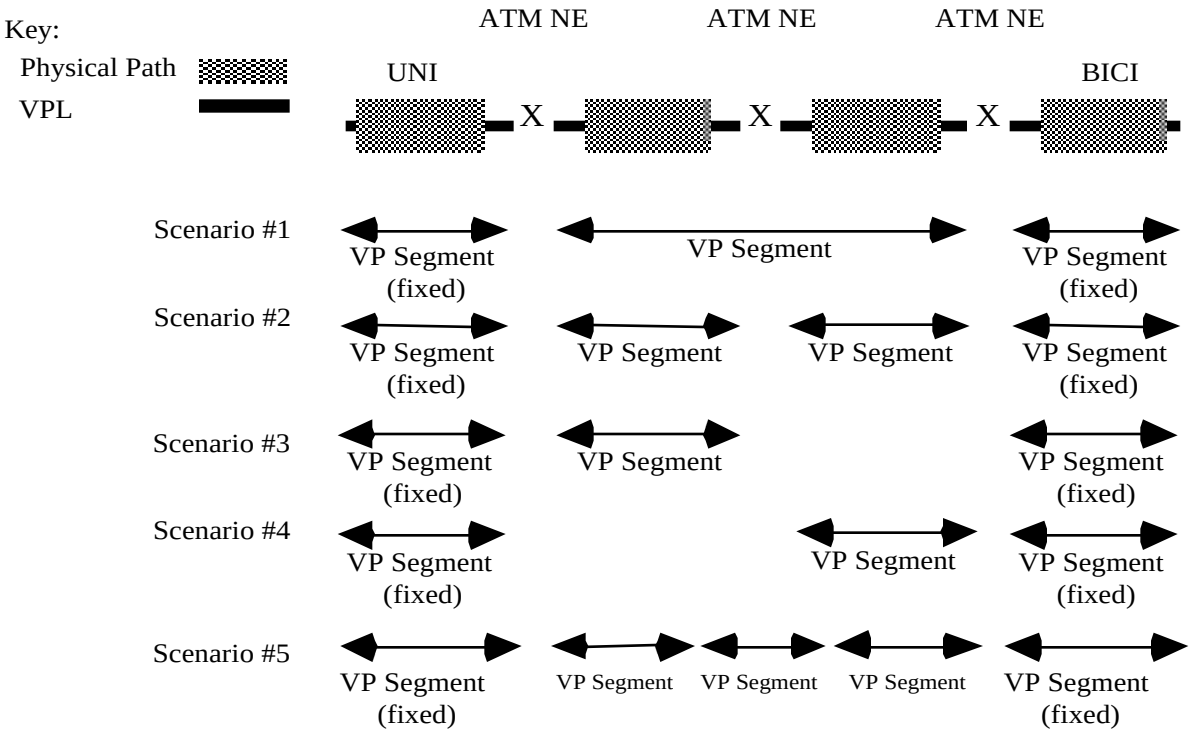


Figure 2-6 Example VPC Segment Configuration Scenarios

The following operations interface functions are required to support the configuration and reconfiguration of VPC and VCC segments:

(R) CM-23 The M4 Interface shall support management system requests to configure and reconfigure active VPL and VCL termination points as either *segment* or *non-segment* end-points.

(O) CM-24 The M4 Interface should support management system requests to configure and reconfigure the directionality aspect of a segment end point as: INTO_NE, OUT_OF_NE or both.

Note that the above requirement aligns functionally with ITU-T [I.610] and [I.751] and can be needed to support cases such as:

- when there are two contiguous segments and the cross connection between the two segments cannot be supervised by a segment OAM flow or
- when it is not possible to define a segment inside a subnetwork that can stay active after a failure followed by re-routing.

(R) CM-25 The M4 Interface shall support management system requests to retrieve the data stored in the ATM NE that identifies whether a particular VPL or VCL termination point has or has not been configured as a segment end-point.

Note that the details of how to make segments into a multipoint connection is for future study.

2.1.4.1. Related Managed Entities

The managed entities defined in Section 3 that are required to support the configuration and reconfiguration of VPC and VCC segments are as follows:

- ATM NE
- TC Adaptor
- VCL Termination Point
- VPL Termination Point

2.1.5. Event Flow Control - Event Forwarding Discriminator Function

There are a variety of notifications that are autonomously generated by the ATM NE to the management system. Examples include alarms, configuration updates, and threshold crossing alerts. At times, it may be necessary for the management system to configure the ATM NE to selectively suppress outbound notifications and only pass up to the management system those notifications that meet a specified set of criteria. The suppression of ATM NE-generated notifications would be based on one or more of the following: (1) notification type; (2) specific detail(s) of a notification type (e.g., the severity of an alarm); (3) type of managed entity reporting the notification; or (4) specific detail(s) about the managed entity reporting the notification .

(R) CM-26 The M4 Interface shall support management system messages used to configure the ATM NE to suppress specific notifications. The management system shall be able to configure the ATM NE such that notifications are suppressed based on one or more of the following:

- Notification Type (e.g., specific alarm or threshold crossing alert)
- Specific Aspect(s) of a Notification Type (e.g., perceived severity)
- Type of Managed Entity Reporting the Notification
- Specific Aspect(s) of the Managed Entity Reporting the Notification

2.1.5.1. Related Managed Entities

The following managed entities are required to support the suppression of ATM NE-generated notifications:

- ATM NE
- Event Forwarding Discriminator

2.1.6. Physical Transmission Interface Management

(R) CM-27 The M4 interface shall support the configuration of the physical transmission interfaces used by the NE. These interfaces can vary with the NE, its function and its geographic location. Possible interfaces include DS1 & DS3, E1 & E3, J2 and SONET SDH physical connections. Additional interfaces are possible beyond the ones listed here. An NE does not have to support all types of physical interfaces, but shall be able to support the configuration of the interfaces that it uses. Because of this, the following functions are required if the NE supports the corresponding optional physical interface.

(CR) CM-28 The M4 interface shall support the configuration management of E1 interfaces if an E1 interface is present on the NE. ITU-T Recommendations [G.704], [G.706], [G.826] describe the E1 PDH (Pliesochronous Digital Hierarchy) interface and its configuration management. Additionally, ITU-T Recommendations [G.703], [G.804], [G.823]] and ETSI specifications [EST 300 213], [EST 300 214] provide additional functional descriptions on the characteristics of the interface.

(CR) CM-29 The M4 interface shall support the configuration management of E3 interfaces if an E3 interface is present on the NE. ITU-T Recommendations [G.826], [G.832] describe the E3 PDH (Pliesochronous Digital Hierarchy) interface and its configuration management. Additionally, ITU-T Recommendations [G.703], [G.823] and ETSI specifications [EST 300 337], [EST 300 213], [EST 300 214] provide additional functional descriptions on the characteristics of the interface.

(CR) CM-30 The M4 interface shall support the configuration management of DS1 interfaces if an DS1 interface is present on the NE. ANSI document [T1.247] and Bellcore document [GR-836] describe the DS1 PDH (Pliesochronous Digital Hierarchy) interface and its configuration management. . Additionally, ITU-T Recommendations [G.703], [G.704] and ANSI specifications [T1.107], [T1.408] provide additional functional descriptions on the characteristics of the interface.

(CR) CM-31 The M4 interface shall support the configuration management of DS3 interfaces if an DS3 interface is present on the NE. ANSI document [T1.119] and Bellcore document [GR-836] describe the DS3 PDH (Pliesochronous Digital Hierarchy) interface and its configuration management. Additionally, ITU-T Recommendations [G.703], [G.704] and ANSI specification [T1.240] provide additional functional descriptions on the characteristics of the interface.

(CR) CM-32 The M4 interface shall support the configuration management of J2 interfaces if an J2 interface is present on the NE. The standards describing this interface are still in progress, but initial requirements can be found in [af-phy-029.000].

(CR) CM-33 The M4 interface shall support the configuration management of SDH or SONET interfaces if an SDH or SONET interface is present on the NE. ITU-T Recommendations [G.774] series and [GR-1042] describe the Synchronous Digital Hierarchy interfaces and their configuration management. (Note that SONET (Synchronous Optical NETwork) interfaces are managed using the SDH objects.) ANSI specification [T1.119] provides additional information on SONET management.

(CR) CM-34 The M4 interface shall support the configuration management of any other physical interfaces if that interface is present on the NE. These shall include but not be limited to the known interfaces of TAXI, 25Mbps, ADSL, Wireless ATM(WATM) and 51Mbps. Support of these interfaces is for future study.

2.1.6.1. Related Managed Entities

The managed entities needed to support the above requirements are not within the scope of this document. However, their definition would generally follow the object class definitions in the above referenced standards.

2.1.7. AAL Management

Overview of AAL Management

AAL management criteria vary depending on the AAL Type (i.e., Type 1, Type 3/4, or Type 5). Note that although most AAL processing is done outside the public network, there are expected to be some ATM PVCs for which AAL processing resides in the public network. Connections that terminate on Inter-Working Units, connections that terminate on higher-layer Packet Handlers, as well as, connections that support signaling or operations message transfer are just a few examples. The criteria presented in this paper applies only to those connections for which AAL processing and associated management is the responsibility of the public network.

The ATM Forum UNI Specification Version 4.0 defines an AAL Parameters Information and BICI Version 2.0 defines an *AAL Parameters Parameter*. This *information element* is used during the SVC set-up process to negotiate AAL-specific parameters that characterize the desired AAL processing to be performed at both ends of the SVC. While the ATM Forum UNI Specification only addresses the configuration of AAL parameters from an SVC perspective, the need to configure AAL parameters would seem to apply to some, network-terminated PVCs as well.

(R) CM-35 The M4 Interface shall support management system requests to configure the AAL Type for a given VCC termination point in an ATM NE. Valid values are: AAL Type 1, Type 2 (for future use), Type 3/4, and Type 5.

2.1.7.1. AAL Type 1 Configuration Information

(CR) CM-36 If the NE supports AAL Type 1 connections, the following configuration information shall be readable by the management system across the M4 Interface. If the NE needs this information to be configured by the management system, this information shall also be configurable across the M4 interface.

1. The AAL type 1 subtype used by the CBR service application (e.g. 64 KBPS voice band signal transport, circuit transport)
2. The CBR service application rate (e.g. 64 KBPS, 1544 KBPS, 44736 KBPS, n x 64 KBPS)
3. The source clock frequency recovery method in use:
   - Synchronous or
   - Asynchronous - Synchronous Residual Time Stamp (SRTS) or
   - Asynchronous - Adaptive Clock.
4. Structured Data Transfer (SDT) Block Size ($1 < \text{Block Size} < 2^{16} - 1$ in octets) (optional)
5. Partial Cell Payload Fill ($0 <$ Payload Fill < 47 octets of AAL user information) (optional)
6. Forward Error Correction (FEC) Type (optional)
   - No forward error correction (FEC)
   - FEC for Loss Sensitive Signal Transport (i.e., (128,124) Reed-Solomon encoded long interleaver)
   - FEC for Delay Sensitive Signal Transport (i.e., (94, 88) Reed-Solomon encoded short interleaver)
7. Cell Loss Integration Period (in milliseconds)

2.1.7.2. AAL Type 3/4 Configuration Information

(CR) CM-37 If the NE supports AAL Type 3/4 VCC termination points, the following configuration information shall be readable by the management system across the M4 Interface. If the NE needs this information to be configured by the management system, this information shall also be configurable across the M4 interface.

1. Message Identifier (MID) field range (i.e., the lowest and highest MID field values)
2. Maximum CPCS_SDU Size (i.e., upper bound on the AAL type 3/4 CPCS_SDU size in octets where the SDU size range is $0 \leq \text{SDU} \leq 2^{16} - 1$ octets)
   - for the forward direction (i.e., the calling user to called user direction for SVC service)
   - for the backward direction (i.e., called user to calling user direction for SVC service)

3. Mode of operation:
   - message or streaming
   - assured or unassured
4. Identify AAL type 3/4 convergence sub-layer protocol options applicable to the specific service application supported by the AAL (i.e., AAL type 3/4 SSCS).

2.1.7.3. AAL Type 5 Configuration Information

(CR) CM-38 If the NE supports AAL Type 5 VCC termination points, the following configuration information shall be readable by the management system across the M4 Interface. If the NE needs this information to be configured by the management system, this information shall also be configurable across the M4 interface.

1. Maximum CPCS_SDU Size (i.e., upper bound on the AAL type 5 CPCS_SDU size in octets where the SDU size range is $0 \leq SDU \leq 2^{16} - 1$ octets)
   - for the forward direction (i.e., the calling user to called user direction for SVC service) and
   - for the backward direction (i.e., called user to calling user direction for SVC service)
2. Mode of operation (e.g. message or streaming, assured or unassured)
3. Identify AAL type 5 convergence sub-layer protocol options applicable to the specific service application supported by the AAL (i.e., AAL type 5 SSCS).

2.1.7.4. Related Managed Entities

The managed entities needed to support the above requirements are:

- AAL1 Profile
- AAL3/4 Profile
- AAL5 Profile

2.1.8. Traffic Descriptors Management

This section describes the various traffic descriptors for the different types of services. Note that traffic descriptors includes QoS (Quality of Service) parameters.

Traffic descriptors, particularly those used to describe ABR service, can require the specification of a large number of parameters. The approach used in this document reduces the replication of identical traffic descriptor data associated with each of many VCL Termination Points and VPL Termination Points and provides that instances of the Traffic Descriptor managed entity be contained in the ATM NE. A VCL Termination Point or a VPL Termination Point is associated by means of a pointer with the appropriate instance of the Traffic Descriptor managed entity. This approach is consistent with the ATM Forum's M4 Network View, product specific implementations, implementation of new traffic classes and expanded services.

(CR) CM-39 If the NE supports Constant Bit Rate service, then the M4 interface should support the following parameters in the traffic descriptor profile.

1. PCR Peak Cell Rate (ingress and egress) for the CLP =0+1 traffic flow.
2. CDVT Cell Delay Variation Tolerance (ingress and egress) in relation to the PCR of the for the CLP =0+1 traffic flow.
3. CLR Maximum permissible Cell Loss Ratio (ingress and egress) for the CLP =0+1 traffic flow.

(CR) CM-40 If the NE supports Non Real-time Variable Bit Rate service following the VBR.1 Conformance Definition, then the M4 interface should support the following parameters in the traffic descriptor profile.

1. PCR Peak Cell Rate (ingress and egress) for the CLP =0+1 traffic flow.
2. SCR Sustainable Cell Rate (ingress and egress) for the CLP =0+1 traffic flow.
3. MBS Maximum Burst Size (ingress and egress) for the CLP =0+1 traffic flow.

4. CDVT Cell Delay Variation Tolerance (ingress and egress) in relation to the PCR of the for the CLP =0+1 traffic flow.
5. CLR Maximum permissible cell Loss Ratio (ingress and egress) for the CLP =0+1 traffic flow.

Note: ITU-T Recommendation[I.371] identifies the use of a second CDVT value for SCR.

(CR) CM-41 If the NE supports Non Real-time Variable Bit Rate service following the VBR.2 Conformance Definition, then the M4 interface should support the following parameters in the traffic descriptor profile.

1. PCR Peak Cell Rate (ingress and egress) for the CLP =0+1 traffic flow.
2. SCR Sustainable Cell Rate (ingress and egress) for the CLP =0 traffic flow.
3. MBS Maximum Burst Size (ingress and egress) for the CLP =0 traffic flow.
4. CDVT Cell Delay Variation Tolerance (ingress and egress) in relation to the PCR of the for the CLP =0+1 traffic flow.
5. CLR Maximum permissible Cell Loss Ratio (ingress and egress) for the CLP =0 traffic flow

Note: ITU-T Recommendation[I.371] identifies the use of a second CDVT value for SCR.

(CR) CM-42 If the NE supports Non Real-time Variable Bit Rate service following the VBR.3 Conformance Definition, then the M4 interface should support the following parameters in the traffic descriptor profile. Tagging option applies.

1. PCR Peak Cell Rate (ingress and egress) for the CLP =0+1 traffic flow.
2. SCR Sustainable Cell Rate (ingress and egress) for the CLP =0 traffic flow. If tagging is supported by the network, a CLP=0 cell that is not conforming to the SCR objective, but is conforming to the PCR objective, will have its CLP bit changed to 1.
3. MBS Maximum Burst Size (ingress and egress) for the CLP =0 traffic flow.
4. CDVT Cell Delay Variation Tolerance (ingress and egress) in relation to the PCR of the for the CLP =0+1 traffic flow.
5. CLR Maximum permissible Cell Loss Ratio (ingress and egress) for the CLP =0 traffic flow.

Note: ITU-T Recommendation[I.371] identifies the use of a second CDVT value for SCR.

(CR) CM-43 If the NE supports Real-time Variable Bit Rate service following the VBR.1 Conformance Definition, then the M4 interface should support the following parameters in the traffic descriptor profile. The difference between rt-VBR compared to nrt-VBR is the QoS parameters.

1. PCR Peak Cell Rate (ingress and egress) for the CLP =0+1 traffic flow.
2. SCR Sustainable Cell Rate (ingress and egress) for the CLP =0+1 traffic flow.
3. MBS Maximum Burst Size (ingress and egress) for the CLP =0+1 traffic flow.
4. CDVT Cell Delay Variation Tolerance (ingress and egress) in relation to the PCR of the for the CLP =0+1 traffic flow.
5. CLR Maximum permissible Cell Loss Ratio (ingress and egress) for the CLP =0+1 traffic flow.

Note: ITU-T Recommendation[I.371] identifies the use of a second CDVT value for SCR.

(CR) CM-44 If the NE supports Real-time Variable Bit Rate service following the VBR.2 Conformance Definition, then the M4 interface should support the following parameters in the traffic descriptor profile. The difference between rt-VBR compared to nrt-VBR is the QoS parameters.

1. PCR Peak Cell Rate (ingress and egress) for the CLP =0+1 traffic flow.
2. SCR Sustainable Cell Rate (ingress and egress) for the CLP =0 traffic flow.
3. MBS Maximum Burst Size (ingress and egress) for the CLP =0 traffic flow.
4. CDVT Cell Delay Variation Tolerance (ingress and egress) in relation to the PCR of the for the CLP =0+1 traffic flow.

5. CLR Maximum permissible Cell Loss Ratio (ingress and egress) for the CLP =0 traffic flow.

Note: ITU-T Recommendation[I.371] identifies the use of a second CDVT value for SCR.

(CR) CM-45 If the NE supports Real-time Variable Bit Rate service following the VBR.3 Conformance Definition, then the M4 interface should support the following parameters in the traffic descriptor profile Tagging option applies.

1. PCR Peak Cell Rate (ingress and egress) for the CLP =0+1 traffic flow.
2. SCR Sustainable Cell Rate (ingress and egress) for the CLP =0 traffic flow. If tagging is supported by the network, a CLP=0 cell that is not conforming to the SCR objective, but is conforming to the PCR objective, will have its CLP bit changed to 1.
3. MBS Maximum Burst Size (ingress and egress) for the CLP =0 traffic flow.
4. CDVT Cell Delay Variation Tolerance (ingress and egress) in relation to the PCR of the for the CLP =0+1 traffic flow.
5. CLR Maximum permissible Cell Loss Ratio (ingress and egress) for the CLP =0 traffic flow.

Note: ITU-T Recommendation[I.371] identifies the use of a second CDVT value for SCR.

(CR) CM-46 If the NE supports Unspecified Bit Rate service following the UBR.1 Conformance Definition, then the M4 interface should support the following parameters in the traffic descriptor profile. UBR service does not guarantee the PCR or any QoS parameters.

1. PCR Peak Cell Rate (ingress and egress) for the CLP =0+1 traffic flow. The use of PCR for CAC, and enforcement of PCR by UPC/NPC, is network specific .
2. CDVT Cell Delay Variation Tolerance (ingress and egress) in relation to the PCR of the for the CLP =0+1 traffic flow.

(CR) CM-47 If the NE supports Unspecified Bit Rate service following the UBR.2 Conformance Definition, then the M4 interface should support the following parameters in the traffic descriptor profile. UBR service does not guarantee the PCR or any QoS parameters. Tagging option applies, the network may overwrite the CLP bit to 1 for any cell of the connection.

1. PCR Peak Cell Rate (ingress and egress) for the CLP =0+1 traffic flow. The use of PCR for CAC, and enforcement of PCR by UPC/NPC, is network specific.
2. CDVT Cell Delay Variation Tolerance (ingress and egress) in relation to the PCR of the for the CLP =0+1 traffic flow.

If the NE supports Available Bit Rate service, then the M4 interface should support the traffic service related requirements to support enhanced functions of Traffic Management 4.0, in the context of the M4 Network View interface. Specifically the following detailed requirements shall be supported and the objective **CM-49** is desirable:

(CR) CM-48 If the NE supports Available Bit Rate service, then the M4 interface should support the following parameters in the traffic descriptor profile:

1. PCR Peak Cell Rate (ingress and egress) for the CLP =0 traffic flow.
2. MCR Minimum Cell Rate (ingress and egress) for the CLP =0 traffic flow.
3. CDVT Cell Delay Variation Tolerance (ingress and egress) in relation to the PCR of the for the CLP =0 traffic flow.
4. ICR Initial Cell Rate (ingress and egress). Rate at which a source should send initially and after an idle period. The unit is an integer number of cells/second. The value must not exceed PCR, and is usually lower.
5. TBE Transient Buffer Exposure (ingress and egress). The number of cells that the network would like to limit the source to sending during startup periods, before the first RM cell returns.
6. FRTT Fixed Round-Trip Time. The sum of the fixed and propagation delays from the source to the destination and back.

7. RDF Rate Decrease Factor (ingress and egress). Controls the rate decrease which occurs when backward RM cells with CI =1, are received. Allowed values are in {1/32768, 1/16384, 1/8192, 1/4096, 1/2048, 1/1024, 1/512, 1/ 256, 1/128, 1/64, 1/32, 1/16, 1/8, 1/4, 1/2, 1}
8. RIF Rate Increment Factor (ingress and egress). Controls the rate at which the rate increases, when a backward RM cell is received with CI =0 and NI =0. Allowed values are in {1/32768, 1/16384, 1/8192, 1/4096, 1/2048, 1/1024, 1/512, 1/256, 1/128, 1/64, 1/32, 1/16, 1/8, 1/4, 1/2, 1}

(O) CM-49 If the NE supports Available Bit Rate service, then it is desirable that the M4 interface supports the following parameters in the traffic descriptor profile:

1. Nrm Number RM (ingress and egress). The maximum number of data cells a source may send for each forward RM cell. Allowed values are in {2, 4, 8, 16, 32, 64, 128, 256}.
2. Trm Time RM (ingress and egress). Upper bound on the time between forward RM cells for an active source. Allowed values are computed as 100 * 2^(-k), where 0 <= k <= 7. The resulting range is from 0.78125 ms to 100 ms, with the default being 100 ms.
3. CDF Cutoff Decrease Factor (ingress and egress). Controls the rate decrease associated with lost or delayed backward RM cells). Allowed values are in {0, 1/64, 1/32, 1/16, 1/8, 1/4, 1/2, 1}
4. ADTF ACR Decrease Time Factor (ingress and egress). Time permitted between sending RM cells, before the rate is decreased to ICR. Range is 10 ms to 10.23 seconds, in increments of 10 ms.

(O) CM-50 It is desirable that all traffic descriptor profiles should support the following parameter.

1. Profile Name A user defined name for the managed entity instance.

2.1.8.1. Related Managed Entities

The managed entities needed to support the above requirements are:

- ATM NE
- Traffic Descriptor
- VCL Termination Point
- VPL Termination Point

2.1.9. CES Interworking Management

This section identifies the ATM NE management interface functions that enable management systems to configure Interworking Functions (e.g. Circuit Emulation Service). The requirements in this section are required if the network element supports CES Interworking.

(CR) CM-51 If the NE supports CES, then the M4 Interface shall support management system requests to configure an Interworking VCC Termination Point. The following information shall be provided with each configuration request:

- Upstream and Downstream Connectivity Pointer (points to vcCTP)
- VPI value (agent selects this value)
- CES Service Profile Pointer
- AAL Profile Pointer
- Termination Points List (ordered list of TPs which are being interworked)
- Operational State
- Administrative State
- Current Problem List
- Alarm Status
- Alarm Severity Assignment Profile Pointer

(CR) CM-52 If the NE supports CES, then the M4 Interface shall support management system requests to retrieve configuration data associated with each Interworking VCC Termination Point.

(CR) CM-53 If the NE supports CES, then the M4 Interface shall support management system requests to reconfigure the data elements identified in CM-59.

(CR) CM-54 If the NE supports CES, then the M4 Interface shall support management system requests to add or remove interworked termination points from Termination Points List.

(CR) CM-55 If the NE supports CES, then the M4 Interface shall support management system requests to configure CES Service Profile. The following information shall be provided with each configuration request:

- CES Service Profile ID
- Buffered CDV tolerance timing in 10 micro seconds increment
- Channel Associated Signaling

(CR) CM-56 If the NE supports CES, then the M4 Interface shall support management system requests to retrieve configuration data associated with each CES Service Profile.

(CR) CM-57 If the NE supports CES, then the M4 Interface shall support management system requests to reconfigure the data elements identified in CM-63.

2.1.9.1. Related Managed Entities

The management entities that are needed to support the configuration of Interworking functions are as follows:

- ATM NE
- Interworking VCC Termination Point
- CES Service Profile
- VCL Termination Point

2.1.10. ABR Service Configuration Management

In ABR service, the source adapts its rate to changing network conditions. Information about the state of the network is conveyed to the source through Resource Management Cells (RM-cells). To support ABR services, a number of congestion control mechanisms may be used by the ATM NEs to convey the network status.

(CR) CM-58 If the NE supports ABR service, then the M4 interface shall support a management system's requests to retrieve an indication of which of the following ABR control mechanisms are supported at each NE, and which of these ABR control mechanisms is active at each NE.

· EFCI Marking

· Relative Rate Marking

· Explicit Rate marking

(CR) CM-59 If the NE supports ABR service, and if more than one ABR control mechanism is supported by the NE, then the M4 interface should support managing system requests to configure two or more ABR control mechanisms at the NE.

(CR) CM-60 If the NE supports ABR service, then the M4 interface shall support a management system's requests to retrieve an indication of whether or not VS/VD (Virtual Source/Virtual Destination) control is supported at each NE interface, and, if supported, whether or not VS/VD control is active at each NE interface and optionally on a VP basis.

(CR) CM-61 If the NE supports ABR service and VS/VD control, then the M4 interface should support a management system's requests to turn configure VS/VD control on a per NE interface and optionally on a VP basis at creation time of the managed entities.

(CR) CM-62 If the NE supports ABR service and is located at an intermediate node, the management system shall be able to read and optionally control whether the NE will monitor and change backward RM cells or will generate new RM cells.

(O) CM-63 If the NE supports ABR service, the management system should be able to determine if the NE is using a use-it-or-lose-it policy.

2.1.10.1. Related Managed Entities

The managed entities needed to support the above requirement are:

- ABR Feedback Control
- ATM Access Profile
- ATM NE
- VCC Termination Point

2.1.11. Configuration Management of Signaling Channels

This section addresses the requirements for the management of signaling channels. Common requirements, access signaling, and interoffice signaling are covered in separate sections.

The common part is the Signaling AAL (SAAL). The SAAL includes AAL5 Common Part (CP), Service Specific Connection Oriented Protocol (SSCOP), and Service Specific Coordination Function (SSCF). There are two types of SSCF: SSCF-UNI and SSCF-NNI[2].

For *access signaling*, a user has one VCC designated as a signaling channel. Figure 2-7 illustrates this (in the case where there is one user for the UNI), and shows the protocol stack.

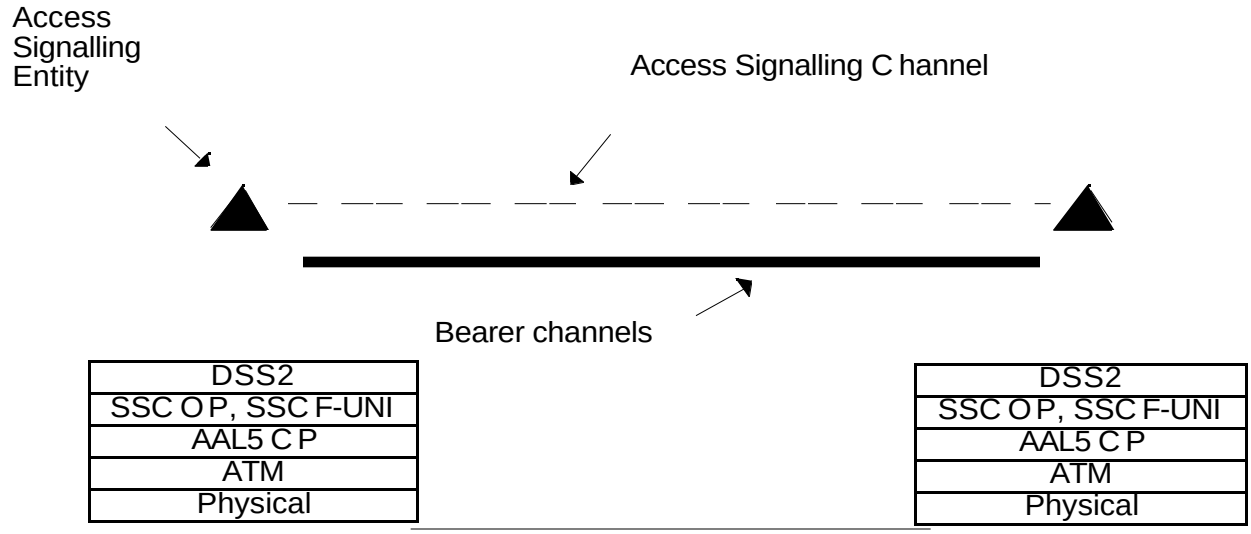


Figure 2-7 Access Signaling

For *interoffice signaling*[3], ATM switches may use multiple signaling channels (or "signaling links") between two given signaling entities. For interoffice signaling, the assumptions and architecture of the BICI spec are assumed

[2] SSCF-NNI applies to both inter- and intra-carrier signaling channels.

(i.e., the associated mode of signaling is used, and the BICI specified subset of MTP3 is supported). Figure 2-8 illustrates this, and shows the protocol stack. The physical, ATM, AAL5 CP, SSCOP, and SSCF-NNI layers provide functionality analogous to that provided by MTP Levels 1 and 2 in existing narrow band signaling networks.

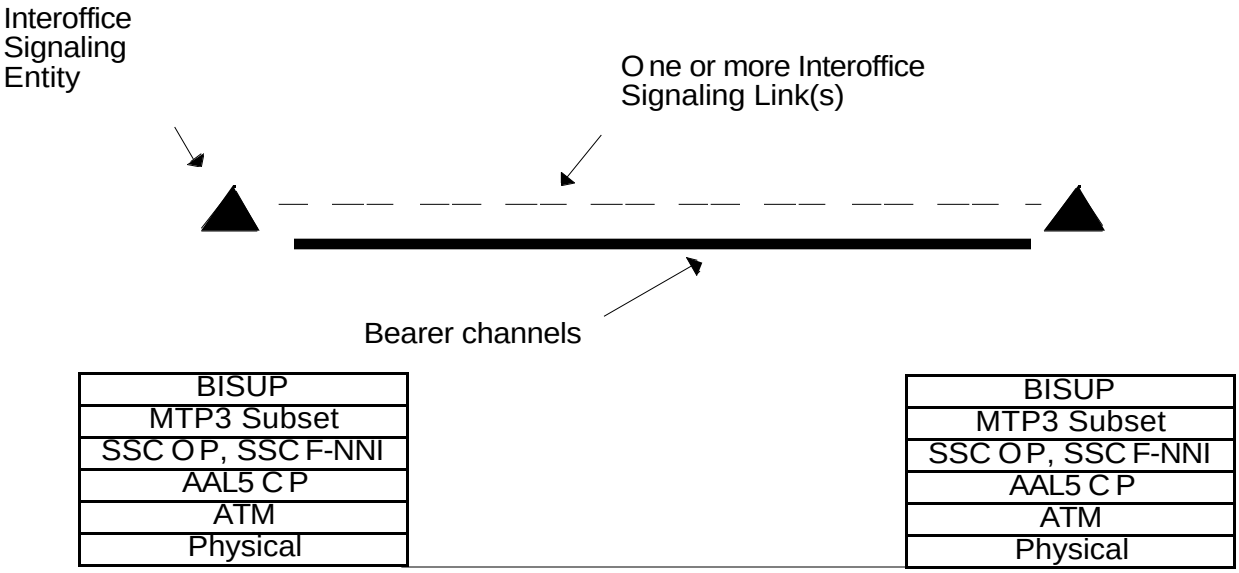


Figure 2-8 Interoffice Signaling

2.1.11.1. Common Signaling Channel Requirements: AAL5 CP, SSCOP and SSCF

This section addresses SSCOP and SSCF configuration management requirements for access and interoffice signaling channels. The ATM Forum's UNI specification requires the use of SSCOP as defined in Q.2110, and SSCF-UNI as defined in Q.2130; and the ATM Forum's BICI specification requires the use of SSCOP as defined in Q.2110 and SSCF-NNI as defined in Q.2140.[4]

The requirements for the common part of AAL5 are discussed in another section of this specification, as they are not SVC specific.

While SSCOP is common for access signaling and interoffice signaling, some of the parameter values differ in each case. The SSCOP parameters are shown in Table 2-1. All but the first two, k and j, should be settable by a management system.

In order to understand the SSCOP protocol, Q.2110 should be consulted. However, at a high level, SSCOP has PDUs that are used for various tasks. SD PDUs are used to transport data for the user of the SSCOP connection. Periodically, one connection endpoint will check on the status of the other end by issuing a POLL PDU, and wait for a STAT PDU in reply. In addition, there are PDUs (e.g., BGN, END) that are used in the establishment and release of the SSCOP connection, PDUs (e.g., RS) that are used to resynchronize the connection, and PDUs (e.g., ER) used for error recovery.

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[3] "Interoffice" signaling applies to both inter- and intra-carrier signaling.

[4] At present, the M4 interface would only manage UNI and intra- and inter-carrier signaling channels. In the future other signaling channels, such as signaling channels used in PNNI, could be managed over the M4 interface. However, since PNNI uses SSCOP and SSCF-UNI, the material in this section should still be applicable.

Table 2-1 SSCOP Parameters and Timers

Parameter or Timer *(with brief explanation)*	**Default Value for Access Signaling Channels**	**Default Value for Interoffice Signaling Channels**
bufferRelease *Ability to release messages from transmission buffer and transmission queue*	TRUE	FALSE
k Maximum Information Field Length (not settable)	4096 octets	4096 octets
j *Maximum SSCOP-UU (not settable)*	4 octets	4 octets
MaxCC *Maximum number of transmissions of BGN, END, ER, or RS PDUs*	4 PDUs	4 PDUs
MaxPD *Maximum number of SD PDUs before transmission of a POLL PDU*	25 PDUs	500 PDUs
MaxSscopCreditToPeer *The maximum size of the receive window given to the peer*	16 PDUs	128 PDUs
MaxSTAT *The maximum number of list elements in a STAT PDU.*	67 PDUs	67 PDUs
Timer_CC *During SSCOP connection/release or resync or recovery, this timer protects transmission of the PDUs*	1 sec	200 ms (700 ms for satellite links)
Timer_KEEPALIVE *Set somewhat larger than the time between a transmitted POLL and the expected receipt of a STAT*	2 sec	100 ms
Timer_NO_RESPONSE *Maximum time interval in which at least one STAT PDU must be received.*	7 sec	1.5 sec
Timer_POLL *Determines when the next POLL PDU is sent*	750 ms	100 ms
Timer_IDLE *The sum of Timer_IDLE and Timer_NO_RESPONSE is the maximum time between received STATs*	15 sec	100 ms

For the SSCF-UNI, there are no additional parameters. However, the SSCF-NNI has additional settable parameters related to alignment and proving the connection, as specified in Q.2140, and summarized in Table 2-2. Default values also appear in Table 2-2. [Note Q.2140 contains proposals for default values for the SSCF-NNI parameters. An initial set of defaults was proposed, but later analysis (documented in Q.2144) showed that in order to perform adequate alignment and proving, different values were needed. Because the purpose of these parameters is to perform alignment and proving, this second set of values has been adopted. Q.2144 also proposed Max_NRP =1 (see Table 2-3).]

Table 2-2 SSCF-NNI Parameters and Timers (Interoffice Signaling Channels Only)

Parameter or Timer	Default Value
Timer_T1 *During alignment, time between link release and next link re-establish action*	5 seconds
Timer_T2 *Total time SSCF will attempt alignment*	120 seconds
Timer_T3 *Time between proving PDUs*	60/n1 seconds
n1 *Number of PDUs sent during normal proving*	4200 + 15.2(X-173) PDUs, where X is the link speed in cells/sec, and X> 173

Layer Management for the SAAL - of interoffice links only - is described in Q.2144. In order to support layer management, several parameters need to be configured. These are specified in Q.2144, and summarized in Table 2-3. (Note that the parameters and timers T_sup through N_blk are all part of the reference error monitor, which removes a link when its error rates are excessive.)

Table 2-3 Layer Management Parameters and Timers for SAAL-NNI

Parameter or Timer	Default Value
Max_NRP *Maximum number of retransmitted PDUs during proving*	1
Timer_REPEAT_SREC *Timer indicates time since last SSCOP recovery. If SSCOP recovery occurs before this timer expires, the connection is released.*	1 hour
Timer_NO_CREDIT *Length of time a PDU is waiting for transmission with no credit. If timer expires, the connection is released.*	1.5 seconds
T_sup *Super block size in seconds*	120 seconds
T_loss *STAT loss limit in seconds*	1.3 seconds
Alpha (α) *Exponential smoothing factor*	.1
Thres *Threshold for comparing the running QoS*	.244
Tau (τ) *Error monitoring interval*	.1 seconds
N *Number of monitoring intervals needed to span time when messages not released from buffers as a result of a 400 ms error event*	9

Parameter or Timer	Default Value
N_blk *Number of monitoring intervals in a block for Algorithm 2 (Algorithm 2 is concerned with intermediate error rates).*	3

(CR) CM-64 If the NE supports SVCs, then the M4 Interface shall support Management System requests to read and optionally set:

1. For access signaling channels: SSCOP parameters and timers for signaling channels (except k and j). See Table 2-1.
2. For interoffice signaling channels: SSCOP parameters and timers for signaling channels (except k and j), all SSCF-NNI parameters and timers, and all SAAL Layer Management parameters and timers. See Tables 2-1, 2-3, and 2-4.

(CR) CM-65 If the NE supports SVCs, then the M4 Interface shall support Management system requests to retrieve the data stored in the ATM NE that contains values for SSCOP parameters and timers for signaling channels, and, for interoffice signaling channels, values for SSCF-NNI and SAAL layer management parameters and timers.

It is noted that the SSCOP will always be operating in the assured mode[5] of operation for signaling channels managed by the M4 interface, so there is no need to configure this option.

On access signaling channels, the SSCOP connection can be configured to provide failure notifications or to not provide failure notifications (see the Fault Management section for related requirements and discussion.

(CR) CM-66 If the NE supports SVCs, then on access signaling links, the M4 Interface shall support configuration of a specified SSCOP connection as either providing or not providing notifications of SSCOP failure and SSCOP recovery from failure.

In addition to the parameters and timers specified in SAAL standards, it is necessary to configure in the SAAL the thresholds that are used to indicate congestion to the MTP3 layer. (Note that this is related to the MTP3 Signaling Traffic Flow Control procedures discussed in Section 7.7.5 of BICI 2.0, which in turn are related to the BISUP Signaling Congestion Control procedures discussed in Section 7.9.6 of BICI 2.0.) There are three levels of congestion (1, 2, and 3), in addition to the non-congested state. Each congestion level has an associated onset, abatement, and discard threshold.

No defaults are specified in the Q.2751.1 standard. However, for a given level, the onset value must be higher than the abatement level. Furthermore, the values of the thresholds of a level may not be bigger than the respective values of a higher level.

(CR) CM-67 If the NE supports SVCs, then the M4 Interface shall support Management system requests to configure the following transmission congestion thresholds (see Sections 7.7.5 and 7.9.6 of BICI 2.0):

1. Onset, abatement, and discard thresholds for Level 1
2. Onset, abatement, and discard thresholds for Level 2
3. Onset, abatement, and discard thresholds for Level 3

2.1.11.2. Access Signaling Channel Requirements

This section addresses configuration management requirements at the DSS2 (e.g., "Q.2931") level.

In the configuration assumed in the UNI Signaling specification, all SVCs are established using messages over one signaling channel, using a default of VPI =0, VCI =5 at the customer side of the UNI. See Figure 2-9.

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[5] In the assured mode of operation, SSCOP user PDUs are transported using SD PDUs, which are numbered to allow the receiving end to detect loss, and request retransmission.

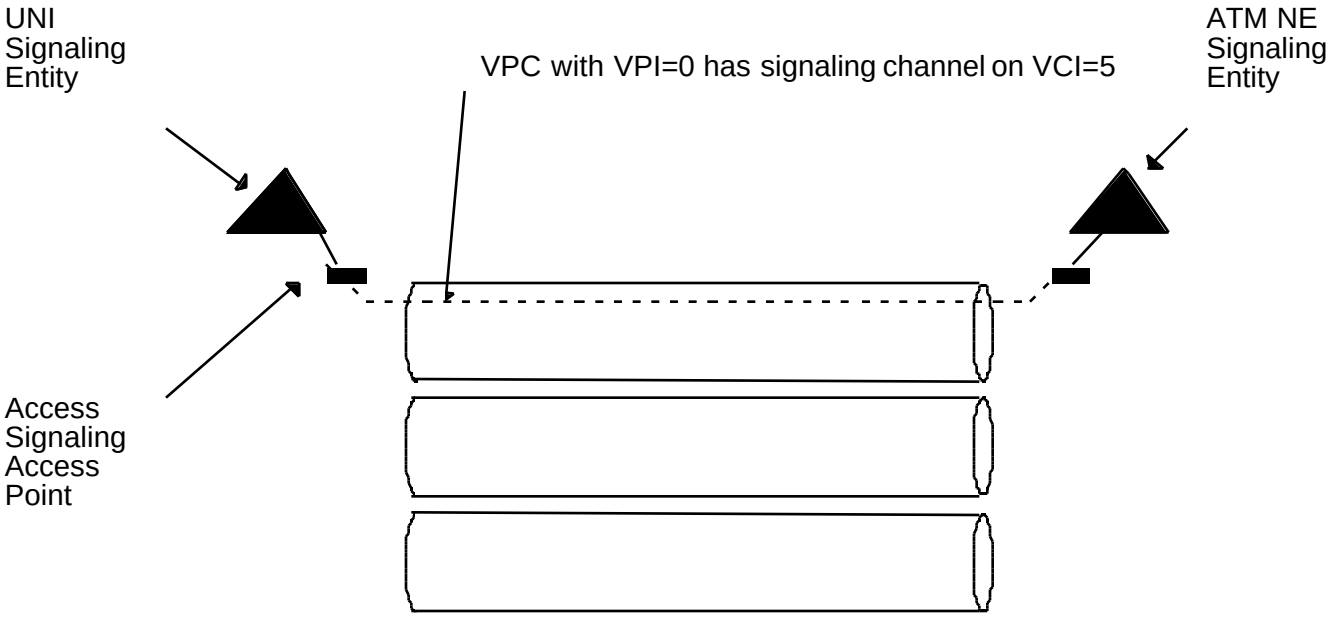

Figure 2-9 Example: Interoffice Signaling Configuration

It is necessary to configure the version of signaling protocol being used on an access signaling channel to ensure that the signaling entities on each end are using compatible protocols. The ATM signaling versions to be supported include UNI 3.0, 3.1, Signaling 4.0, and ITU-T's 1995 DSS2. Note that at present, PNNI signaling is not an option that the M4 interface needs to consider.

It is stressed that an ATM NE may need to support different versions on different access signaling channels that it terminates.

(CR) CM-68 If the NE supports SVCs, then the M4 Interface shall support management system requests to read and optionally set the version of the signaling protocol used over an access signaling channel. The following versions may be supported:

1. ATM Forum Version 3.0
2. ATM Forum Version 3.1
3. ATM Forum Version 4.0
4. ITU-T DSS2 1995.

(CR) CM-69 If the NE supports SVCs, then the M4 Interface shall support management system requests to configure and reconfigure the procedure used by the NE for the selection of VPCI/VCI at a destination UNI.

2.1.11.3. Interoffice Signaling Channel Requirements

This section addresses configuration management requirements for interoffice signaling channels at the MTP3 and BISUP level. Figure 2-10 illustrates the relationship among the key concepts of signaling entities: Signaling Point Codes (SPCs), signaling links, signaling link sets, and VPCs that contain VCCs that are controlled by a pair of signaling entities.

In the example shown in the figure, the two signaling links in the signaling link set provide the transport of messages for SVCs on VPCIs 5, 8, and 13. Messages on either link can be associated with any VPCI. Not all VPCs controlled by the pair of signaling entities need to contain a signaling channel, but those that do use VCI =5 for signaling.

It is noted that the three VPCs may be mapped into different transmission paths and transmission links, and the physical routes of the VPCs may be very different. This is often desirable for increased survivability.

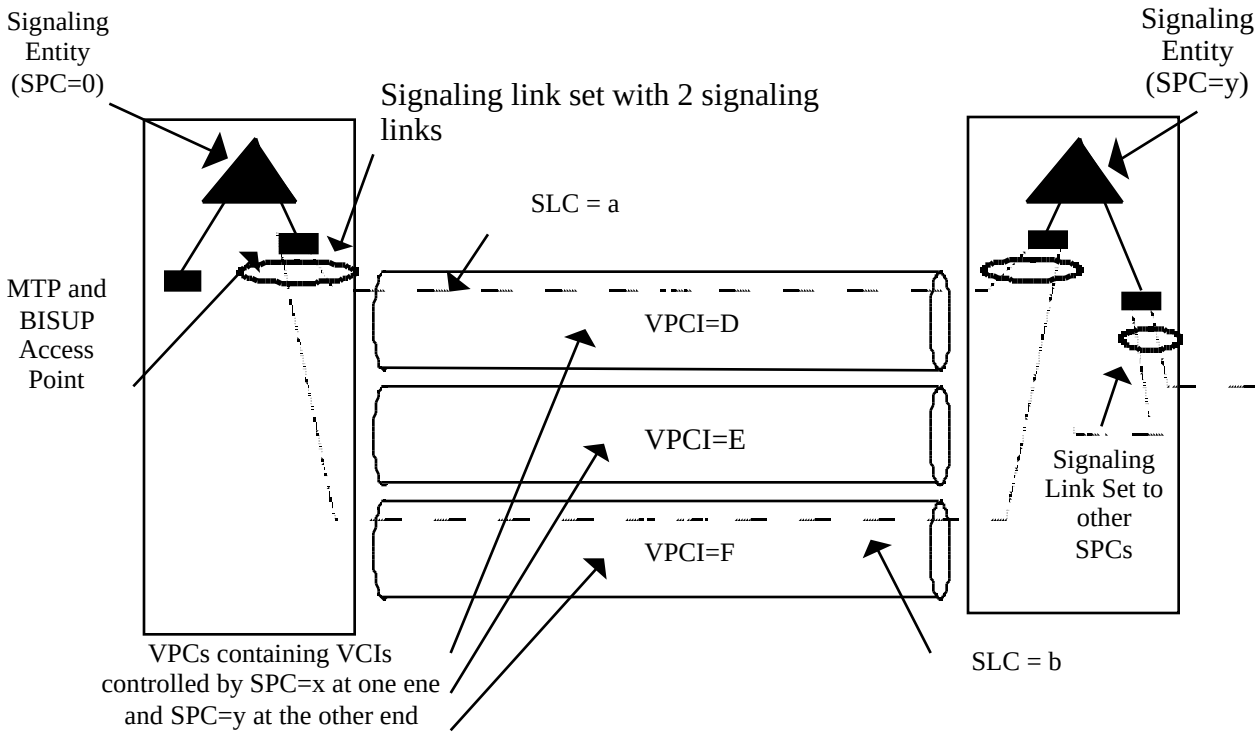

Figure 2-10 Example: Interoffice Signaling Configuration

2.1.11.3.1. Signaling Routes and Route Sets

A signaling link set interconnects directly two adjacent signaling points. A signaling route set is a collection of routes towards a specific signaling target. A signaling route - from the network view - is the sequence of link sets from an originating signaling point to a destination signaling point.

From the network element view a signaling route (NE part) is the first segment of that route (i.e., the first link set) together with information about the destination to which shall be routed via this first segment. As a consequence, in network element view a signaling route set (NE part) using a certain link set can be unavailable, but a different signaling route set (NE part) using the same link set can be available (provided that the link set is operational).

Also signaling routes and route sets belong to the key concepts of interoffice signaling. Management should therefore support their configuration, too.

2.1.11.3.2. MTP3 Configuration Management

The following entities need to be configured when associated signaling is used:

- Signaling link parameters
- Signaling link set parameters
- MTP3 timers
- Signaling Point Code(s) associated with the signaling entity
- Signaling route parameters

- Signaling route set parameters

For narrow band networks, MTP3 has been modeled in ITU Q.751, and this work is referenced in Q.2751.1. The requirements in this section are consistent with Q.751.

(CR) CM-70 If the NE supports SVCs, then the M4 Interface shall support Management system requests to configure the following attributes for an interoffice signaling link:

1. The Signaling Link Code.
2. Pointer to the associated SSCOP connection: (and hence to the underlying ATM connection)
3. Operational State: This indicates if the signaling link is operational (in-service) or not operational (out of service).
4. Administrative State: This allows the signaling link to transport traffic (unlocked), be inhibited for new traffic (shutting down),or be deactivated except for test traffic (locked).
5. Link TP status: This contains the possible SS7 functional states (localBlocked, remoteBlocked, localInhibited, remoteInhibited, failed, deactivated - and combinations of these values) of the link as they are defined in Q.704.
6. Procedural Status: This indicates whether the link is 'initializing' or 'not initialized'.
7. Usage State: This attribute indicates whether the link carries no user part traffic or not or if it is congested. 'Idle': The ATM Signaling Link Termination Point carries no user part traffic (test traffic may be present); 'active': The ATM Signaling Link Termination Point is not congested. Currently the link termination point carries user part traffic; 'busy': The ATM Signaling Link Termination Point is congested due to user part traffic.

Each link shall be associated with one and only one signaling link set.

(CR) CM-71 If the NE supports SVCs, then the M4 Interface shall support Management system requests to configure the following attributes for an interoffice signaling link set:

1. Link Set Name
2. The SPC of the adjacent end (integer value)
3. Operational State. This indicates if the entire signaling link set is operational (in-service) or not operational (out of service).
4. Administrative State. This allows the entire link set be activated (unlocked), inhibited for new traffic (shutting down), or deactivated except for test traffic (locked). Activation of the link set can be done by activating one or more of its links. (optional)
5. Signaling Route Set. Each link set shall be associated with one and only one signaling route set.
6. Congestion Control Method. This indicates which congestion control method according to ITU-T Q.704 is used.
7. Periodic Link Test Flag. This indicates whether the periodic test procedure of ITU-T Q.707 is applied to the links in this signaling link set.

In the associated mode of interoffice signaling, only a subset of MTP capabilities are required, as stated in Section 7.7.5 of BICI 2.0. Timers are needed to support the following capabilities within that subset:

- Changeover and Changeback
- Management Inhibit
- Link Activation
- MTP Restart (Optional)
- False Link Congestion (as a carrier option)
- Link Test

The MTP3 timers are set on a per-node basis, and there is no coordination needed among nodes. Because these are, in practice, set very infrequently (e.g., upon installation of the NE), it is not necessary that these timers be set using the M4 interface. Thus, setting them using an ATM NE's local interface should be sufficient.

However, in the future, it may be determined that there is a need to support a read capability for these timers over the M4 interface. It should also be noted that some ANSI and ITU MTP3 procedures, and hence timers, differ, and they will be set differently depending on whether the ATM NE will comply with ANSI or ITU. At present, the ANSI modeling of these timers has not been done.

Note that the thresholds needed to support Signaling Traffic Flow Control procedures are configured as part of the SSCOP/SSCF configuration, and have been presented previously.

(CR) CM-72 If the NE supports SVCs, then the M4 Interface shall support Management system requests to configure the following attributes for each signaling entity:

1. Number of SPCs
2. Primary SPC
3. Secondary SPCs (only if there is more than one SPC)
4. MTP Network Identifier (needed if more than one MTP signaling network terminates at the ATM NE)

(CR) CM-73 If the NE supports SVCs, then the M4 Interface shall support Management system requests to configure the following attributes for a signaling route set:

1. Identifier = DPC
2. Operational State
3. Administrative State
4. Congestion Information (optional)
5. Load sharing Information (optional)

(CR) CM-74 If the NE supports SVCs, then the M4 Interface shall support Management system requests to configure the following attributes for a signaling route:

1. The identifier of the route
2. Pointer to the associated signaling link set
3. Operational State
4. Administrative State
5. Availability Status
6. Priority
7. Load sharing information (optional)
8. Each route shall be associated with one and only one signaling link set.
9. Each route shall be associated with one and only one signaling route set.

2.1.11.3.3. BISUP Configuration Management

At the BISUP layer, the following need to be configured on a per-BISUP Access Point (i.e., per OPC/DPC pair) basis:

1. The VPCI(s) that are controlled by the OPC/DPC pair.
2. The version of BISUP that is used on the link set (e.g., BICI 2.0).
3. Indication of whether the link set uses associated or quasi-associated signaling (for future compatibility).
4. ISC Point Code information (if supported).
5. BISUP timers.
6. Configuration of Automatic Congestion Control levels. (on a per BISUP Signaling Point basis:)

(CR) CM-75 If the NE supports SVCs, then the M4 Interface shall support Management system requests to configure the VPCI(s) that are controlled by each signaling link set.

(CR) CM-76 If the NE supports SVCs, then the M4 Interface shall support Management system requests to read and optionally set the version of BISUP that is used on each signaling link set (i.e., ITU-T 1994, BICI 2.0), and an indication of whether the associated or quasi-associated mode is used.

(CR) CM-77 If the NE supports SVCs and ISC Point Codes, the M4 Interface shall support Management system requests to configure the related ISC Point Code information.

1. The ISC Point Code
2. If not received, whether to include or not include the Originating ISC Point Code in Initial Address Messages (IAMs) for outgoing international calls.

3. If received, whether to discard or include the received Originating ISC Point Code in outgoing Initial Address Messages (IAMs).

(CR) CM-78 If the NE supports SVCs, then the M4 Interface shall support Management system requests to read and optionally set the timers of BISUP specified in Q.2764.

Table 2-4 contains a summary of the timers that are used in BISUP. Q.2764 contains ranges of values for these timers. Default values are for further study.

Table 2-4 BISUP Timers

Timer
T1b: Await Release Complete
T4b: User Part Availability
T7b: Await Address Complete
T12b: Await Blocking Acknowledgment
T14b: Await Unblocking Acknowledgment
T16b: Await Reset Acknowledgment
T17b: Repeat Reset
(T34b: Segmentation - not required for BICI 2.0)
T40b: Await IAM Acknowledgment
T41b: Await Consistency Check Request Acknowledgment
T42b: Await Consistency Check End Acknowledgment

(O) CM-79 If the NE supports SVCs, then the M4 Interface should support Management system requests to read and optionally set the two Automatic Congestion Control levels of a BISUP Signaling Point. In addition, the M4 Interface should support requests to read and optionally set the Control Duration of traffic control, and the amount of traffic that is to be controlled.

2.1.11.4. Related Managed Elements

The managed entities needed to support the configuration of signaling channels are:

- ATM NE
- ATM MTP Signaling Point
- ATM Signaling Link Set Termination Point
- ATM Signaling Link Termination Point
- BISUP Access Point
- BISUP Signaling Point
- BISUP Timers Profile
- DSS2 Access Signaling Channel Termination Point
- MTP3b Access Point
- SAAL NNI Protocol Profile
- SAAL UNI Protocol Profile
- Signaling VCC Termination Point
- TC Adaptor
- Traffic Descriptor
- VCC Termination Point
- VPC Termination Point

• VPL Termination Point

2.1.12. SVC Configuration Management Requirements

(CR) CM-80 If the NE supports SVCs, then the M4 Interface shall support management system requests to specify the propagation delay through an NE. This requirement supports the setup propagation delay information accumulated in order to determine the end-to-end transit delay as described in section 4.5.17 of UNI 4.0 and ITU-T Recommendation [Q.2931].

2.1.13. Call/Connection Configuration Management Requirements

This section addresses items related to configuring the VPCs that are used to establish SVC VCC bearer channels, and subscription parameters at the UNI and BICI. In this section, when the term "subscriber" or "subscription parameter" is used, it refers to parameters that apply to a UNI, or Virtual-UNI (V-UNI) if a V-UNI exists (V-UNIs were introduced earlier in non-SVC sections).

Work is proceeding in ITU on signaling Capability Set 3 regarding the separation of call control and connection control. When that is accomplished, a call will be able to contain multiple connections. However, until that separation takes place, the term "call/connection" will be used.

2.1.13.1. Call/Connection Requirements at the UNI

Call or connection requirements are discussed in the following sections which deal with the UNI and interoffice interfaces separately.

2.1.13.1.1. UNI Configuration and Subscription Parameters

The management system of an ATM NE needs additional information, beyond that contained in **CM-5**, for UNIs and in **CM-6** for V-UNIs to support SVC services. **CM-5** and **CM-6** already include specification of the ATM Subscriber Address and the Preferred Carrier, which are SVC specific. However, the UNI/V-UNI must also be configured with the Charge Number and Originating Line Information (OLI) in ANSI-based networks. This pair of parameters can be used to deliver information about what party to charge to, when interconnecting through an interexchange carrier.

(CR) CM-81 If the NE supports SVCs and if required by national operating procedures, the M4 Interface shall support Management system requests to configure the Charge Number and the Originating Line Information (OLI) at a UNI/V-UNI.

Once a UNI/V-UNI is configured, several subscription parameters need to be specified. In the UNI Signaling specification, there are several features that are not necessarily required to be supported on a public UNI/V-UNI, regarding which information in a SETUP message is to be forwarded and which is not. Support of these features is determined by subscription, and so these subscription values must be configured.

The following subscription parameters need to be specified at the UNI/V-UNI. In all cases, a value of "yes" means that the feature is supported; "no" means that it is not.

1. Calling Party Number delivery feature: This parameter indicates whether the Calling Party Number (CgPN) is delivered to the user equipment at the called address.
2. Calling Party Subaddress transfer feature: This parameter indicates whether to accept and transfer Calling Party Subaddress information from the calling user on call/ connection origination. Calling Party Subaddress information is only delivered to the called user if CgPN information is delivered.
3. AESA for Calling Party transfer feature: This parameter indicates whether to accept and transfer the AESA for Calling Party information from the calling user on call/ connection origination. AESA for Calling Party information is only delivered to the called user if CgPN information is delivered.
4. Calling Party Number screening feature: This parameter indicates whether screening of a user-provided CgPN is supported at the originating UNI/V-UNI. With screening, the originating ATM NE checks the user-provided CgPN to make sure it is one of the allowable numbers. (This list of allowable numbers is discussed below.) If the number fails screening, the ATM NE will replace the user-provided CgPN with the default number for the

interface in the Initial Address Message (IAM). This will result in a completed call, but the number used for signaling will not be the number requested by the calling customer.

5. The list of allowable calling numbers for screening must be configured if screening is active. One number is identified as the "default number" for the UNI/V-UNI.
6. Called Party Subaddress transfer feature: This parameter indicates whether to accept, transfer, and deliver Called Party Subaddress information from the calling user on call/connection origination.

   The next two items refer to Broadband High- and Low- Layer Information transfer features. The ability to disable their transfer is designed to allow carriers to protect themselves against customers using the unused octets of signaling messages for free information transfer.
7. Broadband High Layer Information (BHLI) transfer feature: This parameter indicates whether to accept, transfer, and deliver high layer information from the calling user to the called user on call/connection origination.
8. Broadband Low Layer Information (BLLI) transfer feature: This parameter indicates whether to accept, transfer, and deliver low layer information from the calling user to the called user on call/connection origination.
9. Broadband Low Layer Information selection feature: This parameter indicates whether to accept, transfer, and deliver up to three instances of the low layer information parameter(s) for low layer information selection in a single message. This parameter may be supplied only if the BLLI transfer feature is "yes".
10. AAL Parameters transfer feature: This parameter indicates whether to accept, transfer, and deliver ATM adaptation layer parameter information from the calling user to the called user on call/connection origination.

The following table clarifies which subscription parameters apply at the originating UNI/V-UNI, the terminating UNI/V-UNI, and at the BICI (see Section 2.1.13.2.1 regarding the BICI). Some of these and other customer subscription features are further discussed in Section 2.1.15.

Table 2-5 Locations at Which Subscription Features Apply

Subscription Feature	Originating UNI/V-UNI	BICI	Terminating UNI/V-UNI
CgPN Delivery	NA	Y	Y
CgPN Subaddress Transfer	Y	Y	NA
AESA for CgP Transfer	Y	Y	NA
CgPN Screening	Y	NA	NA
CdPN Subaddress Transfer	Y	Y	NA
BHLI Transfer	Y	Y	NA
BLLI Transfer	Y	Y	NA
BLLI Selection	Y	NA	NA
AAL Parameters Transfer	Y	Y	NA

Note: It may be desirable to add more subscription items in future releases of this document, such as subscription to multipoint calling features.

(CR) CM-82 If the NE supports SVCs, then the M4 Interface shall support Management system requests to configure each ATM UNI/V-UNI with any of the following signaling subscription features that are applicable on a per-subscriber basis:

1. Calling Party Number delivery
2. Calling Party Subaddress transfer
3. AESA for Calling Party transfer

4. Calling Party Number screening feature: When this value is 'yes', a list of valid numbers is supplied by the management system. One of these values is specified as the "default" number.
5. Called Party Subaddress transfer
6. Broadband High Layer Information transfer
7. Broadband Low Layer Information transfer
8. Broadband Low Layer Information selection
9. AAL Parameters information transfer.

2.1.13.1.2. Configuration of Bearer Channels (VPCIs)

At the UNI/V-UNI, each VPC that is controlled by the signaling entity is assigned a VPCI. This may be done in one of several ways:

- The Management Plane can configure these VPCs with the associated VPCIs.
- The Management Plane can configure the range of VPIs and VPCIs that are used by the Control Plane, and which are under the control of the Management Plane. Note that UNI 3.1 does not include provisions to negotiate or modify allowed ranges for VPCIs and/or VCIs.

Note also that in UNI 3.1, there is a restriction on the UNI that there is a one-to-one mapping between the VPCI and VPI (i.e., VPI =VPCI). In UNI 4.0, this is not always required, although it is the default case.

(CR) CM-83 If the NE supports SVCs, then the M4 Interface shall support Management system requests to configure the VPCIs of a UNI/V-UNI. Such configuration should be undertaken consistent with the constraints of the version of the signaling channel that controls the VPCIs.

VPCIs are identifiers used by the signaling layer to identify VPCs. They are distinct from VPI values, which are identifiers used by the ATM layer to identify VPLs. In many cases the VPCI and VPI are assigned the same value (in fact, VPIs and VPCIs are often mistakenly considered to be identical).

In the ATM Forum's UNI 3.1 specification, VPCIs are configured on a UNI so that the VPCI always has the same value as the VPI. In UNI Signaling 4.0, the VPCI value does not have to equal the VPI value, although it is assumed that many customers will use VPCI =VPI at their interface. Thus, VPCI =VPI should be the default relationship to minimize unnecessary Management System interactions.

When V-UNIs are supported, the VC Switch interfaces to the VP multiplexer via the Vb Interface. For the VC Switch side of the Vb interface, the VPI space must be shared among V-UNIs, and each V-UNI that supports signaling requires a signaling access point. See Figure 2-11. For each VPI used for signaling bearer channels at the switch, there must be a relationship established to a VPCI and to a V-UNI. At the VP multiplexer, there is a mapping between the VPIs used by the customer and VPIs used by the VC Switch.

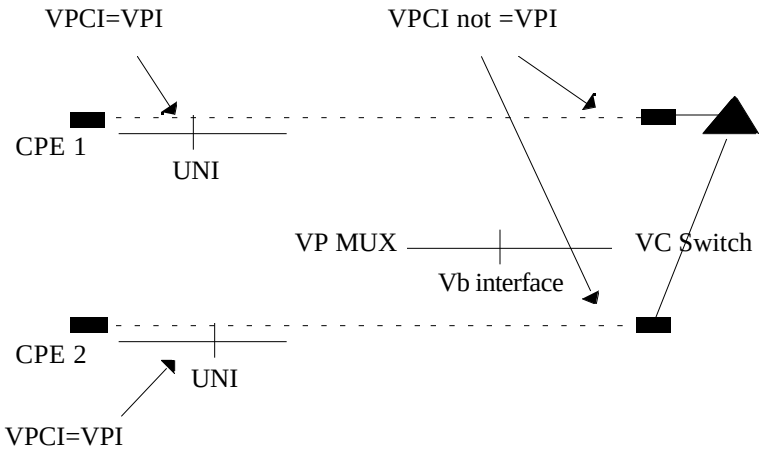

Figure 2-11 Example: Signaling Configuration of Two Virtual UNIs

The specification allows for any arbitrary mapping of VPCIs to VPIs at the Vb interface. It would be desirable if there could be a simple formula to map VPIs from the Customers' UNIs to VPIs on the Vb interface, such as dividing the Vb interface's VPI space into contiguous ranges for each V-UNI. This is possible if it can be known in advance, once and for all, how many VPIs each UNI will require. However, a requirement that a UNI's VPIs be contiguous can cause problems, particularly where there are many V-UNIs that share the same VPI space of a Vb interface. For example, if 4 VPIs are assigned to each V-UNI, but later it is determined that one customer needs 5 VPIs, then many other customers will need to have their VPCs reconfigured at the VP multiplexer in order to keep that customer's 5 VPIs contiguous. This would result in service outage, and a great deal of effort.

Consequently, a table approach is appropriate. At the VC Switch side of the Vb interface, the VPI value is associated with a V-UNI (e.g., by using the VP multiplexer's interface ID for the UNI), and a VPCI value. Table 2-6 shows an example. The following constraints apply in all cases:

- All values in the "VPI at Vb" column must be unique
- For a given V-UNI ID, a VPCI value must be unique.

The following are allowed:

- Any "VPI at Vb" value may be associated with any V-UNI
- Different V-UNIs may use the same VPCI value.

Table 2-6 An Example of VPI Mapping at the Vb Interface

VPI at Vb	V-UNI ID	VPCI
0	1	0
1	1	1
2	2	0
3	1	3
4	2	2
5	2	3
6	1	4

For UNIs (as opposed to V-UNIs), it may be possible to always assume that the VPCI =VPI, so it is not necessary to explicitly configure the VPCI via the Management System in this case. However, if they may differ, then configuration is required.

(CR) CM-84 If the NE supports SVCs, then for VPIs that can be used to support SVC bearer channels, a default VPCI value equal to the VPI value shall be assumed. However, the M4 Interface shall support Management System requests to a VPCI not equal to the VPI with that VPI.

For V-UNIs, it is necessary to associate the information such as that shown in Table 2-6 with a VPI.

(CR) CM-85 If the NE supports SVCs, then to support configuration of a V-UNI, based on information provided by the Management System, the M4 Interface shall support associating the following with each VPI that supports SVCC bearer channels on the Vb interface:

1. V-UNI ID
2. VPCI. (For any given V-UNI, a VPCI must be unique.)

Propagation Delay: During call/connection setup propagation delay information is accumulated in order to determine the end-to-end transit delay. This is described in section 4.5.17 of UNI 4.0/ITU-T Q.2931. To satisfy this requirement information on the expected propagation delay must be provide via the M4 interface.

2.1.13.2. Call/Connection Requirements at the Interoffice Interfaces

This section includes the following items: inter-carrier subscription parameters, VPCI configuration, and call/connection routing.

2.1.13.2.1. BICI Subscription Parameters

Similar to the operation at a UNI, some information in BISUP signaling messages may be transferred or not transferred to the next carrier. Each of the parameters listed for UNIs is also a candidate for inclusion/ exclusion at the BICI on a per succeeding carrier basis, except for CgPN Screening and Broadband Low Layer Information selection.

In addition, the following subscription parameters are both BICI specific and ANSI-specific. Therefore, the following are configured on a per succeeding carrier basis:

1. Carrier Identification Parameter (CIP) delivery feature: This parameter indicates whether the CIP (which contains the Carrier Identification Code (CIC) of the calling user's pre-subscribed carrier or of the carrier specified by the originating calling user) is delivered to the carrier.

2. Carrier Selection Information Parameter delivery feature: This parameter indicates whether the Carrier Selection Information parameter is delivered to the carrier.
3. Originating Line Information Parameter (OLIP) delivery feature: This parameter indicates whether the Originating Line Information is delivered to the carrier.
4. Charge Number delivery feature: This feature is used to deliver information about which party to charge when interconnecting through an interexchange carrier.

Note: The above OLIP and Change Number delivery features must be configured "yes" or "no" as a pair. (See Section 7.8.5.1.1 of BICI 2.0.)

Each carrier may subscribe individually to each BISUP feature to be provided by the preceding carrier. These parameters can be included on a per-CIC basis. For example, the CIC, OLIP and Charge Number parameters could be delivered for CIC values of A and B, while the Carrier Selection parameters could be delivered for CIC values of C and D. Also when BISUP IAM messages from another carrier are received, the ATM NE needs to be capable of the following for the above optional IAM parameters:

1. including or not including any received unrecognized parameters in the outgoing IAM
2. including or not including any received parameters with unrecognized values in the outgoing IAM

(CR) CM-86 If the NE supports SVCs, then the M4 Interface shall support Management system requests to configure, on a per succeeding carrier (i.e., per CIC) basis, which of the following BISUP subscription features apply to calls associated with that carrier.

The following support ANSI BISUP:

1. Carrier Identification Parameter delivery
2. Carrier Selection Information Parameter delivery
3. OLIP and Charge Number delivery

The following features have counterparts at the UNI:

1. Calling Party Number delivery
2. Calling Party Subaddress transfer
3. Called Party Subaddress transfer
4. AESA for Calling Party transfer
5. Broadband High Layer Information transfer
6. Broadband Low Layer Information transfer
7. AAL Parameters transfer.

(CR) CM-87 If the NE supports SVCs, then the M4 Interface shall support Management system requests to configure, on a per succeeding carrier (i.e., per CIC) basis, whether to forward in the outgoing IAM or discard any received IAM parameters that are unrecognized or have unrecognized values.

2.1.13.2.2. Configuration of Interoffice Bearer Channels (VPCIs)

Between ATM NEs, VCPIs are configured and assigned to be under the control of a pair of signaling entities. In this section, as in BICI 2.0, the pair of entities will be referred to as an Originating Point Code (OPC)/ Destination Point Code (DPC) signaling relationship.

VPCIs are assigned to VPCs that are under the control of a given OPC/DPC signaling relationship. Both ATM NEs use the same VPCI for a given VPC, and each VPCI must be unique between the OPC/DPC pair.

For a given VPCI, one ATM NE is the assigning node and the other is the non-assigning node. The assigning ATM NE for a VPCI assigns the VCI values to all requested SVCs in the VPCI, and the non-assigning ATM NE does not assign any VCI values to the requested SVCs for a given VPCI. The "assigning/non-assigning" indication may be specified by the Management System, but if it is not, the ATM NE will use a default procedure. Section 7.8.2 of BICI 2.0 contains more discussion on this point.

Figure 2-12 illustrates these points by showing the assignment of VPCIs and assigning/non-assigning indications to two VPCIs between an OPC/DPC pair (the "+" indicates which end is the assigning end of a VPCI). The figure

also shows that not all VP PVCs are necessarily assigned VPCIs, and also that some VP PVCs extend to other ATM NEs. Note that it is assumed that all SVCs use VCCs, because BISUP does not support SVPs at this time.

(CR) CM-88 If the NE supports SVCs, then the M4 Interface shall support Management System requests to configure the VPCIs from an ATM NE to another ATM NE. Based on the information provided by the Management System, the ATM NE shall associate the following additional information with each configured VPC end point that is used to support interoffice SVCs:

1. VPCI value (which is a 16-bit value)
2. Whether the ATM NE is the assigning node or the non-assigning node for the VPCI (optionally specified by the Management System).

Upon management system request, the ATM NE shall disassociate (release) the above information with a VPC end point.

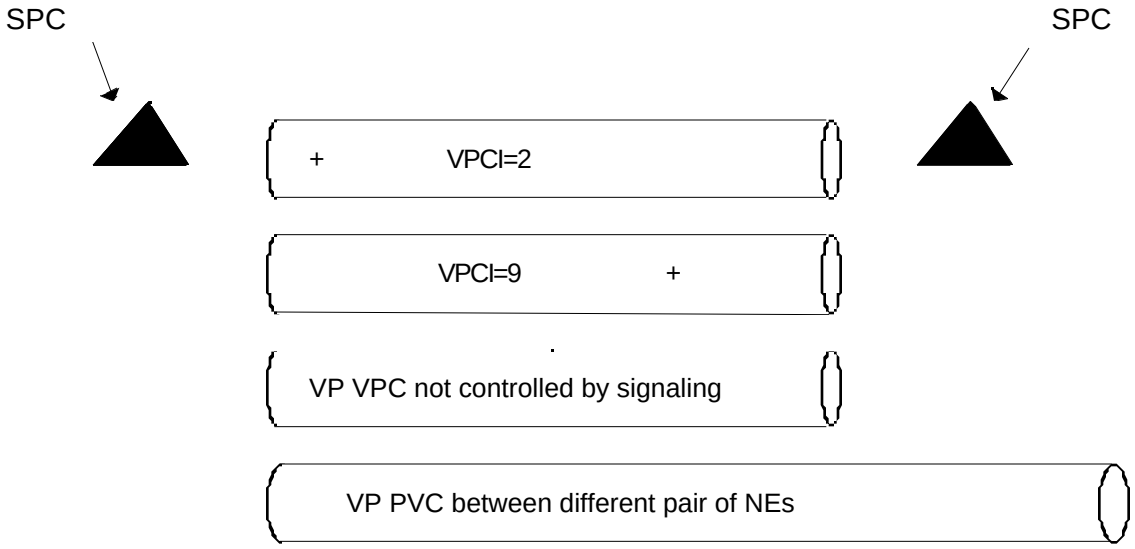

Figure 2-12 Example: VPCI Configuration

VPCI Blocking and Unblocking: Once a VPCI is configured, at times it may be necessary to *block* the VPCI from future SVC attempts, or later *unblock* it. This is described in Section 7.9.2 of BICI 2.0. Blocking may be initiated automatically (i.e., by the ATM NE), or by the Management System.

(CR) CM-89 If the NE supports SVCs, then the M4 Interface shall support Management system requests to Block/Unblock a VPCI. The ATM NE shall provide one of the following responses to such requests:

1. Success of Blocking/Unblocking, or
2. Failure of Blocking/Unblocking (i.e., the timer - T12b for blocking, and T14b for unblocking - has expired).

(CR) CM-90 If the NE supports SVCs, then the M4 Interface shall support Management system requests to retrieve whether or not a VP is remotely blocked.

During call/connection setup propagation delay information is accumulated in order to determine the end-to-end transit delay. This is described in BICI 2.0 (section 7.8.8) and ITU-T Q.2764 (section 2.6). To satisfy this requirement information on the expected propagation delay must be provided via the M4 interface.

2.1.13.2.3. Call/ Connection Routing Configuration

If a call request is received the NE has to evaluate the incoming information and the information of its MIB to select an appropriate destination.

(CR) CM-92 If the NE supports SVCs, then the M4 Interface shall support management system requests to configure the criteria necessary to select a destination of a call depending from:

1. Requested Directory Number
2. Requested Carrier
3. Category of the Calling Party
4. Origination of the Call

(CR) CM-93 If the NE supports SVCs, then the M4 Interface shall support management system requests to configure the profile of a carrier.

(CR) CM-94 If the NE supports SVCs, then the M4 Interface shall support management system requests to configure a local destination which represents a group of directory numbers located on the NE where the call is currently processed. It shall be possible to configure the range of valid directory numbers for a local destination.

(CR) CM-95 If the NE supports SVCs, then the M4 Interface shall support management system requests to configure an abstract destination which is a representation of how to get to a destination which is independent from the exchange currently processing the call.

(CR) CM-96 If the NE supports SVCs, then the M4 Interface shall support management system requests to configure the rules to manipulate the received digit string. It shall be possible to insert, to suppress and to replace digits.

To select an appropriate way trough the network the NE has to evaluate the characteristics requested by the call request and the information of its MIB.

(CR) CM-97 If the NE supports SVCs, then the M4 Interface shall support management system requests to configure the criteria necessary to select an appropriate way through the network depending from:

1. Requested Service Category
2. Requested Bandwidth (Egress and Ingress)
3. Requested Quality of Service
4. Transit Delay

(CR) CM-98 If the NE supports SVCs, then the M4 Interface shall support management system requests to configure the rules (algorithms) of how to distribute the traffic over the possible set of routes through the network that meet the requested parameters.

(CR) CM-99 If the NE supports SVCs, then the M4 Interface shall support management system requests to configure the signaling related information for a route.

(CR) CM-100 If the NE supports SVCs, then the M4 Interface shall support management system requests to configure the rules to manipulate the digit string to be sent to the adjacent exchange. It shall be possible to insert, to suppress and to replace digits.

(CR) CM-101 If the NE supports SVCs, then the M4 Interface shall support management system requests to configure the rules (algorithms) of how to distribute the traffic over the possible set of virtual path groups on the interface to the adjacent exchange that meet the requested parameters.

(CR) CM-102 If the NE supports SVCs, then the M4 Interface shall support management system requests to group sets of VPCs with common characteristics. Based on the information provided by the management system, the NE shall associate the following information:

1. Search method to select one of the VPCs
2. Indication whether the exchange is for the VPCs of this group the assigning or the non-assigning exchange.
3. Ordered list of the VPCs of the group

4. Assignment of a VPCI value to each VPC

(CR) CM-103 If the NE supports SVCs, then the M4 Interface shall support management system requests to configure a logical NNI access which represents the VPCs between two (adjacent) signaling points (OPC/DPC) which are controlled by the same signaling protocol. Based on the information provided by the management system, the NE shall associate the following information:

1. Indication whether the interface is an operator network border
2. Indication whether the interface is a national or an international interface
3. Identification of the signaling link representation
4. Name of the carrier operating the adjacent exchange
5. Assignment of an origination mark
6. Indication if the access belongs to a national transit network

2.1.13.3. Related Managed Entities

The managed entities needed to support the configuration of calls and connections are:

- Abstract Destination
- Analysis Criteria
- ATM NE
- Call Routing Office Data
- Carrier Data
- Digit Manipulation
- Group Combination
- List of Route TPs
- Local Destination
- NNI Access
- Post Analysis Evaluation
- Route Data
- Signaling Route Set NE Part
- Signaling Route NE Part
- TC Adaptor
- Traffic Descriptor
- UNI
- UNI Info
- VCC Termination Point
- VCL Termination Point
- Virtual Path Group
- VPC Termination Point
- VPCI Termination Point
- VPL Termination Point

2.1.14. Configuration of VPC Termination Points

(C) CM-104 The M4 Interface shall support management system requests to configure a VPC Termination Point to support VCs of selected service categories only.

(R) CM-105 The M4 interface shall support management system requests to configure and reconfigure whether or not policing is performed for all VCs within the VPC Termination Point.

2.1.14.1. Related Managed Entities

The managed entities needed to support the above requirements are:

- ATM Access Profile
- VPC Termination Point

2.1.15. Configuration of Customer Subscription Administration

Customer subscription administration is a management activity to exchange over the M4 Interface all the customer related management data and functions necessary to support telecommunication services for the customer.

(CR) CM-106 If the NE supports SVCs, then the M4 Interface shall support management system requests to configure customer profiles used to bind together a range of services and resources for customer administration purposes. Each customer profile shall be related to one or more signaling accesses.

(CR) CM-107 If the NE supports SVCs, then the M4 Interface shall support management system requests to configure E.164 directory numbers.

(CR) CM-108 If the NE supports SVCs, then the M4 Interface shall support management system requests to associate directory numbers with customer profiles, with bearer services (service categories) and with supplementary services. Some of these associations are realized by the help of the Customised Resource managed entity. Multiple directory numbers shall be associated only with customer profiles with a multiple subscriber number service.

(CR) CM-109 If the NE supports SVCs, then the M4 Interface shall support management system requests to configure the properties of a certain subscriber (user). It shall be able to administrate the following user data for the whole customer profile or for certain associated directory numbers only:

1. The category of the calling subscriber according to ITU-T Recommendation Q.2763.
2. An origin mark to determine the origination of the calling subscriber.
3. A preferred carrier attribute to identify the default carrier to use when one is not explicitly identified in the call setup message received and processed by the network element.

(CR) CM-110 If the NE supports SVCs, then the M4 Interface shall support management system requests to configure the use any of the following bearer services which are supported by the NE. The services are described in ATM Forum TM 4.0:

1. CBR (Constant Bit Rate)
2. VBR (Variable Bit Rate - real-time and non-real-time)
3. ABR (Available Bit Rate)
4. UBR (Unspecified Bit Rate).

Supplementary Services

Supplementary services, as defined in ITU-T Recommendation I.210, are services that can only be used in conjunction with another bearer service or another teleservice. The M4 Interface shall support management system requests to configure supplementary services.

(CR) CM-111 If the NE supports SVCs, then the M4 Interface shall support management system requests to configure the supplementary services that are defined by ITU-T to be independent of any particular bearer service/teleservice. The following requirements must only be fulfilled, if the NE supports the related supplementary service.

1. The M4 Interface shall support management system requests to configure the direct dialing in supplementary service as described in ITU-T Recommendation Q.2951.3, which enables a user to call directly via a public ISDN to a user on a private ISDN. Further the M4 Interface shall provide management system ability to determine the length/format of numbers to be transmitted to the user's installation.
2. The M4 Interface shall support management system requests to configure the multiple subscriber number supplementary service, which provides the possibility for assigning multiple number (not necessarily consecutive) to a single public or private interface as described in ITU-T Recommendation Q.2951.2. Further the M4 Interface shall provide management system ability to determine the length/format of numbers to be transmitted to the user's installation.
3. The M4 Interface shall support management system requests to configure the CUG supplementary service including the general subscription options for CUG as specified by ITU-T Recommendation Q.2955.1.

(CR) CM-112 If the NE supports SVCs, then the M4 Interface shall support management system requests to configure the supplementary services that are defined by ITU-T to be dependent of a particular bearer service / teleservice. The following requirements must only be fulfilled, if the NE supports the related supplementary service.

4. The M4 Interface shall support management system requests to configure the supplementary service, which provides the called party with the possibility of receiving identification of the calling party as described in ITU-T Recommendation Q.2951.3. Whether or not the service may be suppressed by the calling party's CLIR option depends on the value of the following parameter:

   No Restriction Allowed.
5. The M4 Interface shall support management system requests to configure the supplementary service, which provides the calling party with the possibility to prevent presentation of the calling party's ISDN number to the called party as described in ITU-T Recommendation Q.2951.4. This service may be used permanently or temporary depending on the value of the following parameter:

   Calling Line Identification Restriction Options.
6. The M4 Interface shall support management system requests to configure the supplementary service, which provides the calling party with the possibility of receiving identification of the connected party as described in ITU-T Recommendation Q.2951.5. Whether or not the service may be suppressed by the connected party's COLR service depends on the value of the following parameter:

   No COLP Restriction Allowed. .
7. The M4 Interface shall support management system requests to configure the supplementary service which provides the connected party with the possibility to prevent presentation of the connected party's ISDN number to the calling party as described in ITU-T Recommendation Q.2951.6. This service may be used permanently or temporary depending on the value of the following parameter:

   Connected Line Identification Restriction Options.
8. The M4 Interface shall support management system requests to configure the supplementary service, which provides the called user with the capability to expand his addressing capacity beyond the one given by the ISDN number as described in ITU-T Recommendation Q.2951.8. In case a called party sub-address is presented by a calling user, it shall be delivered unaffected to the called user.
9. The M4 Interface shall support management system requests to configure the supplementary service which allows an ISDN subscriber to send/receive a limited amount of information to/from another ISDN subscriber over the signaling channel associated with their call according to ITU-T Recommendation Q.2957.
10. The M4 Interface shall support management system requests to configure the CUG subscription option as described in ITU-T Recommendation Q.2955.1.

(CR) CM-113 If the NE supports SVCs and the supplementary service CLIP, then the M4 Interface shall support management system requests to configure the characteristics used for the screening of the Calling Party Directory Number as described in ITU-T Recommendation Q.2951.3. See also section 2.1.11.1 Call/Connection Requirements UNI.

(CR) CM-114 If the NE supports SVCs and the supplementary service COLP, then the M4 Interface shall support management system requests to configure the characteristics used for the screening of the Connected Line Directory Number as described in ITU-T Recommendation Q.2951.5.

(CR) CM-115 If the NE supports SVCs, then the M4 Interface shall support management system requests to configure AESA directory numbers as defined in ATM Forum UNI 4.0.

(CR) CM-116 Within a network element the E.164 numbers used in a native E.164 address or in an AESA(E.164) have to be mutually exclusive, that is the creation of a native E.164 address is prohibited if another DN has already been created with a AESA(E.164) address using the same E.164 numbers and vice versa.

2.1.15.1. Related Managed Entities

The managed entities that are needed to support the above requirements are:

- ABR

- ATM NE
- Calling Line Identification Presentation Dependent
- Calling Line Identification Restriction Dependent
- Calling Number Screening
- CBR
- Connected Line Identification Presentation Dependent
- Connected Line Identification Restriction Dependent
- Connected Number Screening
- CUG Independent
- CUG Subscription Option Dependent
- Customer Profile
- Customised Resource
- Direct Dialing In Independent
- Directory Number E.164
- DSS2 Access Signaling Channel Termination Point
- Multiple Subscriber Number Independent
- Sub-addressing Dependent
- UBR
- User Data
- User To User Signaling Dependent
- VBR

2.1.16. Configuration Management of OAM Flows

The management of OAM flows focuses on two areas: those requirements related to OAM continuity checking and those requirements related to intrusive and non-intrusive Performance Management. This section identifies requirements for both areas.

(CR) CM-117 If the Continuity Check OAM flows are supported, the M4 interface shall support the ability to activate and de-activate sink and source mechanism for this feature separately.

(CR) CM-118 If the Continuity Check OAM flows are supported, the M4 interface shall provide the status (on/off) of the sink and source mechanisms separately.

(CR) CM-119 If the Continuity Check OAM flows are supported, the M4 interface shall provide the operational status (enabled/disabled) related to the functioning of the feature as intended.

(CR) CM-120 If the Performance Management of F4/F5 OAM flows are supported, the M4 interface shall allow a mechanism to configure this feature in intrusive or non-intrusive modes.

(CR) CM-121 If the Performance Management of F4/F5 OAM flows are supported and if the intrusive mode is used, the M4 interface shall support the ability to activate and de-activate the sink mechanism and the source mechanism for this feature separately.

(CR) CM-122 If the Performance Management of F4/F5 OAM flows are supported and if the intrusive mode is used, the M4 interface shall support the ability to activate and de-activate only the sink mechanism for this feature.

(CR) CM-123 If the Performance Management of F4/F5 OAM flows are supported, the M4 interface shall provide the status (on/off) of the sink and source mechanisms separately.

(CR) CM-124 If the Performance Management of F4/F5 OAM flows are supported and if the non-intrusive mode is used, the M4 interface shall allow the ability to configure the monitored flow as Segment or End-to-End.

(CR) CM-125 If the Performance Management of F4/F5 OAM flows are supported and if the non-intrusive mode is used, the M4 interface shall provide the information related to the monitored flow as Segment or End-to-End.

(CR) CM-126 If the Performance Management of F4/F5 OAM flows are supported and if the intrusive mode is used, the M4 interface shall provide the ability to configure the monitoring block size.

(CR) CM-127 If the Performance Management of F4/F5 OAM flows are supported and if Far-End PM data collection is supported, the M4 interface shall allow their activation and de-activation.

(CR) CM-128 If the Performance Management of F4/F5 OAM flows are supported and if Far-End PM data collection is supported, the M4 interface shall provide the information regarding its status (active or not).

(CR) CM-129 If the Performance Management of F4/F5 OAM flows are supported and if backward PM data reporting is supported, the M4 interface shall allow their activation and de-activation.

(CR) CM-130 If the Performance Management of F4/F5 OAM flows are supported and if backward PM data reporting is supported, the M4 interface shall provide the information regarding its status (active or not).

(CR) CM-131 If the Performance Management of F4/F5 OAM flows are supported, the M4 interface shall provide the operational status (enabled/disabled) related to the functioning of the feature as intended.

2.1.16.1. Related Managed Entities

The managed entities required to support OAM Flow Configuration Management are:

- OAM Continuity Monitor
- OAM Performance Monitor

2.2. Fault Management

Fault management is a set of functions that enable the detection, isolation, and correction of abnormal operation of the telecommunications network and its environment [M.3400]. From an ATM network management perspective, this involves the following:

- Notifying the Network Management System of a Detected Failure
- Notifying the Network Management System of any significant event or a recovery from a "Failure" condition
- Logging Failure Reports
- Isolating Faults (via on-demand testing)

2.2.1. Failure Reporting

The following operations interface functions are required to support the notification of ATM NE failures:

(R) FM-1 The M4 Interface shall support notifications used to report failures detected by ATM NEs. Each failure notification (i.e., alarm) shall include the following information:

1. The failed component or list of potentially failed components (if known by the ATM NE). Components identified should represent the smallest replaceable/repairable unit(s) of hardware or software.
2. Generic Trouble Description (see Table 2-7 for a list of generic troubles to be used if applicable)
3. Specific Problems (optionally provided) This parameter identifies further refinements (e.g., sub-cause indicator information) to the generic trouble description of the alarm. The alarm severity's can be assigned by the management system only for equipment alarms and physical layer communications alarms. Severity can be critical, major, minor, warning, indeterminate, and cleared:

   • *Critical* - Indicates that a service affecting condition has occurred and immediate corrective action is required. Such a severity is used when the managed entity is totally out of service and its capability must be restored.

   • *Major* - Indicates that a service affecting condition has occurred and urgent corrective action is required. Such a severity is used when there is a severe degradation in the capability of the managed entity and its full capability must be restored.

   • *Minor* - Indicates that a non-service affecting condition has occurred and that corrective action should be taken in order to prevent a more serious fault.

   • *Warning* - Indicates the detection of a potential or impending service affecting fault, before any significant effects have been felt.

   • *Indeterminate* - Indicates that the severity level cannot be determined.

   • *Cleared* - Indicates the clearing of one or more previously reported alarms.
4. Back-up Status This parameter indicates whether or not the entity emitting the alarm has been backed-up. A value of "true" indicates that the entity has been backed-up; a value of "false" indicates that the entity has not been backed-up.
5. Back-up Entity This parameter identifies the managed entity that is providing back-up services to the failed managed entity. If no back-up service is being provided, the value of this parameter shall be NULL.
6. Additional Text (optionally provided) This parameter is used to allow for additional text to be supplied with the alarm. Such text may further describe problem and/or failed entity (e.g., name and location).
7. Proposed Repair Actions (optionally provided) This parameter, when present, is used if the cause of the alarm is known and the ATM NE can suggest one or more solutions.
8. Time and Date Failure was Detected.

(R) FM-2 The M4 Interface shall support management system requests to assign a severity (i.e., critical, major, minor, or warning) to each alarm generated by each externally managed physical component of the ATM NE.

(R) FM-3 The M4 Interface shall provide management systems the ability to retrieve entries from the ATM NE log of alarm notifications.

2.2.1.1. Related Managed Entities

The managed entities defined in Section 3 that are required to support ATM NE failure reporting functions are as follows:

- Alarm Record
- Alarm Severity Assignment Profile
- ATM NE
- Equipment
- Interworking VCC Termination Point (if CES is supported)
- Physical Path Termination Point
- Plug-in Unit
- Software
- TC Adaptor
- VCC Termination Point
- VCL Termination Point
- VPC Termination Point
- VPL Termination Point

A mapping of the various generic troubles to the management entities listed above is provided in Table 2-8.

Table 2-7 List of Generic Troubles

Alarm Category	Generic Trouble
Communications Alarms	Alarm Indication Signal (AIS)
	Loss of Cell Delineation (LCD)
	Loss Of Frame (LOF)
	Loss Of Pointer (LOP)
	Loss Of Signal (LOS)
	Payload Type Mismatch
	Transmission Error
	Path Trace Mismatch
	Remote Defect Indication (RDI)
	Signal Label Mismatch
	Signaling Route Set Unavailable
Equipment Alarms	Back-plane Failure
	Call Establishment Error
	Congestion
	External Interface Device Problem
	Line Card Problem
	Multiplexer Problem
	Power Problem
	Processor Problem
	Protection Path Failure
	Receiver Failure
	Replaceable Unit Missing
	Replaceable Unit Problem
	Replaceable Unit Type Mismatch
	Timing Problem
	Transmitter Failure
	Trunk Card Problem
Processing Error Alarm	Storage Capacity Problem
	Memory Mismatch
	Corrupt Data
	Software Environment Problem
	Software Download Failure
	Version Mismatch
Environmental Alarms	Cooling Fan Failure
	Enclosure Door Open
	Fuse Failure
	High Temperature
General	Vendor Specific

Table 2-8 Mapping of Generic Troubles to Managed Entities

Generic Trouble	Managed Entity(ies)
Alarm Indication Signal (AIS)	Physical Path Termination Point VCC Termination Point VCL Termination Point VPC Termination Point VPL Termination Point
Loss of Cell Delineation (LCD)	TC Adaptor
Loss Of Frame (LOF)	Physical Path Termination Point
Loss Of Pointer (LOP)	Physical Path Termination Point (SONET only)
Loss Of Signal (LOS)	Physical Path Termination Point
Payload Type Mismatch	Physical Path Termination Point (SONET only)
Transmission Error	Physical Path Termination Point
Path Trace Mismatch	Physical Path Termination Point (SONET only)
Remote Defect Indication (RDI)	Physical Path Termination Point VCC Termination Point, VPC Termination Point VCL Termination Point, VPL Termination Point
Signal Label Mismatch	Physical Path Termination Point (SONET only)
Back-plane Failure	ATM NE, Equipment
Call Establishment Error	ATM NE, Equipment
Congestion	ATM NE, Equipment, Plug-in Unit
External Interface Device Problem	ATM NE, Equipment
Line Card Problem	Plug-in Unit
Multiplexer Problem	Equipment, Plug-in Unit
Power Problem	ATM NE, Equipment
Processor Problem	ATM NE, Equipment, Plug-in Unit
Protection Path Failure	ATM NE, Equipment
Receiver Failure	Plug-in Unit
Replaceable Unit Missing	Plug-in Unit
Replaceable Unit Problem	Plug-in Unit
Replaceable Unit Type Mismatch	Plug-in Unit
Signaling Route Set Unavailable	Signaling Route Set NE Part
Timing Problem	ATM NE, Equipment, Plug-in Unit
Transmitter Failure	Plug-in Unit
Trunk Card Problem	Plug-in Unit
Storage Capacity Problem	ATM NE, Equipment
Memory Mismatch	ATM NE, Equipment
Corrupt Data	ATM NE, Equipment
Software Environment Problem	ATM NE, Equipment
Software Download Failure	ATM NE, Equipment
Version Mismatch	ATM NE, Equipment, Plug-in Unit, Software
Cooling Fan Failure	ATM NE, Equipment
Enclosure Door Open	ATM NE, Equipment
Fuse Failure	ATM NE, Equipment
High Temperature	ATM NE, Equipment

Note: The Equipment managed entity may be used to represent a variety of different supplier-specific components of the ATM NE being managed. It is, therefore, the responsibility of each supplier to determine, based on the ATM NE component

being represented, if all or a subset of the troubles listed above apply to a particular instance of the Equipment managed entity.

2.2.2. OAM Cell Loopback Testing

The following operations interface functions are required to support VPC/VCC OAM cell loopback testing:

(R) FM-4 The M4 Interface shall support management systems requests to perform OAM Cell Loopback tests. An OAM Cell Loopback test is performed (by the ATM NE) by inserting a Loopback OAM cell, with the Loopback Location field set as specified by the management system, into the cell stream of the VPC/VCC connection or connection segment under test and verifying its return. The following information shall be supplied with each management system request to perform an OAM Cell Loopback test:

1. The Loopback OAM Cell Insertion Point This is the identity of the ATM connection or link termination point responsible for inserting the Loopback cell.
2. The OAM Cell Loopback Point This is either an indication that the OAM cell loopback is to be performed at the end of the segment/connection, or a code that uniquely identifies an intermediate point along the connection/segment responsible for logically looping-back the received OAM cell. This code is administered on an ATM interface termination point basis.
3. Segment or End-to-End Indication This indicates whether the Loopback cell to use during the test shall be a *segment* OAM cell or an *end-to-end* OAM cell.

(R) FM-5 The M4 Interface shall support ATM NE reply messages used to autonomously report the results of a previously requested OAM Cell Loopback test. These results shall be provided to the management system as a Boolean Pass/Fail indication.

2.2.2.1. Related Managed Entities

The managed entities defined in Section 3 that are required to support the OAM Cell Loopback Testing capability are as follows:

- ATM NE
- BICI (optional)
- BISSI (optional)
- TC Adaptor
- UNI (optional)
- VCC Termination Point
- VCL Termination Point
- VPC Termination Point
- VPL Termination Point

2.2.3. Physical Transmission Interface Management

(R) FM-6 The M4 interface shall support the fault management of the physical interfaces used by the NE. These interfaces can vary with the NE, its function and its geographic location. Possible interfaces include DS1 & DS3, E1 & E3, J2 and SONET SDH physical connections. Additional interfaces are possible beyond the ones listed here. An NE does not have to support all types of physical interfaces, but shall be able to support the fault management of the interfaces that it uses. Because of this, the following functions are required if the NE supports the corresponding optional physical interface.

(CR) FM-7 The M4 interface shall support the fault management of E1 interfaces if an E1 interface is present on the NE. ITU-T Recommendations [G.704], [G.706], [G.826] describe the E1 PDH (Pliesochronous Digital Hierarchy) interface and its fault management. Failure/notifications should include LOS, LOF, AIS and RAI.

(CR) FM-8 The M4 interface shall support the fault management of E3 interfaces if an E3 interface is present on the NE. ITU-T Recommendations [G.826], [G.832] describe the E1 PDH (Pliesochronous Digital Hierarchy) interface and its fault management. Failure/notifications should include LOS, LOF, AIS and RAI.

(CR) FM-9 The M4 interface shall support the fault management of DS1 interfaces if a DS1 interface is present on the NE. Bellcore document [GR-836] and ANSI specification [T1.247-1995] describes the DS1 PDH (Pliesochronous Digital Hierarchy) interface and its fault management. Additionally, ITU-T Recommendations [G.703], [G.704] and ANSI specifications [T1.107], [T1.408] provide additional functional descriptions on the characteristics of the interface. Failure/notifications should include LOS, LOF, AIS and RAI.

(CR) FM-10 The M4 interface shall support the fault management of DS3 interfaces if an DS3 interface is present on the NE. ANSI document [T1.119] and Bellcore document [GR-836] describe the DS3 PDH (Pliesochronous Digital Hierarchy) interface and its fault management. Failure/notifications should include LOS, LOF, AIS and RAI.

(CR) FM-11 The M4 interface shall support the fault management of J2 interfaces if an J2 interface is present on the NE. ATM Forum document [ATMF-6312] J2 PDH (Pliesochronous Digital Hierarchy) interface and its fault management. Failure/notifications should include LOS, LOF, AIS and RAI.

(CR) FM-12 The M4 interface shall support the fault management of SDH or SONET interfaces if an SONET or SDH interface is present on the NE. ITU-T Recommendations [G.774] series describe the Synchronous Digital Hierarchy interfaces and their fault management. Failure/notifications should include LOS, LOF, AIS and RAI. ANSI specification [T1.119] provides additional information SONET management.

(CR) FM-13 The M4 interface shall support the fault management of any other physical interfaces if that interface is present on the NE. These shall include but not be limited to known interfaces of TAXI, 25Mbps, ADSL, Wireless ATM (WATM) and 51Mbps. Support of these interfaces is for future study.

2.2.3.1. Related Managed Entities

The managed entities required to support physical transmission interfaces are defined in the above referenced standards and will not be reproduced here. Additionally the following NEs are also required:

- Physical Path Termination Point
- TC Adaptor

2.2.4. VCC Termination Point AAL Types

(R) FM-14 The M4 Interface shall support management system fault management messages for the AAL Type for a given VCC termination point in an ATM NE.

2.2.4.1. AAL Type 1 Configuration Information

For connections that terminate on IWUs supporting DSn Circuit Emulation, there is a need to generate an alarm (to the OS) when a receiving AAL Type 1 entity spends an excessive amount of time in the Starvation Condition. Note that a receiving AAL Type 1 entity enters a Starvation Condition when AAL-SDU information is needed to construct the DSn bit stream and none is available for the number of milliseconds specified by Cell Loss Integration Period. This is described further in GR-1248-CORE.

(CR) FM-15 The M4 Interface shall support autonomous notifications used to report AAL Type 1 failures such as Cell Starvation.

2.2.5. Internal Diagnostics Management

The intent of generic maintenance requirements is to define procedures for detecting and predicting network failures and notifying Management Systems or appropriate operations personnel of these findings in a manner that is common across all NEs in the network. The generic operations requirements stated here will ensure that all NEs, irrespective of implementation, perform a minimum set of operations functions and perform them in a way that is generally understood by a remote network management system. However, the development of generic operations criteria does not preclude the need for supplier specific procedures. Internal supplier specific diagnostics are still needed to provide a means by which faults may be located and isolated to the smallest replaceable unit of hardware in the network.

(R) FM-16 The M4 interface shall support Management System requests to activate, deactivate, or abort any in-service and/or out-of-service standard and supplier-specific diagnostic routines if said routines are supported by the NE. In addition the M4 interface shall support either simple pass/fail indication(s) or a detailed summary report of any diagnostic results provided by the ATM NE to the Management System.

(O) FM-17 The M4 interface should support requests from the Management System to schedule the activation or deactivation of a diagnostic routine. The M4 interface shall also be capable of supporting diagnostic reports for scheduled diagnostic tests.

(R) FM-18 The M4 interface shall support unique diagnostic test identifiers within each ATM NE that can be used to identify either supplier-specific or standard diagnostic routines.

(R) FM-19 The M4 interface shall support Management System requests to determine the status of in-progress diagnostic tests and to receive reports of current results from in-progress tests.

2.2.5.1. Related Managed Entities

The managed entity required to support Internal Diagnostics are:

- Diagnostic Control

2.2.6. CES Interworking Management

(CR) FM-20 If the NE supports CES Interworking, then the M4 interface shall support Management System requests to determine the status of failures or problems relating to Emulated Circuits. This would include any previous fault management requirements as applied to CES.

2.2.7. Fault Management for Signaling Channels

This section covers Fault Management for signaling channel management and Interoffice signaling channel management.

2.2.7.1. SSCOP FM Requirements

The SSCOP protocol includes the capability to detect when the SSCOP connection has been lost. This capability is used to identify SSCOP loss when the underlying physical and ATM layers are still operational.

On access signaling channels, the channel is known to have failed when the Timer_NO_RESPONSE expires. For interoffice signaling channels, the SSCF allows for the detection of other failure conditions in addition to the timer expirations, i.e., excessive error rate failures, and excessive duration of congestion. These are discussed in Q.2144.

A notification shall be sent to the management system whenever the SSCOP supporting an interoffice signaling link fails. For access signaling channels, it is not clear whether this feature is desirable, because CPE may be turned off or disabled by the customer as a routine practice. This is a configurable feature.

(CR) FM-21 If the NE supports SVCs then for support of interoffice signaling links, the M4 Interface shall support notifications of SSCOP failure and recovery from failure.

(CR) FM-22 If the NE supports SVCs then for support of access signaling links, the M4 Interface shall support notifications of SSCOP failure and recovery from failure, if the SSCOP is configured to send the alarm.

2.2.7.2. Interoffice Signaling Channel FM Requirements

2.2.7.2.1. MTP3 FM Requirements

MTP3 provides several notifications. Briefly, they are:

· False Link Congestion detection (carrier option): This notification is sent when a link is taken out of service because it stayed in one congestion level for too long.

- Near-End Forced Link Unavailable/Available: Sent when a link is made unavailable at the near end by an administrative action, or returned to availability.

- Link Failure/Recovery: Sent when a link fails/recovers.

- Link Set Failure/Recovery: Sent when all links in a link set are out.

- Signaling Routing Control Initiated Uninhibit: Sent if the ATM NE autonomously uninhibits a link so that a destination can become accessible. Note that this is one type of Management Uninhibit.

- Route Set Unavailable (Communications Alarm): Sent when a route set which was previously available becomes unavailable.

(CR) FM-23 If the NE supports SVCs, then the M4 Interface shall support the following per-link notifications of MTP3:

1. False Link Congestion detected (carrier option)
2. Near-End Forced Link Unavailable/Available
3. Link Failure/Recovery
4. Management Uninhibit by ATM NE

(CR) FM-24 If the NE supports SVCs, then the M4 Interface shall support the following per-link set notification of MTP3:

1. Link Set Failure/Recovery

(CR) FM-25 If the NE supports SVCs, then the M4 Interface shall support the following per-link route set NE Part notification of MTP3:

1. Route Set Unavailable (Communications Alarm)

2.2.7.2.2. BISUP FM Requirements

The following Fault Management requirements apply to BISUP (see Section 7.9 of BICI 2.0):

- Reset
- Consistency Check

Resets: When the BISUP signaling entity autonomously invokes a Reset and timer T17b expires, a notification needs to be sent to the Management System.

(CR) FM-26 If the NE supports SVCs, then the M4 Interface shall support the notification of Reset timer expiration at the ATM NE. Notifications shall include the following parameters:

1. Identification of the ATM interface involved,
2. The VPCI
3. The OPC and DPC
4. MTP Network Identifier (needed if multiple networks are terminated on the ATM NE)
5. Resource for which reset was attempted (i.e., SID, VPCI/VCI, or VPCI)
6. Probable cause (timer T17b expiration)
7. Event date and event time

A Management System may initiate the Reset of a VPCI. When the Management System initiates a Reset, the ATM NE attempts to invoke the Reset, and reports whether the Reset was successful or not.

(CR) FM-27 If the NE supports SVCs, then the M4 Interface shall support the reset of a VPCI. The request includes:

1. Identification of the ATM interface involved
2. The type of resource to reset (i.e., VPCI)
3. Identity of the resource (i.e., the VPCI value) Upon completion of the Reset, or expiration of timer T17b, the ATM NE shall notify the Management System of the success or failure of the Reset.

When a VPCI is in the Blocked state and it is reset, the Blocking condition is removed by the reset. Thus, when the BISUP signaling entity autonomously initiates a Reset on a blocked VPCI, the Management System needs to know that the VPCI is no longer blocked. (Note that Resets of other resources do not affect blocking conditions.)

(CR) FM-28 If the NE supports SVCs, then when the BISUP signaling entity invokes a Reset on a VPCI and the VPCI is in a Blocked state, the M4 Interface shall support a notification from the ATM NE to the Management System. The notification shall include the following parameters:

1. Identification of the ATM interface involved,
2. VPCI,
3. Probable cause (ATM NE Reset of Blocked VPCI),
4. Event date and event time.

Consistency Check: In order to support the Consistency Check procedure (see Section 7.9.8 of BICI), an ATM NE needs to be able to receive a request to initiate Consistency Check and report on the results, and it also must be able to notify the Management System when a remote ATM NE has initiated the Consistency Check procedure. This latter notification is an essential component of the procedure.

As stated in the BICI, Consistency Check can only be initiated for one VPC to any adjacent node at a time. Only the ATM NE that initiates the procedure can terminate it.

(CR) FM-29 If the NE supports SVCs, then the M4 Interface shall support requests to initiate Consistency Check at an ATM NE, and to terminate Consistency Check. If either timer T41b or T42b expires, a failure is reported. Upon completion of the procedure, the ATM NE shall report the result: VPCI check successful, VPCI check not successful, or VPCI check not performed.

(CR) FM-30 If the NE supports SVCs, then the M4 Interface shall support notifications of the completion of a remotely initiated VPCI consistency check. The notification shall include the following parameters: the SPC of the remote signaling entity that initiated the check, VPCI, the results of the test (VPCI check successful, VPCI check not successful, or VPCI check not performed), event date, and event time.

2.2.8. Call/Connection Fault Management Requirements

This section identifies the fault management requirements for switched virtual circuits.

2.2.8.1. Access Call/Connection FM Requirements

This section addresses DSS2 Restart procedures. Restart procedures may be initiated when the other side of the interface is not responding to messages, and/or failure has occurred as indicated by timer expirations. Restarts may be initiated for either a single SVC or for all SVCs on the UNI. They may be initiated by the signaling protocol (i.e., by the ATM NE) or by the Management System.

The DSS2 restart procedures for one SVC are used to return the SVC to the available state. The UNI Specification specifies that when an SVC is not properly released (e.g., no RELEASE COMPLETE is received in response to RELEASE), and if the ATM NE cannot successfully restart the SVC, the ATM NE shall notify the Management System that the SVC is considered to be out of service. (Note that the SSCOP is still active.)

(CR) FM-31 If the NE supports SVCs, then the M4 Interface shall support per-UNI notifications from the ATM NE to the management system about SVCs being put in the out of service condition as a result of a failed RESTART procedure that has been automatically initiated by the ATM NE.

The Management System may restart all SVCs on the ATM UNI.

(CR) FM-32 If the NE supports SVCs, then the M4 Interface shall support requests by the management system to all SVCs on a specified UNI. If UNI Signaling 4.0 is supported, the Management System shall support requests to restart all SVCCs in a specified VPCI.

2.2.9. Fault Management of OAM Flows

The management of OAM flows focuses on two areas: those requirements related to OAM continuity checking and those requirements related to intrusive and non-intrusive Performance Management. This section identifies requirements for both areas.

(CR) FM-33 If the Continuity Check OAM flows are supported and if the sink mechanism is activated, the M4 interface shall report a Loss of Continuity alarm when VP/VC is detected as disrupted.

2.2.9.1. Related Managed Entities

The managed entities required to support OAM Flow Fault Management are:

- OAM Continuity Monitor

2.3.Performance Management

Performance management provides functions to evaluate and report upon the behavior of telecommunications equipment and the effectiveness of the network or network element. Its role is to gather statistical data for the purpose of monitoring and correcting the behavior and effectiveness of the network, network element, or equipment and to aid in planning and analysis.

From an ATM network management perspective, this involves the following:

- Performance Monitoring
- Traffic Management
- UPC/NPC Disagreement Monitoring
- Performance Management Control
- Network Data Collection

2.3.1. ATM Cell Level Protocol Monitoring

Cell Level protocol monitoring involves collecting and thresholding data counts that measure an ATM NEs ability to successfully process and deliver incoming ATM cells. Cell Level protocol monitoring is particularly concerned with protocol abnormalities detected at the Transmission Convergence Sublayer and ATM Layer of the Broadband protocol stack. Cell Level protocol monitoring also entails logging detailed information (in the ATM NE) that may be retrieved and used by a management system to diagnose cell processing malfunctions.

The following M4 Interface functions are required to support Cell Level protocol monitoring:

(R) PM-1 The M4 Interface shall provide management systems the ability to retrieve current and history(15 minute) counts of the following data from each ATM interface (UNI, BICI, Virtual UNI or BISSI) terminating on the ATM NE. There will be separate counters for each ATM interface.

1. Discarded Cells due to HEC Violation: This parameter provides a count of the number of incoming ATM cells discarded due to a Header Error Check (HEC) violation.
2. Discarded Cells due to Protocol Errors: This parameter provides a count of the number of ATM cells discarded due to an unrecognizable cell header field value (e.g., unassigned VPI/VCI value, out-of-range VPI/VCI value, or invalid Payload Type Identification value).
3. Cells Received at NE interface: This parameter provides a count of the number of ATM cells received at the NE interface.
4. Transmitted at NE interface: This parameter provides a count of the number of ATM cells transmitted from the NE interface.
5. Discarded Cells due to Congestion: This parameter provides a count of the number of ATM cells discarded due to congestion. (CLP =0+1)

(R) PM-2 The M4 Interface shall support management system requests to reset any of the counters in PM-1 to zero.

(R) PM-3 The M4 Interface shall support management system requests to define multiple sets of threshold values (i.e., threshold value packages) for the parameters listed in **PM-1** and selectively assign each set to one or more interfaces terminating on the ATM NE.

(R) PM-4 The M4 Interface shall provide management systems the ability to modify threshold values for the performance parameters identified in requirement **PM-1**.

(R) PM-5 The M4 Interface shall support autonomous notifications (generated by the ATM NE) used to report threshold crossings for the parameters identified in requirement **PM-1**. Such notifications are often referred to as "threshold crossing alerts".

(R) PM-6 The M4 Interface shall provide management systems the ability to retrieve current (15 minute) counts of the number of OAM cells that are received and are transmitted at each ATM NE interface. There will be separate counters for transmitting and receiving.

(O) PM-7 The M4 Interface may provide management systems with the ability to retrieve current counts of High Priority Cells discarded due to congestion.

(R) PM-8 The M4 Interface shall provide management systems the ability to reset to zero each count for the performance parameters identified in requirements **PM-1** and **PM-6**.

(R) PM-9 The M4 Interface shall provide management systems the ability to retrieve history counts (thirty-two 15 minute counts) of the performance parameters identified in requirement **PM-1**.

(R) PM-10 The M4 Interface shall provide management systems the ability to retrieve history counts (thirty two 15 minute counts) of the performance parameters identified in requirement **PM-6**.

(R) PM-11 Failures, testing routines, and reconfigurations of UNIs, BISSIs, and BICIs may affect the collection of data identified in requirements **PM-1** and **PM-6**. When such events occur, the ATM NE is expected to flag the collected data as "suspect". The M4 Interface shall provide management systems the ability to retrieve an indication as to whether the counts identified in requirements **PM-1** and **PM-6** are reliable or suspect.

(R) PM-12 For each UNI, BICI, and BISSI terminating on the ATM NE, the ATM NE is expected to maintain a "latest occurrence" log containing the following information for ATM cells that were discarded due to protocol errors (see **PM-1**, Item 2):

1. The Abnormality Type: This attribute identifies the type of protocol error that resulted in the discarding of the ATM cell. Valid values are: (1) unassigned VPI/VCI value, and (2) out-of-range VPI/VCI value.
2. VPI/VCI Value of Discarded Cell.
3. Time and Date.

The term "latest occurrence" is used to indicate that the ATM NE only logs the latest occurrence of each abnormality type per interface. For a given interface, the ATM NE is not required to record another occurrence of any abnormality type within one second.

The M4 Interface shall provide management systems the ability to retrieve entries from the log of discarded ATM cell headers. Both individual entry retrievals as well as group retrievals (based on criteria specified by the management system) shall be supported over the M4 Interface. The receipt of the threshold crossing alert referred to in **PM-5** may trigger such a retrieval.

(R) PM-13 The M4 Interface shall support the suppression of all-zero performance monitoring counts, as identified in **PM-6**.

2.3.1.1. Related Managed Entities

The managed entities defined in Section 3 that are required to support Cell Level protocol monitoring are as follows:

- ATM Cell Protocol Monitoring Current Data
- ATM Cell Protocol Monitoring History Data
- ATM Cell Protocol Monitoring Log Record
- ATM NE
- ATM Traffic Load Current Data
- ATM Traffic Load History Data
- BICI
- BISSI
- Congestion Discard Current Data
- Congestion Discard History Data
- Latest Occurrence Log
- TC Adaptor
- TC Adaptor Protocol Monitoring Current Data
- TC Adaptor Protocol Monitoring History Data
- Threshold Data
- UNI

2.3.2. UPC/NPC Disagreement Monitoring

UPC and NPC algorithms are intended to police incoming cells to ensure that each access connection supported by the ATM NE is complying with pre-negotiated traffic descriptors. Based on the traffic management specifications developed by the ATM Forum (see [af-tm-0056.000]), non-compliant traffic may result in cell discarding or tagging. Since cells discarded due to UPC/NPC functions (a fault of the user) and cells discarded due to transmission errors and malfunctions (a fault of the network) will have the same effect on the end-to-end performance of a VPC/VCC, it is important for trouble shooting and trouble sectionalization purposes to provide network managers with the tools needed to distinguish between these two events.

The following operations interface functions are required so that management systems can retrieve ATM NE collected data that reflects the extent to which individual users are violating their pre-negotiated traffic descriptors.

(R) PM-14 The M4 Interface shall support management system requests to initiate UPC/NPC Disagreement Monitoring on a limited number of VP/VC links at any one point in time (e.g., 30 ATM links per DS3 and 90 ATM links per STS-3c).

(R) PM-15 The M4 Interface shall support management system requests to cease UPC/NPC Disagreement Monitoring that was previously activated for a VP/VC link. The identity of the VP/VC link shall be provided along with the request.

(R) PM-16 The M4 Interface shall provide management systems the ability to retrieve current (15 minute) counts of the following data from each VP/VC link for which UPC/NPC Disagreement Monitoring is being performed:

1. Discarded Cells due to UPC/NPC Disagreements: This parameter provides a count of the number of ATM cells discarded due to traffic descriptor violations detected by the combined CLP =0 and CLP =1 UPC/NPC policing function.
2. Discarded CLP =0 Cells due to UPC/NPC Disagreements: This parameter provides a count of the number of high priority (CLP =0) ATM cells discarded due to traffic descriptor violations detected by the CLP =0 UPC/NPC policing function. This counter is only required if CLP =0 traffic is separately policed.
3. Successfully Passed Cells: This parameter provides a count of the number of cells that have been passed (i.e., not discarded) by the combined CLP =0 and CLP =1 UPC/NPC policing function.
4. Successfully Passed CLP =0 Cells: This parameter provides a count of the number of high priority cells that have been passed (i.e., not discarded) by the CLP =0 UPC/NPC policing function. This counter is only required if CLP =0 traffic is separately policed.
5. Tagged CLP=) Cells: This parameter provides a count of the cells which have been tagged.

(R) PM-17 The M4 Interface shall support management system requests to define multiple sets of threshold values (i.e., threshold value packages) for the parameters listed in **PM-16** and selectively assign each set to one or more interfaces terminating on the ATM NE.

(R) PM-18 The M4 Interface shall provide management systems the ability to modify threshold values for the "Discarded Cells" and the "Discarded CLP =0 Cells" performance parameters identified in requirement **PM-16**.

(R) PM-19 The M4 Interface shall support autonomous notifications (generated by the ATM NE) used to report threshold crossings for the parameters identified in requirement **PM-16**. Such notifications are often referred to as "threshold crossing alerts".

(R) PM-20 The M4 Interface shall provide management systems the ability to reset to zero the performance parameters identified in requirement **PM-16**.

(R) PM-21 The M4 Interface shall provide management systems the ability to retrieve history counts (thirty two 15 minute counts) of the parameters identified in **PM-16**.

(R) PM-22 Failures, testing routines, and reconfigurations of VPCs and/or VCCs may affect the collection of data identified in requirement **PM-16**. When such events occur, the ATM NE is expected to flag the collected data as "suspect". The M4 Interface shall provide management systems the ability to retrieve an indication as to whether the counts identified in **PM-16** are reliable or suspect.

2.3.2.1. Related Managed Entities

The managed entities defined in Section 3 that are required to support UPC/NPC Disagreement Monitoring are as follows:

- ATM NE
- TC Adaptor
- UPC/NPC Disagreement Monitoring Current Data
- UPC/NPC Disagreement Monitoring History Data
- VCL Termination Point
- VPC Termination Point
- VPL Termination Point

2.3.3. Physical Transmission Interface Management

(R) PM-23 The M4 interface shall support the performance management of the physical interfaces used by the NE. These interfaces can vary with the NE, its function and its geographic location. Possible interfaces include DS1 & DS3, E1 & E3, J2 and SONET SDH physical connections. Additional interfaces are possible beyond the ones listed here. An NE does not have to support all types of physical interfaces, but shall be able to support the fault management of the interfaces that it uses. Failure/notifications should include threshold alerts for unacceptable performance (error) rates. Performance data should include of transmission counts of Errored Seconds (ES), Severely Errored Seconds (SES), Coding Violations (CV) and Unavailable Seconds (UAS). Because of this, the following functions are required if the NE supports the corresponding optional physical interface.

(CR) PM-24 The M4 interface shall support the performance management of E1 interfaces if an E1 interface is present on the NE. ITU-T Recommendations [G.704], [G.706], [G.826] describe the E1 PDH (Pliesochronous Digital Hierarchy) interface and its performance management

(CR) PM-25 The M4 interface shall support the performance management of E3 interfaces if an E3 interface is present on the NE. ITU-T Recommendations [G.826], [G.832] describe the E1 PDH (Pliesochronous Digital Hierarchy) interface and its performance management.

(CR) PM-26 The M4 interface shall support the performance management of DS1 interfaces if a DS1 interface is present on the NE. Bellcore document [GR-836] and ANSI [T1.247] describe the DS1 PDH (Pliesochronous Digital Hierarchy) interface and its performance management. Additionally, ITU-T Recommendations [G.703], [G.704] and ANSI specifications [T1.107], [T1.408] provide additional functional descriptions on the characteristics of the interface.

(CR) PM-27 The M4 interface shall support the performance management of DS3 interfaces if an DS3 interface is present on the NE. ANSI document [T1.247], [T1.231], [T1.240] and Bellcore document [GR-836] describe the DS3 PDH (Pliesochronous Digital Hierarchy) interface and its performance management.

(CR) PM-28 The M4 interface shall support the performance management of J2 interfaces if an J2 interface is present on the NE. ATM Forum document [ATMF-6312] J2 PDH (Pliesochronous Digital Hierarchy) interface and its performance management.

(CR) PM-29 The M4 interface shall support the performance management of SONET/SDH interfaces if an SONET or SDH interface is present on the NE. ITU-T Recommendations [G.774], [G.774.01], Bellcore [GR-1042] and ANSI [T1.119-02] describe the Synchronous Optical NETwork interfaces and the Synchronous Digital Hierarchy interfaces and their performance management.

(CR) PM-30 The M4 interface shall support performance management functions of any other physical interfaces if that interface is present on the NE. These shall include but not be limited to the known interfaces of TAXI, 25 Mbps, ADSL, Wireless ATM, and 51 Mbps. Support of these interfaces is for future study.

2.3.3.1. Related Managed Entities

The managed entities required to support physical transmission interfaces are not within the scope of this document. However, their definition would generally follow the object class definitions in the above referenced standards.

2.3.4. AAL Protocol Performance Monitoring

The approach for AAL performance monitoring is based on maintaining counts of errors in received Segmentation And Reassembly (SAR) and Convergence Sublayer (CS) Protocol Data Units (PDUs) per VCC termination point. Tables 2-9, 2-10, and 2-11 summarize information regarding AAL protocol monitoring for AAL Types 1, 3/4, and 5. Note that, as in the case of TC Sublayer and ATM Layer protocol monitoring, the granularity period for AAL protocol monitoring shall be 15 minutes. Also 8 hours of history shall be maintained in the ATM NE.

Table 2-9 AAL Type 1 Protocol Monitoring Summary

Parameter	Simple Counter	Thresholded
AAL Header Errors	√	√
Sequence Violations	√	√
Cell Loss	√	√
Cell Misinsertion	√	√
Buffer Underflow Events	√	√
Buffer Overflow Events	√	√
SDT Pointer Reframes	√	√
SDT Pointer Parity Check Failures	√	√

Table 2-10 AAL Type 3/4 Protocol Monitoring Summary

Parameter		Sum of Errors	Simple Counter	Thresholded
CS	Invalid Fields (Invalid CPI + Invalid Alignment + Invalid BASize)	√		√
	Incorrect Fields	√		√
	BTag not equal to ETag		√	
	BASize not consistent with Length		√	
	Actual length not consistent with Length		√	
SAR	Invalid Fields (Invalid MID + Invalid Length Indication)	√		√
	Incorrect Fields	√		√
	Incorrect CRC		√	
	Unexpected Sequence Number		√	
	Unexpected MID		√	
	SRI Time Outs		√	√
	Number of Aborts		√	

Table 2-11 AAL Type 5 Protocol Monitoring Summary

Parameter		Sum of Errors	Simple Counter	Thresholded
CS	Invalid Fields (Invalid CPI + Oversized Received SDU + Length Violation)	√		√
	Incorrect Fields (CRC-32 Violation)		√	√
	Reassembly Timer Expirations		√	√

(R) PM-31 The M4 Interface shall support the management messages of the AAL Type for a given VCC termination point in an ATM NE.

2.3.4.1. AAL Type 1 Performance Management

(CR) PM-32 If the NE supports AAL Type 1 protocol monitoring, the M4 Interface shall provide management systems the ability to retrieve current (15 minute) counts of the following errors (at the CS layer) at each connection end point where receiving IWF functions are performed:

1. AAL Header Errors: i.e., the number of AAL1 header errors detected, including those corrected. Header errors include correctable and uncorrectable CRC plus bad parity.
2. Sequence Count total violations: i.e., the count of incoming AAL Type 1 SAR-PDUs where the sequence count in the PDU header causes a transition from the SYNC state to the OUT OF SEQUENCE state as defined by ITU-T Recommendation I.363.1. (optional)

   - lost cell: i.e., the number of lost cells, as detected by the AAL1 sequence number processing, for example. This count records the number of cells detected as lost in the network prior to the destination interworking function AAL1 layer processing. (optional)

   - misinserted cells: i.e., the number of sequence violation events which the AAL CS interprets as misinserted of cells as defined by ITU-T Recommendation I.363.1. (optional)
3. Buffer Underflows: i.e., the number of times the reassembly buffer underflows. In the case of a continuous underflow caused by a loss of ATM cell flow, a single buffer underflow should be counted. If the interworking function is implemented with multiple buffers, such as a cell level buffer and a bit level buffer, then either buffer underflow will cause this count to be incremented. Buffer underflow may be caused by slight clocking differences between the node at which segmentation takes place and the node at which reassembly takes place. Buffer underflow may also result from unexpectedly large CDV.
4. Buffer Overflows: i.e., the number of times the reassembly buffer overflows. If the interworking function is implemented with multiple buffers, such as a cell level buffer and a bit level buffer, then either buffer overflow will cause this count to be incremented). Buffer overflow may be caused by slight clocking difference between the node at which segmentation takes place and the node at which reassembly takes place. Buffer overflow may also result from unexpectedly large CDV.
5. SDT Pointer Reframes: i.e., the number of events in which the AAL1 reassembler found that a structured data pointer is not where it is expected, and the pointer must be re-acquired. This count is only meaningful for structured data transfer modes as unstructured modes do not use pointers. (mandatory for structured data transfer)
6. SDT Pointer Parity Check Failures: i.e., the number of times the AAL reassembler detects a parity check failure at the point where a structured data pointer is expected. This count is only meaningful for structured data transfer modes as unstructured modes do not use pointers.), (optional for structured data transfer).

(CR) PM-33 If the NE supports AAL Type 1 protocol monitoring, the M4 Interface shall support management system requests to define at least one set of threshold values (i.e., threshold value packages) for the supported parameters listed in PM-25 and selectively assign each set to one or more AAL Type 1 entities in the ATM NE.

(CR) PM-34 If the NE supports AAL Type 1 protocol monitoring, the M4 Interface shall provide management systems the ability to modify threshold values for the supported performance parameters identified in requirement **PM-32**.

(CR) PM-35 If the NE supports AAL Type 1 protocol monitoring, the M4 Interface shall support autonomous notifications (generated by the ATM NE) used to report threshold crossings for the supported parameters identified in requirement **PM-32**.

(CR) PM-36 If the NE supports AAL Type 1 protocol monitoring, the M4 Interface shall provide the management system the ability to retrieve history counts (thirty-two 15 minute counts) of the supported performance parameters identified in **PM-32**.

2.3.4.2. Related Managed Entities

The managed entities required to support AAL 1 are:

- AAL1 Protocol Current Data
- AAL1 Protocol History Data

2.3.4.3. AAL Type 3/4 Performance Management

(CR) PM-37 If the NE supports AAL Type 3/4 protocol monitoring, the M4 Interface shall provide the management system the ability to retrieve a single, aggregate, thresholded current (15 minute) sum of errors count that reflects the following errors:

1. Invalid Message Identifier (MID) i.e., MID = 0 when there is multiplexing, or MID not equal to 0 when there is no multiplexing.
2. Invalid SAR-PDU Length Indication i.e., Length Indication not equal to 44 octets for a BOM or COM, not in the set of values [4, 8, .., 44] octets or 63 octets for an EOM, or not in the set of values [8, 12, .., 44] octets for an SSM. The value "63" is used in the abort procedures, as described in ITU-T Recommendation I.363.3.

(CR) PM-38 If the NE supports AAL Type 3/4 protocol monitoring, the M4 Interface shall provide the management system the ability to retrieve a current (15 minute) sum of errors count that reflects the following errors:

1. SAR-PDU CRC incorrect when computed.
2. COM/EOM Segment with unexpected SAR Sequence Number, i.e., SAR Sequence Number not incremented by 1 (modulo 16) relative to the previous (non-EOM) SAR-PDU received over the same VPC/VCC, and containing the same MID.
3. BOM/EOM Segment with unexpected MID, i.e., a BOM is received with a currently active MID (a MID for which an EOM has not yet been received), or an EOM received for which a MID is not currently active.

(CR) PM-39 If the NE supports AAL Type 3/4 protocol monitoring, the M4 Interface shall provide the management system the ability to retrieve separate performance counters on each connection end point that terminates the AAL Type 3/4 protocol, for each of the SAR-PDU incorrect field error types listed in PM-7.

(CR) PM-40 If the NE supports AAL Type 3/4 protocol monitoring, the M4 Interface shall provide the management system the ability to retrieve current (15 minute) counts of the number of SRI time-outs that occur on each connection end point that terminates the AAL Type 3/4 protocol.

(CR) PM-41 If the NE supports AAL Type 3/4 protocol monitoring, the M4 Interface shall provide the management system the ability to retrieve current (15 minute) counts of the number of aborts that occur on each connection end point that terminates the AAL Type 3/4 protocol.

(CR) PM-42 If the NE supports AAL Type 3/4 protocol monitoring, the M4 Interface shall provide the management system the ability to retrieve a current (15 minute) sum of errors count that reflects the following errors:

1. BASize Field value not valid on an incoming AAL Type 3/4 CS-PDU; i.e., < 37 octets for multi-segment messages
2. Common Part Indicator not valid (i.e., not equal to 0)

3. Alignment Field not equal to 0.

Note that not all ATM NEs that terminate AAL Type 3/4 will check for these errors.

(CR) PM-43 If the NE supports AAL Type 3/4 protocol monitoring, the M4 Interface shall provide the management system the ability to retrieve a current (15 minute) sum of errors count that reflects the following errors:

1. Beginning Tag (BTag) not equal to End Tag (ETag)
2. Buffer Allocation Size (BASize) and Length fields not equal when message mode is used, or BASize < Length when streaming mode is used. (When supporting SMDS, BASize must always be = Length.)
3. Actual length of CS-PDU Payload not consistent with Length field. For clarification, the length is consistent in the following cases. In a proper CS-PDU composed of multiple segments, the number of octets in the partially assembled CS-PDU plus the SAR Length Indication field must be in the range [Length + 4, Length + 7], because the last SAR-PDU will contain 4 octets CS trailer and 0-3 octets Pad. (A range is specified because the size of the Pad is not known by the CS layer.) In a proper CS-PDU composed of only a single segment, the SAR Length Indication field must be in the range [Length + 8, Length + 11], because the SAR-PDU will contain 4 octets CS header, 4 octets CS trailer, and 0-3 octets Pad.

(CR) PM-44 If the NE supports AAL Type 3/4 protocol monitoring, the M4 Interface shall provide the management system the ability to retrieve separate performance counters for each connection end point that terminates the AAL Type 3/4 protocol, for each of the CS-PDU incorrect field error types listed in PM-36.

(CR) PM-45 If the NE supports AAL Type 3/4 protocol monitoring, the M4 Interface shall support management system requests to define multiple sets of threshold values (i.e., threshold value packages) for the parameters listed in PM-29, PM-30, PM-32, PM-34 and PM-36 and selectively assign each set to one or more AAL Type 3/4 entities in the ATM NE.

(CR) PM-46 If the NE supports AAL Type 3/4 protocol monitoring, the M4 Interface shall provide management systems the ability to modify threshold values for the performance parameters identified in requirements PM-29, PM-30, PM-32, PM-34 and PM-36.

(CR) PM-47 If the NE supports AAL Type 3/4 protocol monitoring, the M4 Interface shall support autonomous notifications (generated by the ATM NE) used to report threshold crossings for the parameters identified in requirement PM-29, PM-30, PM-32, PM-34 and PM-36.

(CR) PM-48 If the NE supports AAL Type 3/4 protocol monitoring, the M4 Interface shall provide the management system the ability to retrieve history counts (thirty-two 15 minute counts) of the performance parameters identified in requirements PM-29 to PM-37.

2.3.4.4. Related Managed Entities

The managed entities required to support AAL 3/4 are:

- AAL3/4 Protocol Current Data
- AAL3/4 Protocol History Data

2.3.4.5. AAL Type 5 Performance Management

(CR) PM-49 If the NE supports AAL Type 5 protocol monitoring, the M4 Interface shall provide the management system the ability to retrieve current (15 minute) sum of errors count of the following errors at each connection end point where AAL Type 5 is terminated:

1. Invalid CPI
2. Oversized Received SDU
3. Length Violation (a length violation results in an invalid Pad field size)

(CR) PM-50 If the NE supports AAL Type 5 protocol monitoring, the M4 Interface shall provide the management system the ability to retrieve current (15 minute) counts of CRC-32 violations.

(CR) PM-51 If the NE supports AAL Type 5 protocol monitoring, the M4 Interface shall provide the management system the ability to retrieve current (15 minute) counts of the number of reassembly timer expirations on each receiving connection end point where AAL Type 5 is terminated.

(CR) PM-52 If the NE supports AAL Type 5 protocol monitoring, the M4 Interface shall support management system requests to define multiple sets of threshold values (i.e., threshold value packages) for the parameters listed in PM-42, PM-43, and PM-44 and selectively assign each set to one or more AAL Type 5 entities in the ATM NE.

(CR) PM-53 If the NE supports AAL Type 5 protocol monitoring, the M4 Interface shall provide management systems the ability to modify threshold values for the performance parameters identified in requirement PM-42, PM-43, and PM-44.

(CR) PM-54 If the NE supports AAL Type 5 protocol monitoring, the M4 Interface shall support autonomous notifications (generated by the ATM NE) used to report threshold crossings for the parameters identified in requirement PM-42, PM-43, and PM-44.

(CR) PM-55 If the NE supports AAL Type 5 protocol monitoring, the M4 Interface shall provide the management system the ability to retrieve history counts (thirty-two 15 minute counts) of the performance parameters identified in PM-42, PM-43, and PM-44.

2.3.4.6. Related Managed Entities

The managed entities required to support AAL 5 are:

- AAL5 Protocol Current Data
- AAL5 Protocol History Data

2.3.5. VP and VC Layer Performance Monitoring

Performance information is useful for both the Virtual Path (VP) and Virtual Circuit (VC) levels of information passing through a Network Element (NE). The M4 interface shall provide the ability to initiate VP/VC performance monitoring on a limited number of VP/VC termination points. This data is then used by the NE's OS to compute the lost cell ratio and the misinserted cell ratio. Specific counters should exist for:

- User Cells
- Lost Cells
- Misinserted Cells

2.3.5.1. VP & VC Performance Information Collection Requirements

Performance information collection refers to the ability for the NE to collect the various performance monitoring (PM) parameters related to a single monitored entity in that NE.

(R) PM-56 The ATM NE shall count and store in a current PM bin the layer performance parameters identified. These counters should be thirty two 15 minute intervals.

(R) PM-57 The M4 interface shall provide management systems the ability to retrieve current (15 minute) counts of the following data for each selected VCL and each selected VPL associated with a PVC:

1. number of (CLP =0+1) cells received at each VCL
2. number of (CLP =0+1) cells transmitted at each VCL
3. number of (CLP =0+1) cells received at each VPL
4. number of (CLP =0+1) cells transmitted at each VPL

(R) PM-58 The M4 interface shall provide the OS in the NE with the ability to reset to zero each current count for the layer performance parameters identified.

(O) PM-59 The M4 interface should support management system requests to initiate, and to cease, ATM traffic load monitoring on a limited number of VCLs and VPLs that are associated with a PVC.

2.3.5.2. VP & VC Performance Information Storage Requirements

Performance information storage refers to the capability for the NE to store PM history information on each monitored entity for a prescribed time duration. The NE can also store summarized or statistical information derived from various monitored entities.

(R) PM-60 The M4 interface shall provide management systems the ability to retrieve history counts (thirty-two 15 minute counts) of the performance parameters identified in requirement **PM-57**.

(R) PM-61 Failures, testing routines, non-boundary resets and reconfigurations may affect the collection of performance monitoring information. When such events occur, the ATM NE is expected to flag the collected information as "suspect." The operations interface shall provide to the OS the ability to retrieve an indication as to whether the counts are reliable or suspect.

(R) PM-62 The ATM NE shall support the suppression of all zero performance monitoring counts.

2.3.5.3. VP & VC Performance Information Thresholding Requirements

Performance management thresholding refers to the ability for the NE to inform the OS of any threshold crossing. It also provides the OS with the means for establishing thresholding criteria. When this capability is available, the following specific requirements are associated with the thresholding activity.

(R) PM-63 The M4 operations interface shall support requests by the NE's OS to retrieve and change the threshold of each register.

(R) PM-64 As soon as a threshold is reached or crossed for a given performance event, a threshold crossing notification is generated.

(R) PM-65 The M4 Interface shall support requests by the NE's OS to disable, that is to prevent the generation of threshold crossing notifications, and to enable thresholds associated with performance monitoring. [Note: This capability is implemented in the protocol independent MIB by changing the Threshold Data Id in a Current Data object only, not by modifying the values in the Threshold Data object.]

(O) PM-66 The M4 interface should support management system requests to define multiple sets of threshold values (i.e., threshold value packages) for parameters listed in **PM-57** and selectively assign each set to one or more VCLs or VPLs that are associated with a PVC.

2.3.5.4. VP & VC Performance Information Reporting Requirements

Performance management information reporting refers to the optional capability for the NE to report PM information on a scheduled basis, or as a result of a spontaneous request from the management system. A report may contain information from a given monitored entity, or it can contain summarized information or information derived statistically from a set of monitored entities. The following specific requirements are associated with the reporting activity:

(R) PM-67 Performance information shall be reportable when a request is made across the M4 interface.

(O) PM-68 Performance information collection may be performed periodically to support trend analysis to predict future failure or degraded conditions. On request by the M4 interface, the PM information of specific ports should be reportable periodically.

2.3.5.5. Related Managed Entities

The managed entities required to support VP & VC Performance Monitoring are:

- ATM Traffic Load Current Data
- ATM Traffic Load History Data
- VCL Termination Point
- VPL Termination Point

2.3.6. Performance Management for Signaling Channels

This section identifies the performance management requirements for the signaling channels.

2.3.6.1. Common PM Requirements (SSCOP)

There are two main activities associated with the performance monitoring for SSCOP:

- Protocol monitoring - for detecting undesired abnormality levels
- Protocol data capture - for logging protocol abnormalities. (see af-test-nm-0094.000 for details.)

Experience with N-ISDN has shown that it is not unusual for CPE to have errors in implementing the signaling protocol, and so it is important for an ATM NE to have the capability to collect information about the number and type of access signaling protocol errors. It is expected that interoffice equipment will be more thoroughly tested for conformity to signaling specifications, but since the impact of an interoffice signaling protocol error is greater, so the interoffice signaling operations requirements are vital as well.

2.3.6.1.1. SSCOP Protocol Monitoring: Counters and Thresholds

SSCOP protocol abnormalities include SSCOP PDU re-transmission and errored PDU received. The errored PDUs include unexpected PDUs, invalid PDUs (as defined in SSCOP) and PDUs with sequence number errors or list element errors. These measures are consistent with those defined in the IETF.

The SSCOP monitoring functions *count and threshold* the SSCOP protocol abnormalities. Threshold crossings are reported to the Management System. The counters are reset periodically and a certain amount of history data is kept at the ATM NE.

For SSCOP performance monitoring, the following events are counted:

- SSCOP connection disconnect (i.e., loss of SSCOP connection). The SSCOP connection between signaling entities is a rather critical resource since it carries signaling traffic. The significance of losing the SSCOP connection is relative (it may be used for interoffice signaling, or it may be used for access signaling for a single video terminal), so there will be cases when it is critical to monitor this event and cases when it is desirable but not essential.
- Inability to establish an SSCOP connection
- Re-establishment or resynchronization of the SSCOP link connection. This usually indicates lack of synchronization between the two ends.

In most cases, the above abnormalities are communicated to layer management through an MAA-ERROR indication. A list of the error codes can be found in Annex A of the SSCOP standard (see Q.2110 and T1.637).

(CR) PM-69 If the NE supports SVCs, then the ATM NE shall count and threshold the *SSCOP Connection Monitoring Counter* to monitor the receive side of each signaling channel that it supports. This counter is incremented when any of the following events occurs.

1. SSCOP connection disconnect - The abnormal occurrence of this event is characterized by the expiration of Timer_NO_RESPONSE. This event is communicated to the layer management with MAA-ERROR code P.
2. SSCOP connection initiation failure - This condition indicates the inability to establish an SSCOP connection. This event occurs whenever the number of expires of the connection control Timer_CC exceeds MaxCC (communicated to layer management with MAA-ERROR code O) or upon receipt of a connection reject message BGREJ PDU.
3. SSCOP connection re-establishment/resynchronization - This event occurs upon receipt of a BGN PDU or RESYNC PDU.

(CR) PM-70 If the NE supports SVCs, then the ATM NE shall count and threshold a sum of errors SSCOP Errored PDUs counter of errored PDUs to monitor the receive side of each signaling channel that it supports. This counter is incremented when any of the following events occurs:

1. Unexpected PDUs (MAA-ERRORS A-M).

2. Invalid PDUs. These are defined in SSCOP and consist of PDUs with incorrect length (MAA-ERROR code U), undefined PDU type code (i.e., '0000') or "not 32-bit aligned".
3. Unexpected PDU Values. PDU N(S), N(PS), N(R) errors or list elements error in STAT/USTAT PDUs. These events are communicated to layer management with MAA-ERRORs Q-T.

The Threshold Crossing Alert (TCA) shall contain, at a minimum, a time stamp, the signaling channel identifier, and the identifier and value of the counter exceeding the threshold.

These counters shall be used on all interoffice signaling channels. For access signaling channels, at any given time, SSCOP performance monitoring shall be available for an arbitrary subset of at least 10% of all active signaling channels. For access signaling channels, the ATM NE shall allow the Management System to activate/deactivate the protocol monitoring capability for a given channel.

(CR) PM-71 If the NE supports SVCs, then the ATM NE shall provide management systems the ability to retrieve history counts (thirty-two 15 minute counts) of the *SSCOP Connection Monitoring Counter* and *SSCOP Errored PDUs* Counter.

These counters are summarized in Table 2-12.

Table 2-12 SSCOP Protocol Monitoring Parameters

Parameter	Sum of Errors	Thresholded
SSCOP Connection Monitoring Counter	√	√
SSCOP Errored PDUs	√	√

2.3.6.2. Related Managed Entities

The managed entities required to support SVC Performance Monitoring are:

- SSCOP Current Data
- SSCOP History Data

2.3.7. Performance Management of OAM Flows

The management of OAM flows focuses on two areas: those requirements related to OAM continuity checking and those requirements related to intrusive and non-intrusive Performance Management. This section identifies PM requirements for the later areas.

(CR) PM-72 If the Performance Management of F4/F5 OAM flows are supported, the M4 interface shall support the following performance counters which shall be kept in relation with the VPL TP, VPC TP, VCL TP or VCC TP at which the monitoring occurs: Lost Cells, Misinserted Cells, and User Cells.

(CR) PM-73 If the Performance Management of F4/F5 OAM flows are supported and if Far-End data collection is supported, the M4 interface shall support the following performance counters in relation with the VPL TP, VPC TP, VCL TP or VCC TP at which the monitoring occurs: Far-End Lost Cells, Far-End Misinserted Cells, and Far-End User Cells.

(CR) PM-74 If the Performance Management of F4/F5 OAM flows are supported, the M4 interface shall support a history of 32 15 minute counters which shall be kept for the counters listed in **PM-63** and **PM-64**.

(CR) PM-75 If the Performance Management of F4/F5 OAM flows are supported, the M4 interface shall support the ability to reset the counters listed in **PM-63** and **PM-64**.

2.3.7.1. Related Managed Entities

The managed entities required to support OAM Flow Performance Management are:

- OAM Performance Monitor

3. Protocol Independent MIB

This section defines a protocol independent MIB used to describe the exchange of information across the ATM NE Management Interface. This logical MIB is intended to form the basis from which protocol-specific models (e.g., CMIP, SNMP or CORBA Information Models) for ATM are defined. As a guideline, protocol-specific MIB implementations should resemble the protocol independent MIB as much as is possible and practical. The protocol independent MIB should not, however, place unnecessary constraints on its protocol-specific implementations.

The protocol independent MIB presented in this document has been defined in terms of *managed entities*. In this document, managed entities are abstract representations of resources and services in an ATM NE. The managed entities defined in this document are:

- AAL1 Profile
- AAL1 Protocol Current Data
- AAL1 Protocol History Data
- AAL3/4 Profile
- AAL3/4 Protocol Current Data
- AAL3/4 Protocol History Data
- AAL5 Profile
- AAL5 Protocol Current Data
- AAL5 Protocol History Data
- ABR
- ABR Feedback Control
- Abstract Destination
- Alarm Record
- Alarm Severity Assignment Profile
- Analysis Criteria
- ATM Access Profile
- ATM Cell Protocol Monitoring Current Data
- ATM Cell Protocol Monitoring History Data
- ATM Cell Protocol Monitoring Log Record
- ATM Cross Connection
- ATM Cross Connection Control
- ATM MTP Signaling Point
- ATM NE
- ATM Signaling Link Set Termination Point
- ATM Signaling Link Termination Point
- ATM Traffic Load Current Data
- ATM Traffic Load History Data
- Attribute Value Change Record
- BICI
- BISSI
- BISUP Access Point
- BISUP Signaling Point
- BISUP Timers Profile
- Calling Line Identification Presentation Dependent
- Calling Line Identification Restriction Dependent
- Calling Number Screening
- Call Routing Office Data
- Carrier Data
- CBR
- CES Service Profile
- Congestion Discard Current Data

- Congestion Discard History Data
- Connected Line Identification Presentation Dependent
- Connected Line Identification Restriction Dependent
- Connected Number Screening
- CUG Independent
- CUG Subscription Option Dependent
- Customer Profile
- Customised Resource
- Diagnostic Control
- Digit Manipulation
- Direct Dialing In Independent
- Directory Number AESA
- Directory Number E.164
- DSS2 Access Signaling Channel Termination Point
- Equipment
- Equipment Holder
- Event Forwarding Discriminator
- Group Combination
- Interworking VCC Termination Point
- Latest Occurrence Log
- List of Route TPs
- Local Destination
- Log
- Managed Entity Creation Log Record
- Managed Entity Deletion Log Record
- MTP3b Access Point
- Multiple Subscriber Number Independent
- Multipoint Bridge
- NNI Access
- OAM Continuity Monitor
- OAM Performance Monitor
- OAM VP-VC Current Data
- OAM VP-VC History Data
- Physical Path Termination Point
- Plug-in Units
- Post Analysis Evaluation
- Route Data
- SAAL NNI Protocol Profile
- SAAL UNI Protocol Profile
- Signaling Route Set NE Part
- Signaling Route NE Part
- Signaling VCC Termination Point
- Software
- SSCOP Current Data
- SSCOP History Data
- State Change Record
- Sub Addressing Dependent
- TC Adaptor
- TC Adaptor Protocol Monitoring Current Data
- TC Adaptor Protocol Monitoring History Data
- Threshold Data
- Traffic Descriptor
- UBR
- UNI

- UNI Info
- UPC/NPC Disagreement Monitoring Current Data
- UPC/NPC Disagreement Monitoring History Data
- User Data
- User To User Signaling Dependent
- VBR
- VCC Termination Point
- VCL Termination Point
- Virtual Path Group
- VPC Termination Point
- VPCI Termination Point
- VPL Termination Point

A detailed description of each managed entity is provided in the subsections that follow. The descriptions include (1) the purpose of the entity, (2) the attributes of the entity, (3) the management operations (actions) that may be performed on the entity, (4) the notifications generated by the managed entity, and (5) the relationship(s) that the entity supports with other managed entities. Note that additional uses, Attributes, actions, notifications, and Relationships may be defined for these managed entities as more operations interface functions are defined.

In this document, all Relationships should be interpreted as being bi-directional, that is, if Managed Entity A is documented as having a relationship with Managed Entity B, then Managed Entity B has a reverse relationship with Managed Entity A, although this may not be explicitly documented. Attributes whose value is documented as a pointer to some other managed entity shall be interpreted as expressing the existence of a relationship between the two managed entities. In agreement with the preceding, these Relationships are also bi-directional.

The following notation is used in the model:

- mandatory – indicates a required element (or elements) of the model
- optional – indicates an optional element (or elements) of the model
- A/R – indicates a set-valued attribute for which members of the set can be added and removed. Also implies, the value of the attribute can be set when the managed entity is created.
- R – indicates an attribute which can be read by a managing system
- W – indicates an attribute which can be set by a managing system, either when the managed entity is created or later.
- S=D – indicates an attribute which can be set to a default value equal to D.
- Default = d – indicates the default value for the attribute is d.
- Set-by-Create – indicates the managing system can set the value of the attribute when the managed entity is created, but not after creation.

SVC Notes:

The SVC related managed entities in this section provide the detailed protocol-independent information model for configuration management of routing, signaling channels and bearer channels to be used for ATM SVC service. This model supports management of both access signaling channels from users, and interoffice signaling channels using associated mode BISUP signaling. The management of SS7 signaling channels that use quasi-associated signaling and may not use ATM transport is for further study.

Note that ITU-T Recommendation Q.751.1 and Q.2751.1 contain additional attributes (notifications) that are not required or defined in this document. Additionally certain attribute names used in the Q documents differ from those used in this document. Many of the attribute names used here are more closely aligned with the ITU functional specification names such as those found in ITU-T Recommendations Q.2140, Q.2144 and Q.2120.

The relationships between the managed entities described in this section are summarized in Figures 3-1, 3-2, 3-3, 3-4, 3-5, 3-6, 3-7, 3-8 and 3-9. Note that some managed entities appear in more than one figure.

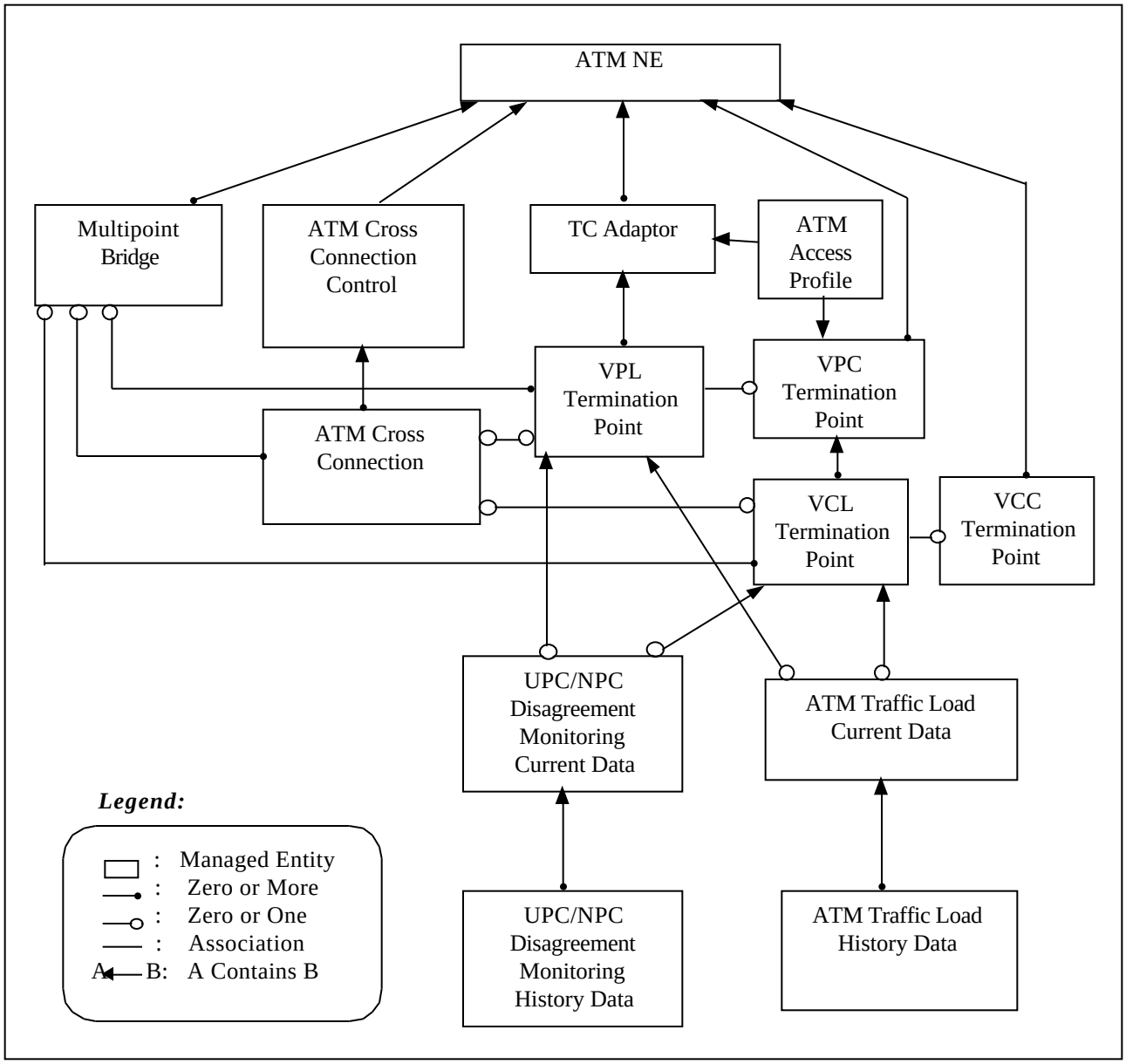

Figure 3-1 Managed Entity Relationship Diagram (1 of 9)

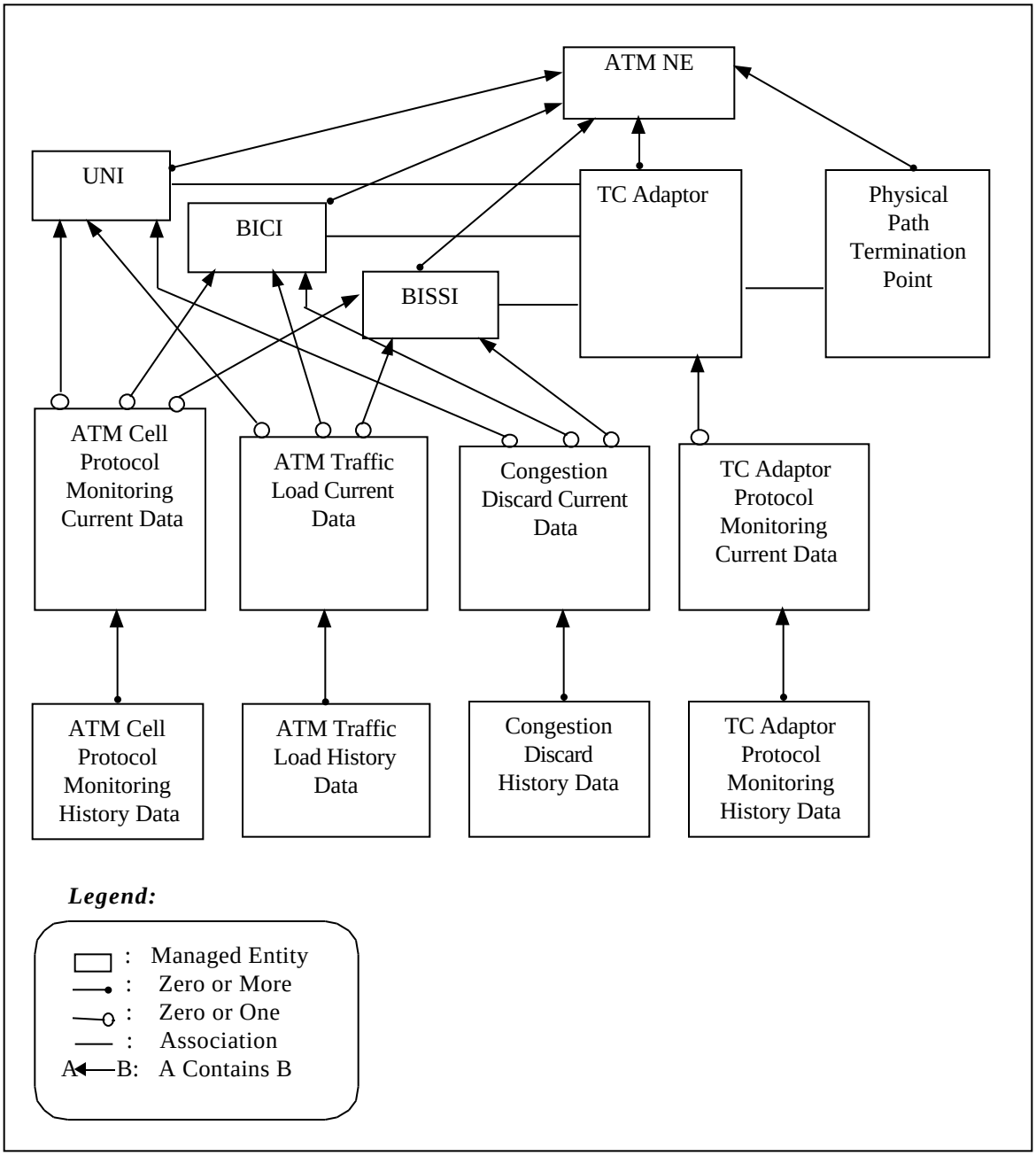

Figure 3-2 Managed Entity Relationship Diagram (2 of 9)

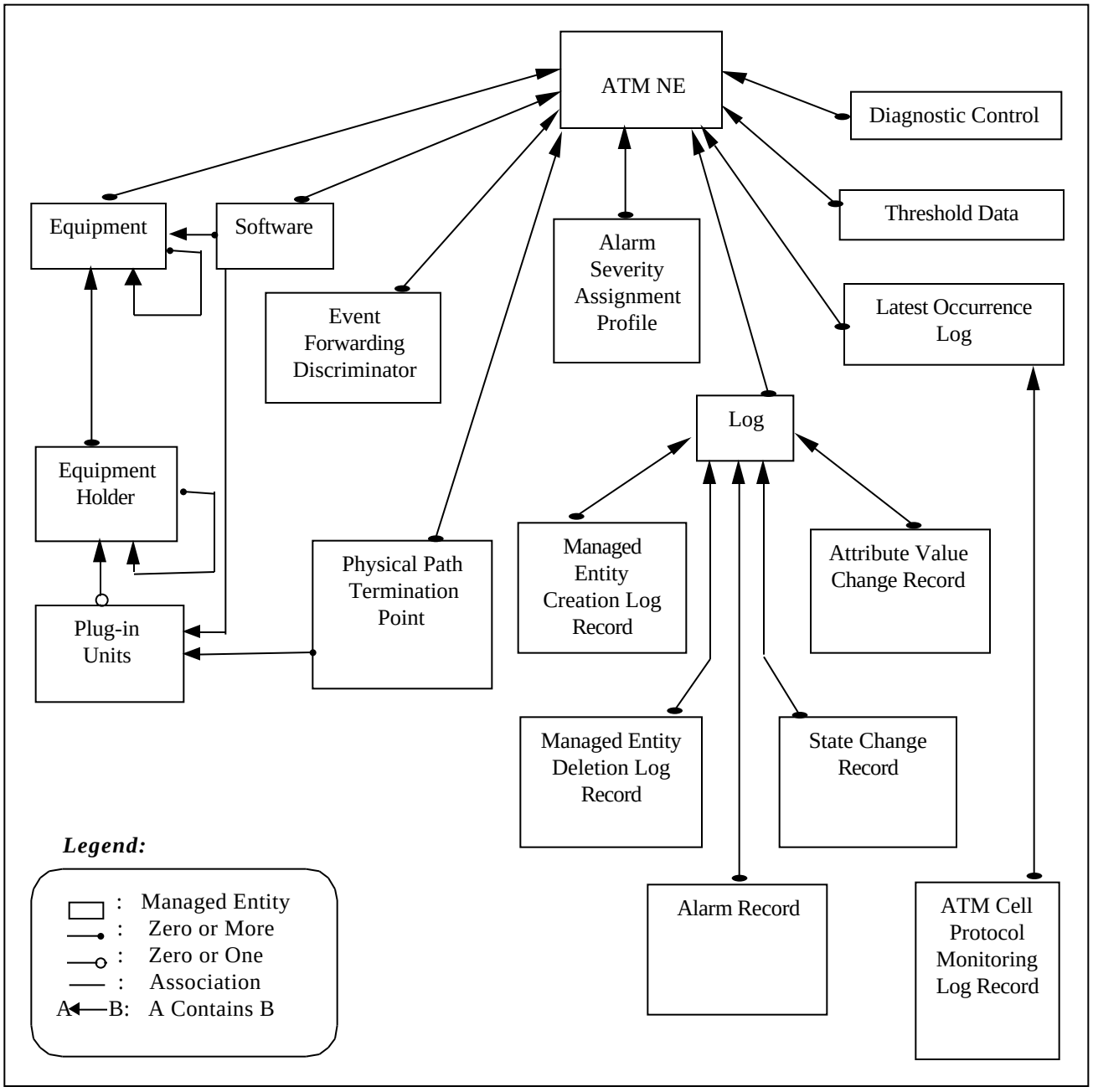

Figure 3-3 Managed Entity Relationship Diagram (3 of 9)

Note that Threshold Data has relations with all “Current Data X” managed entities and that the associations are not shown in this figure.

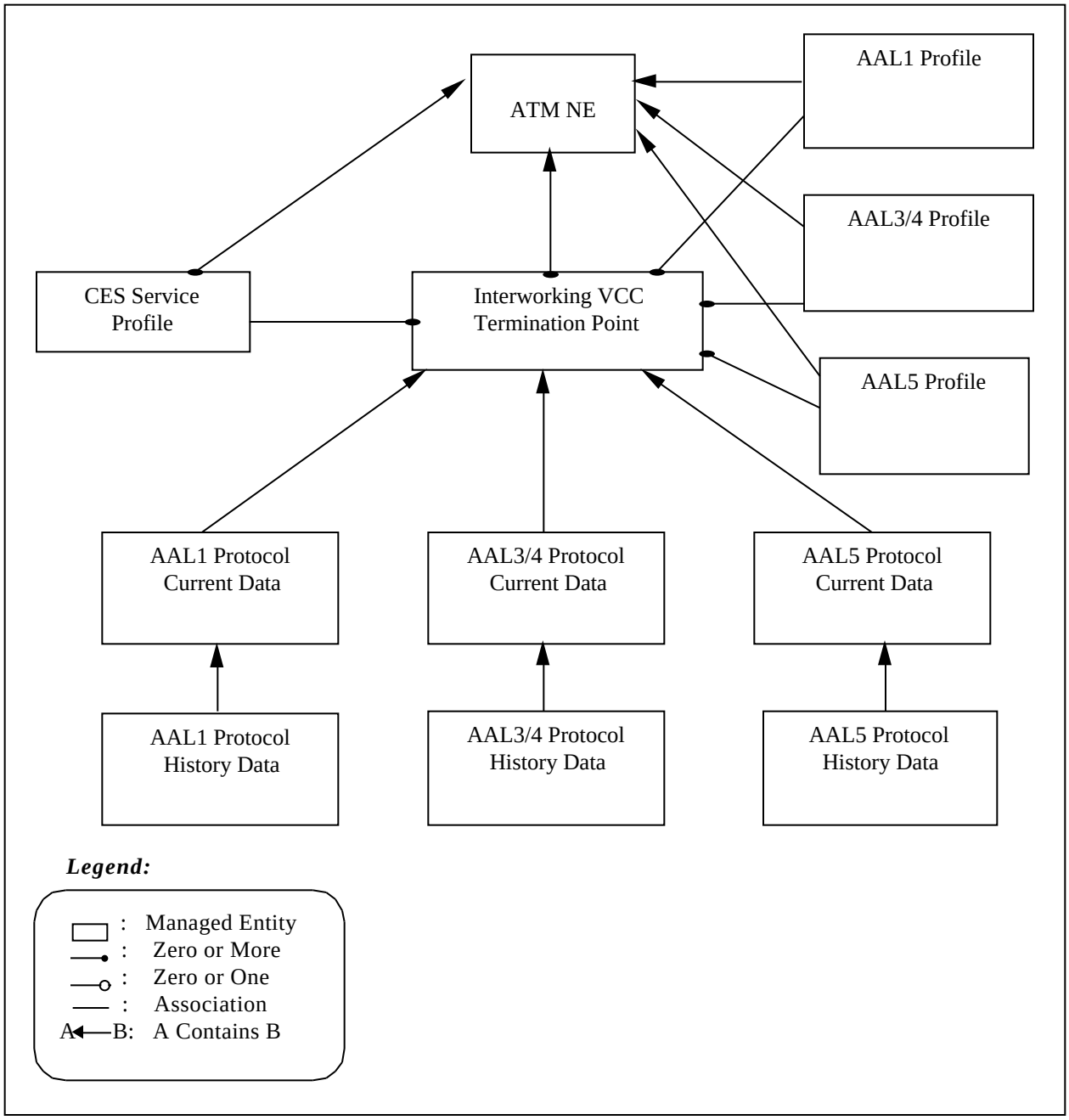

Figure 3-4 Managed Entity Relationship Diagram (4 of 9)

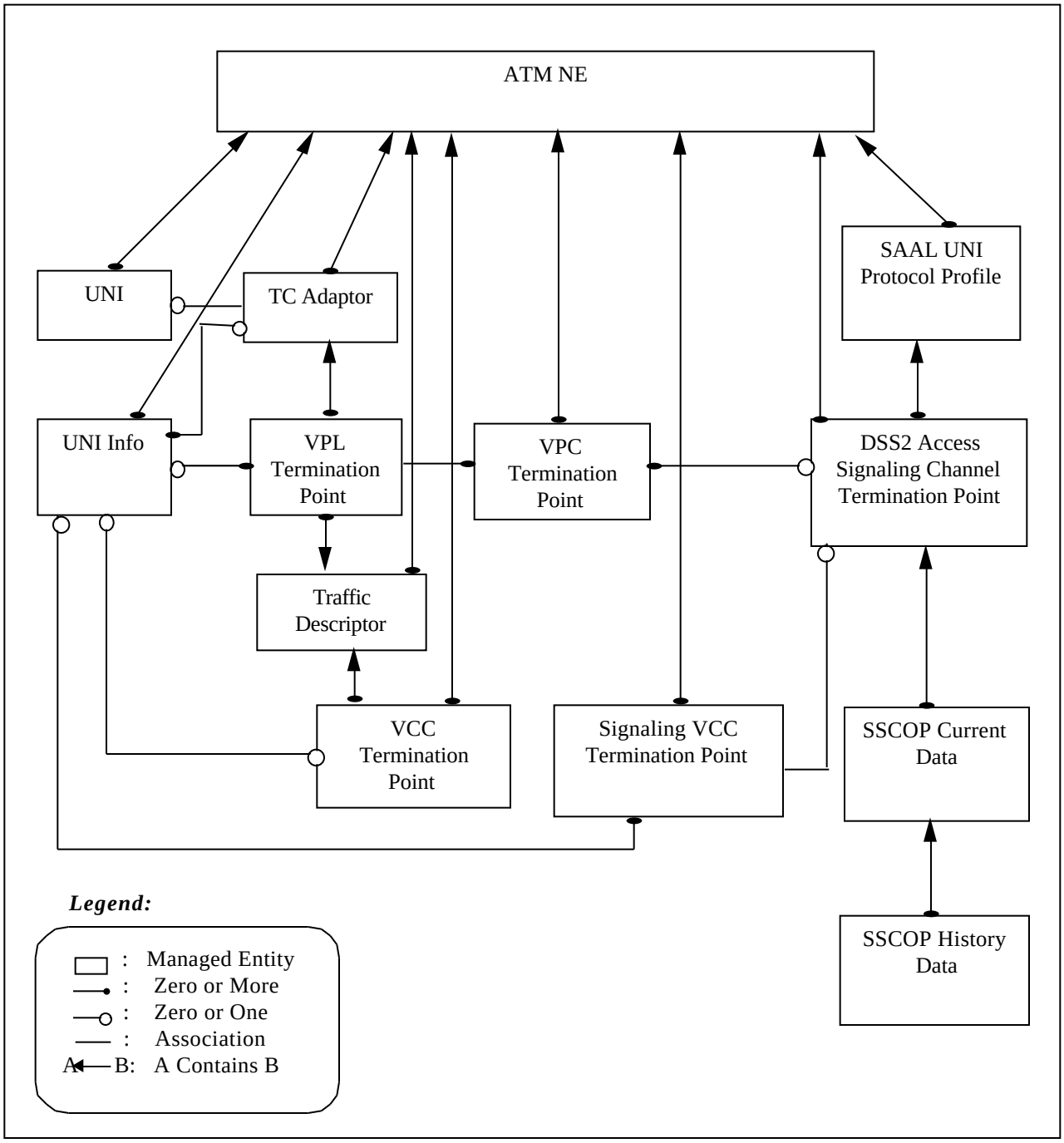

Figure 3-5 Managed Entity Relationship Diagram - Access Signaling (5 of 9)

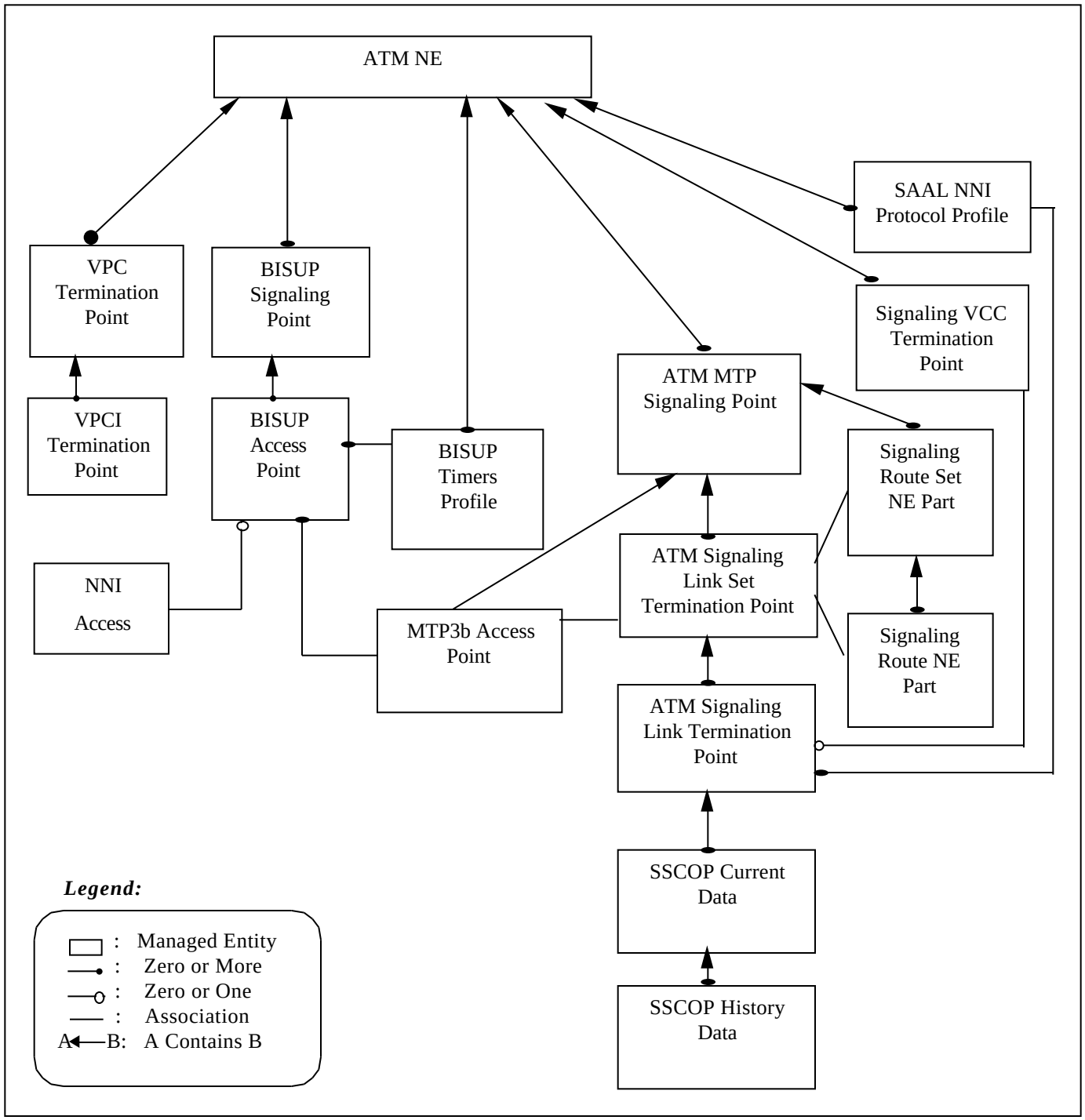

Figure 3-6 Managed Entity Relationship Diagram - NNI Signaling (6 of 9)

Although there is an attribute Adjacent Point Code at the ATM Signaling Link Set Termination Point, no relation between the ATM Signaling Link Set Termination Point and the ATM Signaling Route Set NE Part was shown in this diagram. This was done to avoid an indication that no ATM Signaling Route NE Part is needed in case of associated signaling.

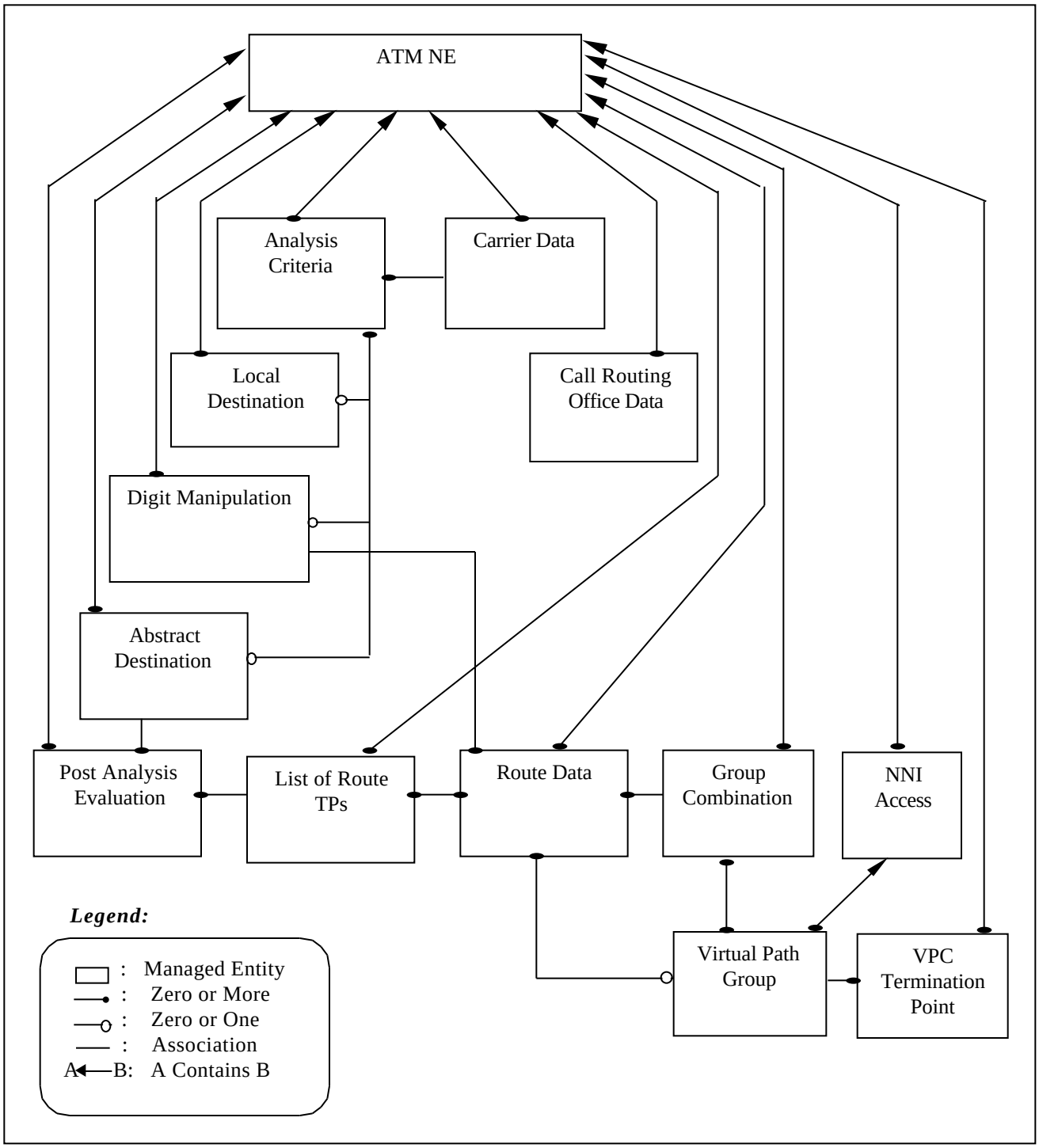

Figure 3-7 Managed Entity Relationship Diagram – Call Routing Management (7 of 9)

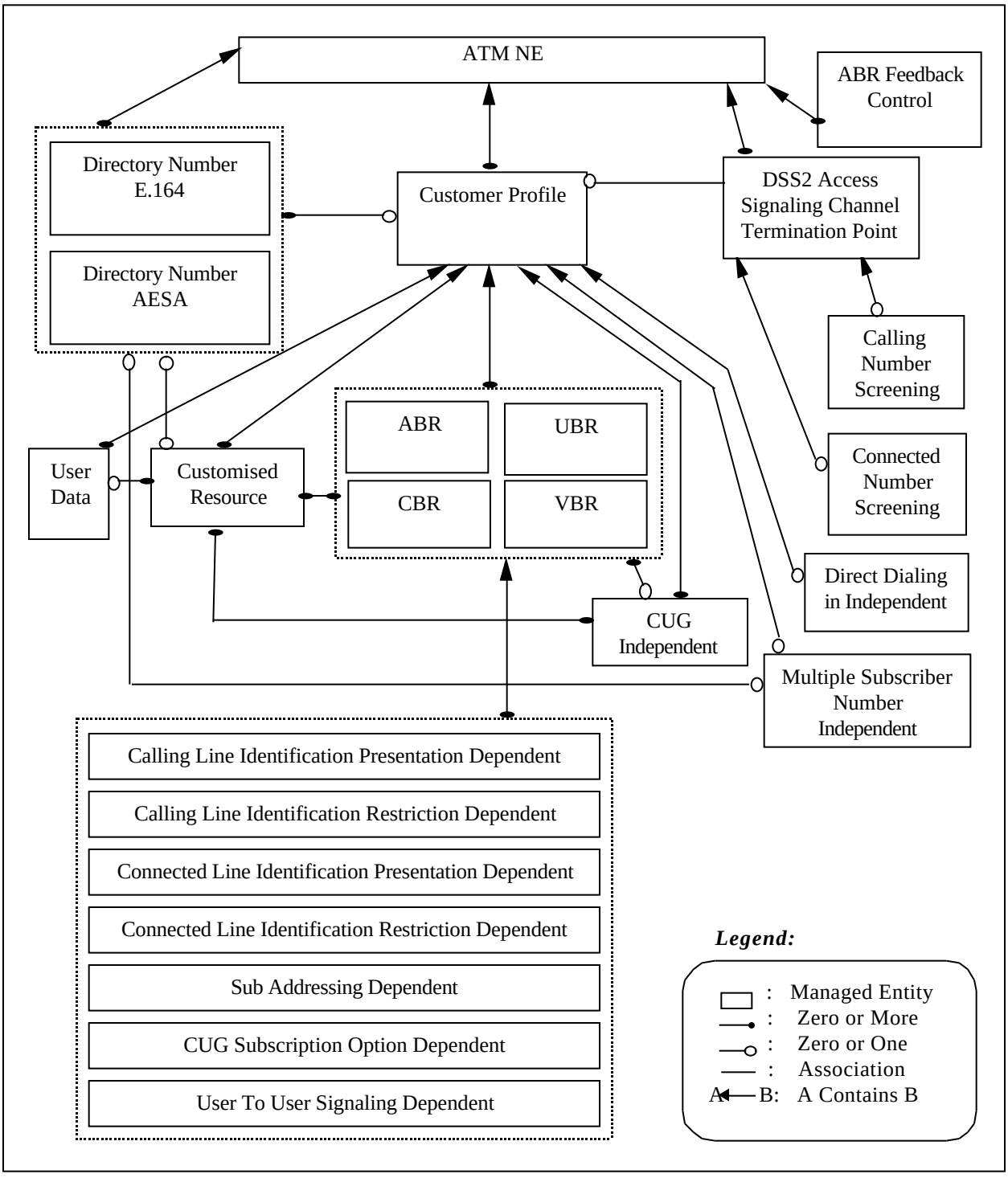

Figure 3-8 Managed Entity Relationship Diagram – Call Routing Management (8 of 9)

Note: The dotted boxes in the above diagram indicate that the managed entities contained within each dotted box have all the relationships of the dotted boxes. This is done for simplicity of the diagram.

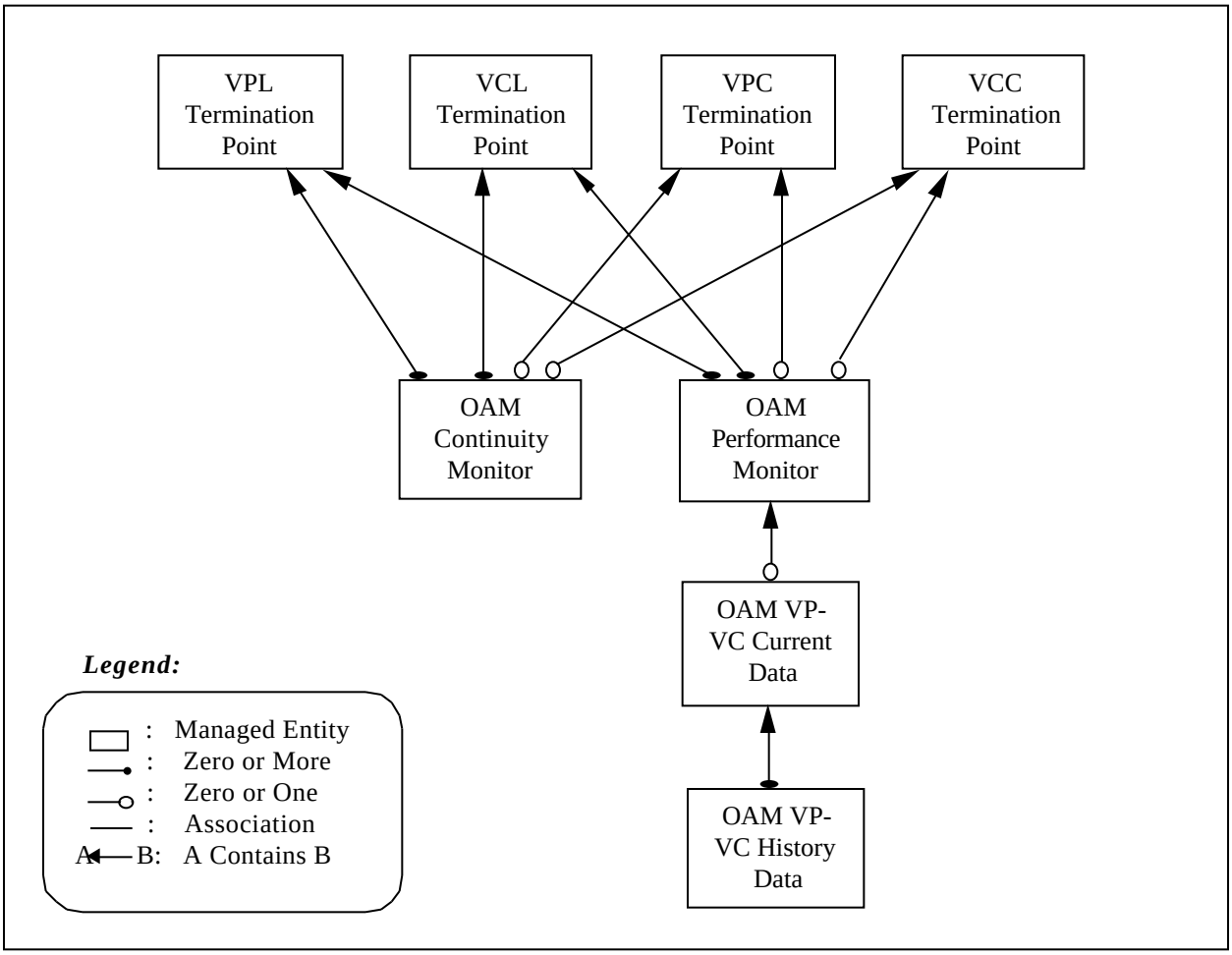

Figure 3-9 Managed Entity Relationship Diagram – OAM Flow Management (9 of 9)

3.1. AAL1 Profile

This managed entity is used to organize data that describes the AAL Type 1 processing functions of the ATM NE. It is used with the Interworking VCC Termination Point managed entity class.

In an ATM environment, AAL Type 1 performance monitoring parameters are associated with an Interworking VCC Termination Point managed entity through a pointer relationship. Each instance of this managed entity class defines a combination of parameter values that may be associated with multiple Interworking VCC Termination Point objects.

Instances of this managed entity are created and deleted by request of the managing system.

Attributes

Managed Entity Id: This attribute provides a unique name for the managed entity instance in the ATM NE. (R, Set-by-Create) (mandatory)

Sub Type: This attribute is used to identify the AAL subtype. Valid values for this attribute are NULL, Voice-band based on 64 KBPS, Circuit Emulation (synchronous), Circuit Emulation (asynchronous), High- quality Audio, and Video. (R) (mandatory)

CBR Rate: This attribute represents the rate of the CBR service supported by the AAL. (R) (mandatory)

Clock Recovery Type: This attribute indicates whether the clock recovery type is NULL (Timing is derived from the physical interface), SRTS (Synchronous Residual Time Stamp), or Adaptive Clock Recovery. (R) (mandatory)

Forward Error Correction Type: This attribute indicates the FEC method: no FEC, FEC for Loss Sensitive Signal Transport, or FEC for Delay Sensitive Signal Transport. (R) (optional)

Structured Data Transfer: This attribute indicates whether Structured Data Transfer (SDT) has been configured at the AAL. A value of TRUE means SDT has been selected. This attribute value cannot be set to TRUE when the Forward Error Correction Type attribute equals TRUE. (R) (optional)

Partially Filled Cells: This attribute identifies the number of leading octets in use. (R) (optional)

Cell Loss Integration Period: This attribute represents the time in milliseconds for the cell loss integration period. If cells are lost for this period of time, the Interworking VCC Termination Point entity will generate a cell starvation alarm. (R) (mandatory)

Actions

No actions have been defined for this managed entity.

Notifications

Attribute Value Change: This notification is used to report changes to the attributes of this managed entity (except the Managed Entity ID attribute). The notification shall identify the attribute that changed, its old value, and its new value. (optional)

Managed Entity Creation: This notification is used to report the creation of an instance of this managed entity. (optional)

Managed Entity Deletion: This notification is used to report the deletion of an instance of this managed entity. (optional)

Relationships

One instance of this managed entity shall exist for each combination of AAL1 parameter values used within an ATM NE.

One instance of this managed entity may be associated to zero or more instances of the Interworking VCC Termination Point.

3.2. AAL1 Protocol Current Data

This managed entity contains the current performance monitoring data collected as a result of performing Segmentation and Reassembly (SAR) Level and Convergence Sublayer (CS) protocol monitoring.

Instances of this managed entity are created automatically by the ATM NE whenever an instance of the Interworking VCC Termination Point managed entity is created that represents AAL functions. Instances of this managed entity are deleted by the ATM NE.

Attributes

Managed Entity ID: This attribute provides a unique name for the managed entity instance in the ATM NE. (R, Set-by-Create) (mandatory)

Administrative State: This attribute is used to activate (unlock) and deactivate (lock) the data collection function performed by this managed entity. (R, W) (mandatory)

Suspect Interval Flag: This attributes used to indicate that the performance data for the current period may not be reliable. (R, S=D, D =False) (optional)

Elapsed Time: This attribute represents the difference between the current time and the start of the present summary interval. (R) (mandatory)

Threshold Data ID: This attribute provides a pointer to an instance of the Threshold Data managed entity that contains the threshold values for the performance monitoring data collected by this managed entity. (R, W) (optional)

Number of Suppressed Intervals: This attribute is non-zero only if the ATM NE is suppressing AAL1 Protocol History Data creation when the current interval terminates with “all-zeroes” performance measurements. (R) (optional)

Header Errors: This attribute represents a count of the number of AAL1 header errors detected, including those corrected. Header errors include correctable and uncorrectable CRC plus bad parity. (R, S=D, D=0) (mandatory)

Sequence Violations: This attribute represents a count of incoming AAL Type 1 SAR-PDUs where the sequence count in the PDU header causes a transition from the SYNC state to the OUT OF SEQUENCE state as defined by ITU-T Recommendation I.363.1. A negative value indicates that this attribute is not supported. (R, S=D, D=0) (mandatory)

Cell Loss: This attribute represents a count of the number of lost cells, as detected by the AAL1 sequence number processing, for example. This count records the number of cells detected as lost in the network prior to the destination Interworking function AAL1 layer processing. A negative value indicates that this attribute is not supported. (R, S=D, D=0) (mandatory)

Cell Misinsertion: This attribute represents a count of sequence violation events which the AAL CS interprets as misinserted of cells as defined by ITU-T Recommendation I.363.1. A negative value indicates that this attribute is not supported. (R, S=D, D=0) (mandatory)

Buffer Underflows: : This attribute represents a count of the number of times the reassembly buffer underflows. In the case of a continuous underflow caused by a loss of ATM cell flow, a single buffer underflow should be counted. If the interworking function is implemented with multiple buffers, such as a cell level buffer and a bit level buffer, then either buffer underflow will cause this count to be incremented. (R, S=D, D=0) (mandatory)

Buffer Overflows: This attribute represents a count of the number of times the reassembly buffer overflows. If the interworking function is implemented with multiple buffers, such as a cell level buffer and a bit level buffer, then either buffer overflow will cause this count to be incremented. (R, S=D, D=0) (mandatory)

STD Pointer Reframes: This attribute represents a count of the number of events in which the AAL1 reassembler found that a structured data pointer is not where it is expected, and the pointer must be re-acquired. This count is

only meaningful for structured data transfer modes as unstructured modes do not use pointers. A negative value indicates that this attribute is not supported, however it must be supported when pointers are used. (R, S=D, D=0) (mandatory)

STD Pointer Parity Check Failures: This attribute represents a count of the number of times the AAL reassembler detects a parity check failure at the point where a structured data pointer is expected. This count is only meaningful for structured data transfer modes as unstructured modes do not use pointers. A negative value indicates that this attribute is not supported. (R, S=D, D=0) (mandatory)

Actions

No actions have been defined for this managed entity.

Notifications

Threshold Crossing Alert: This message is used to notify the management system when one of the above values exceeds a pre-set threshold. The following information shall be supplied with this notification: (optional)

- The ID of the managed entity reporting the threshold crossing alert.

- The Type of performance parameter that exceeded the threshold.

Relationships

One instance of this managed entity shall exist for each instance of the interworking VCC Termination Point managed entity that represents AAL1 functions.

3.3. AAL1 Protocol History Data

This is a managed entity that contains the past performance monitoring data collected as a result of performing Segmentation and Reassembly (SAR) Level and Convergence Sublayer (CS) protocol monitoring.

Instances of this managed entity are created automatically by the ATM NE. Instances of this managed entity are deleted by the ATM NE or by request of the managing system.

Attributes

Managed Entity ID: This attribute provides a unique name for the managed entity instance in the ATM NE. (R, Set-by-Create) (mandatory)

Period End Time: This attribute records the time at the end of the interval. (R) (mandatory)

Suspect Interval Flag: This attribute is used to indicate that the performance data for the current period may not be reliable. (R) (optional)

Number of Suppressed Intervals: This attribute is non-zero only if the ATM NE is suppressing AAL1 Protocol History Data creation when the current interval terminates with "all-zeroes" performance measurements. (R) (optional)

Header Errors: This attribute represents a count of the number of AAL1 header errors detected, including those corrected. Header errors include correctable and uncorrectable CRC plus bad parity. (R) (mandatory)

Sequence Violations: This attribute represents a count of incoming AAL Type 1 SAR-PDUs where the sequence count in the PDU header causes a transition from the SYNC state to the OUT OF SEQUENCE state as defined by ITU-T Recommendation I.363.1. A negative value indicates that this attribute is not supported. (R) (mandatory)

Cell Loss: This attribute represents a count the number of lost cells, as detected by the AAL1 sequence number processing, for example. This count records the number of cells detected as lost in the network prior to the destination interworking function AAL1 layer processing. A negative value indicates that this attribute is not supported. (R) (mandatory)

Cell Misinsertion: This attribute represents a sequence violation events which the AAL CS interprets as misinserted of cells as defined by ITU-T Recommendation I.363.1. A negative value indicates that this attribute is not supported. (R) (mandatory)

Buffer Underflows: This attribute represents a count the number of times the reassembly buffer underflows. In the case of a continuous underflow caused by a loss of ATM cell flow, a single buffer underflow should be counted. If the interworking function is implemented with multiple buffers, such as a cell level buffer and a bit level buffer, then either buffer underflow will cause this count to be incremented. (R) (mandatory)

Buffer Overflows: This attribute represents a count of the number of times the reassembly buffer overflows. If the interworking function is implemented with multiple buffers, such as a cell level buffer and a bit level buffer, then either buffer overflow will cause this count to be incremented. (R) (mandatory)

STD Pointer Reframes: This attribute represents a count of the number of events in which the AAL1 reassembler found that a structured data pointer is not where it is expected, and the pointer must be re-acquired. This count is only meaningful for structured data transfer modes as unstructured modes do not use pointers. A negative value indicates that this attribute is not supported. However, it must be supported when pointers are used. (R) (optional)

STD Pointer Parity Check Failures: This attribute represents a count of the number of times the AAL reassembler detects a parity check failure at the point where a structured data pointer is expected. This count is only meaningful for structured data transfer modes as unstructured modes do not use pointers. A negative value indicates that this attribute is not supported. (R) (optional)

Actions

No actions have been defined for this managed entity.

Notifications

No notifications have been defined for this managed entity.

Relationships

A new instance of this entity is created at the end of each 15 minute interval for each current data object. This managed entity will create a copy of the performance management attributes that are present in the associated current data managed entity at the end of the 15 minute interval. From zero to thirty-two instances of this managed entity shall be supported for each current data managed entity.

3.4. AAL3/4 Profile

This managed entity is used to organize data that describes the AAL Type 3/4 processing functions of the ATM NE. It is used with the interworking VCC Termination Point managed entity class.

In an ATM environment, AAL Type 3/4 performance monitoring parameters are associated with an interworking VCC Termination Point managed entity through a pointer relationship. Each instance of this managed entity class defines a combination of parameter values that may be associated with multiple interworking VCC Termination Point objects.

Instances of this managed entity are created and deleted by request of the managing system.

Attributes

Managed Entity Id: This attribute provides a unique name for the managed entity instance in the ATM NE. (R, Set-by-Create) (mandatory)

Max CPCS SDU Size: This multi-valued attribute represents the maximum CPCS_PDU size that will be transmitted over the connection in both the incoming (forward) and outgoing (backward) direction of transmission. (R) (mandatory)

MID Range: This attribute represents the number of MID values supported at the AAL for the supporting VCC. (R) (mandatory)

AAL Mode: This attribute indicates whether the AAL for the supporting VCC is operating in message mode or streaming mode, assured or unassured. (R) (mandatory)

SSCS Type: This attribute identifies the SSCS type for the AAL. Valid values are NULL, Data SSCS based on SSCOP (assured operation), Data SSCS based on SSCOP (non-assured operation), or Frame Relay SSCS. (R) (mandatory)

Actions

No actions have been defined for this managed entity.

Notifications

Attribute Value Change: This notification is used to report changes to the attributes of this managed entity (except the Managed Entity ID attribute). The notification shall identify the attribute that changed, its old value, and its new value. (optional)

Managed Entity Creation: This notification is used to report the creation of an instance of this managed entity. (optional)

Managed Entity Deletion: This notification is used to report the deletion of an instance of this managed entity. (optional)

Relationships

One instance of this managed entity shall exist for each combination of AAL 3/4 parameter values used within the ATM NE.

One instance of this managed entity may be associated to zero or more instances of the Interworking VCC Termination Point.

3.5. AAL3/4 Protocol Current Data

This managed entity contains the current performance monitoring data collected as a result of performing Segmentation and Reassembly (SAR) Level and Convergence Sublayer (CS) protocol monitoring.

Instances of this managed entity are created automatically by the ATM NE whenever an instance of an Interworking VCC Termination Point managed entity is created that represents AAL 3/4 functions. Instances of this managed entity are deleted by the ATM NE.

Attributes

Managed Entity ID: This attribute provides a unique name for the managed entity instance in the ATM NE. (R, Set-by-Create) (mandatory)

Administrative State: This read/write attribute is used to activate (unlock) and deactivate (lock) the data collection function performed by this managed entity. (R, W) (mandatory)

Suspect Interval Flag: This attribute is used to indicate that the performance data for the current period may not be reliable. (R, S=D, D =False) (optional)

Elapsed Time: This attribute represents the difference between the current time and the start of the present summary interval. (R) (mandatory)

Threshold Data ID: This attribute provides a pointer to an instance of the Threshold Data managed entity that contains the threshold values for the performance monitoring data collected by this managed entity. (R, W, A/R) (optional)

Number of Suppressed Intervals: This attribute is non-zero only if the ATM NE is suppressing AAL3/4 Protocol History Data creation when the current interval terminates with “all-zeroes” performance measurements. (R) (optional)

Sum Of Invalid SAR Field Errors: This attribute provides a sum-of-errors count for invalid Segmentation And Reassembly (SAR) field errors. For AAL Type 3/4, this attribute provides a single count of the number of SAR_PDUs discarded due to one of the following error conditions: MID=0 when there is multiplexing, MID not equal to 0 when there is no multiplexing, Length field not equal to 44 octets for a BOM or COM, Length field not in the set [4, 8, .., 44] octets or 63 octets for an EOM, or Length field not in the set [8, 12, .., 44] octets for an SSM. (R, S=D, D=0) (mandatory)

Sum Of Incorrect SAR Field Errors: This attribute provides a sum-of-errors count for incorrect Segmentation And Reassembly (SAR) field errors. For AAL Type 3/4, this attribute provides a single count of SAR_PDUs discarded due to one of the following errors: CRC violation, unexpected Sequence Number (SN) field value, or unexpected MID field value. (R, S=D, D=0) (mandatory)

SAR CRC Violations: This attribute represents the number of CRC violations that were detected for the incoming SAR PDUs. (R, S=D, D=0) (mandatory)

COMS EOMS Unexpected SN: This attribute represents the number of COM and EOM segments received with an unexpected Sequence Number (SN). For a particular message (i.e., MID) transported over a VPC or VCC, this attribute is incremented by one each time a COM or EOM is received with a SAR Sequence Number (SN) that is not correct relative to the SN in the previous (non-EOM) segment. (R, S=D, D=0) (mandatory)

BOMS EOMS Unexpected MID: This attribute represents the number of BOM/EOM segments with an unexpected MID value. This attribute will be incremented by one each time a BOM is received with a currently active MID (a MID for which an EOM has not yet been received), or when an EOM is received for which a MID is NOT currently active. (R, S=D, D=0) (mandatory)

SRI Time Outs: This attribute represents a count of the number of SRI time-outs that occurred on an ATM connection. (R, S=D, D=0) (mandatory)

Number Of Aborts: This attribute provides a count of the number aborts (i.e., EOM with SAR_PDU Length Indication = 63) that are received for the underlying VPC or VCC. (R, S=D, D=0) (mandatory)

Sum Of Invalid CS Field Errors: This attribute provides a sum-of-errors count for invalid Convergence Sublayer (CS) field errors. For AAL Type 3/4, this attribute provides a single count of the number of CS_PDUs discarded due to one of the following error conditions: Common Part Indicator (CPI) field not equal to 0, Alignment field value not equal to 0, or BASize field value < 37 octets for multi-segment messages. (R, S=D, D=0) (mandatory)

Sum Of Incorrect CS Field Errors: This attribute provides a sum-of-errors count for incorrect Convergence Sublayer (CS) field errors. For AAL Type 3/4, this attribute provides a single count of CS_PDUs discarded due to one of the following error conditions: BETag mismatch, BASize field value not consistent with Length field value, or Length field value not consistent with CS_PDU length. (R, S=D, D=0) (mandatory)

BE Tag Mismatch: This attribute represents the number of times an incoming CS_PDU had a BTag field value that did not equal the ETag field value. (R, S=D, D=0) (mandatory)

Length BA Size Mismatch: This attribute represents the number of CS_PDUs in which the Length field value was not consistent with the BASize field value. The definition of consistent depends on the mode in which CS_PDU fragments are being processed. In the message-mode, the BASize field must equal the Length field. In the streaming mode, the BASize field must be less than the Length field. (R, S=D, D=0) (mandatory)

Length Mismatch: This attribute represents the number of CS_PDUs received with a Length field value that does not represent the actual length of the CS_PDU payload. (R, S=D, D=0) (mandatory)

Actions

No actions have been defined for this managed entity.

Notifications

Threshold Crossing Alert: This message is used to notify the management system when one of the above values exceeds a pre-set threshold. The following information shall be supplied with this notification: (optional)

- The ID of the managed entity reporting the threshold crossing alert.

- The type of performance parameter that exceeded the threshold.

Relationships

One instance of this managed entity shall exist for each instance of the Interworking VCC Termination Point managed that represents AAL5 functions.

3.6. AAL3/4 Protocol History Data

This is a managed entity that contains the past performance monitoring data collected as a result of performing Segmentation and Reassembly (SAR) Level and Convergence Sublayer (CS) protocol monitoring.

Instances of this managed entity are created automatically by the ATM NE. Instances of this managed entity are deleted by the ATM NE or by request of the managing system.

Attributes

Managed Entity ID: This attribute provides a unique name for the managed entity instance in the ATM NE. (R, Set-by-Create) (mandatory)

Period End Time: This attribute records the time at the end of the interval. (R) (mandatory)

Suspect Interval Flag: This attribute is used to indicate that the performance data for the current period may not be reliable. (R) (optional)

Number of Suppressed Intervals: This attribute is non-zero only if the ATM NE is suppressing AAL3/4 Protocol History Data creation when the current interval terminates with "all-zeroes" performance measurements. (R) (optional)

Sum Of Invalid SAR Field Errors: This attribute provides a sum-of-errors count for invalid Segmentation And Reassembly (SAR) field errors. For AAL Type 3/4, this attribute provides a single count of the number of SAR_PDUs discarded due to one of the following error conditions: MID=0 when there is multiplexing, MID not equal to 0 when there is no multiplexing, Length field not equal to 44 octets for a BOM or COM, Length field not in the set [4, 8, .., 44] octets or 63 octets for an EOM, or Length field not in the set [8, 12, .., 44] octets for an SSM. (R) (mandatory)

Sum Of Incorrect SAR Field Errors: This attribute provides a sum-of-errors count for incorrect Segmentation And Reassembly (SAR) field errors. For AAL Type 3/4, this attribute provides a single count of SAR_PDUs discarded due to one of the following errors: CRC violation, unexpected Sequence Number (SN) field value, or unexpected MID field value. (R) (mandatory)

SAR CRC Violations: This attribute represents the number of CRC violations that were detected for the incoming SAR PDUs. (R) (mandatory)

COMS EOMS Unexpected SN: This attribute represents the number of COM and EOM segments received with an unexpected Sequence Number (SN). For a particular message (i.e., MID) transported over a VPC or VCC, this attribute is incremented by one each time a COM or EOM is received with a SAR Sequence Number (SN) that is not correct relative to the SN in the previous (non-EOM) segment. (R) (mandatory)

BOMS EOMS Unexpected MID: This attribute represents the number of BOM/EOM segments with an unexpected MID value. This attribute will be incremented by one each time a BOM is received with a currently active MID (a MID for which an EOM has not yet been received), or when an EOM is received for which a MID is NOT currently active. (R) (mandatory)

SRI Time Outs: This attribute represents a count of the number of SRI time-outs that occurred on an ATM connection. (R) (mandatory)

Number Of Aborts: This attribute provides a count of the number aborts (i.e., EOM with SAR_PDU Length Indication = 63) that are received for the underlying VPC or VCC. (R) (mandatory)

Sum Of Invalid CS Field Errors: This attribute provides a sum-of-errors count for invalid Convergence Sublayer (CS) field errors. For AAL Type 3/4, this attribute provides a single count of the number of CS_PDUs discarded due to one of the following error conditions: Common Part Indicator (CPI) field not equal to 0, Alignment field value not equal to 0, or BASize field value < 37 octets for multi-segment messages. (R) (mandatory)

Sum Of Incorrect CS Field Errors: This attribute provides a sum-of-errors count for incorrect Convergence Sublayer (CS) field errors. For AAL Type 3/4, this attribute provides a single count of CS_PDUs discarded due to one of the following error conditions: BETag mismatch, BASize field value not consistent with Length field value, or Length field value not consistent with CS_PDU length. (R) (mandatory)

BE Tag Mismatch: This attribute represents the number of times an incoming CS_PDU had a BTag field value that did not equal the ETag field value. (R) (mandatory)

Length BA Size Mismatch: This attribute represents the number of CS_PDUs in which the Length field value was not consistent with the BASize field value. The definition of consistent depends on the mode in which CS_PDU fragments are being processed. In the message-mode, the BASize field must equal the Length field. In the streaming mode, the BASize field must be less than the Length field. (R) (mandatory)

Length Mismatch: This attribute represents the number of CS_PDUs received with a Length field value that does not represent the actual length of the CS_PDU payload. (R) (mandatory)

Actions

No actions have been defined for this managed entity.

Notifications

No notifications have been defined for this managed entity.

Relationships

A new instance of this entity is created at the end of each 15 minute interval for each current data object. This managed entity will create a copy of the performance management attributes that are present in the associated current data managed entity at the end of the 15 minute interval. From zero to thirty-two instances of this managed entity shall be supported for each current data managed entity.

3.7. AAL5 Profile

This managed entity is used to organize data that describes the AAL Type 5 processing functions of the ATM NE. It is used with the Interworking VCC Termination Point managed entity class.

In an ATM environment, AAL Type 5 performance monitoring parameters are associated with an Interworking VCC Termination Point managed entity through a pointer relationship. Each instance of the managed entity class defines a combination of parameter values that may be associated with multiple Interworking VCC Termination Point objects.

Instances of this managed entity are created and deleted by request of the managing system.

Attributes

Managed Entity Id: This attribute provides a unique name for the managed entity instance in the ATM NE. (R, Set-by-Create) (mandatory)

Max CPCS SDU Size: This multi-valued attribute represents the maximum CPCS_PDU size that will be transmitted over the connection in both the incoming (forward) and outgoing (backward) direction of transmission. (R) (mandatory)

AAL Mode: This attribute indicates whether the AAL for the supporting VCC is operating in message mode or streaming mode, assured or unassured. (R) (mandatory)

SSCS Type: This attribute identifies the SSCS type for the AAL. Valid values are NULL, Data SSCS based on SSCOP (assured operation), Data SSCS based on SSCOP (non-assured operation), or Frame Relay SSCS. (R) (mandatory)

Actions

No actions have been defined for this managed entity.

Notifications

Attribute Value Change: This notification is used to report changes to the attributes of this managed entity (except the Managed Entity ID attribute). The notification shall identify the attribute that changed, its old value, and its new value. (optional)

Managed Entity Creation: This notification is used to report the creation of an instance of this managed entity. (optional)

Managed Entity Deletion: This notification is used to report the deletion of an instance of this managed entity. (optional)

Relationships

One instance of this managed entity shall exist for combination of AAL5 parameter values used within the ATM NE.

One instance of this managed entity may be associated to zero or more instances of the Interworking VCC Termination Point.

3.8. AAL5 Protocol Current Data

This managed entity contains the current performance monitoring data collected as a result of performing Segmentation and Reassembly (SAR) Level and Convergence Sublayer (CS) protocol monitoring.

Instances of this managed entity are created automatically by the ATM NE whenever an instance of the Interworking VCC Termination Point managed entity is created that represents the AAL5 functions. Instances of this managed entity are deleted by the ATM NE.

Attributes

Managed Entity ID: This attribute provides a unique name for the managed entity instance in the ATM NE. (R, Set-by-Create) (mandatory)

Administrative State: This read/write attribute is used to activate (unlock) and deactivate (lock) the data collection function performed by this managed entity. (R, W) (mandatory)

Suspect Interval Flag: This attribute is used to indicate that the performance data for the current period may not be reliable. (R, S=D, D =False) (optional)

Elapsed Time: This attribute represents the difference between the current time and the start of the present summary interval. (R) (mandatory)

Threshold Data ID: This read/write attribute provides a pointer to an instance of the Threshold Data managed entity that contains the threshold values for the performance monitoring data collected by this managed entity. (R, W, A/R) (optional)

Number of Suppressed Intervals: This attribute is non-zero only if the ATM NE is suppressing AAL5 Protocol History Data creation when the current interval terminates with “all-zeroes” performance measurements. (R) (optional)

Sum Of Invalid CS Field Errors: This attribute provides a sum-of-errors count for invalid Convergence Sublayer (CS) field errors. For AAL Type 5, this attribute provides a single count of the number of CS_PDUs discarded due to one of the following error conditions: Invalid Common Part Indicator (CPI), oversized received SDU, or length violation. (R, S=D, D=0) (mandatory)

CRC Violations: This attribute represents the number of CRC violations that were detected for the incoming SAR PDUs. (R, S=D, D=0) (mandatory)

Reassembly Timer Expirations: This attribute provides a count of reassembly timer expirations. A negative value indicates that this attribute is not supported. (R, S=D, D=0) (mandatory if reassembly timer is implemented)

Actions

No actions have been defined for this managed entity.

Notifications

Threshold Crossing Alert: This message is used to notify the management system when one of the above values exceeds a pre-set threshold. The following information shall be supplied with this notification: (optional)

- The ID of the Managed Entity Reporting the Threshold Crossing Alert
- The Type of Performance Parameter that Exceeded the Threshold

Relationships

One instance of this managed entity shall exist for each instance of the Interworking VCC Termination Point managed entity that represents AAL5 functions.

3.9. AAL5 Protocol History Data

This is a managed entity that contains the past performance monitoring data collected as a result of performing Segmentation and Reassembly (SAR) Level and Convergence Sublayer (CS) protocol monitoring.

Instances of this managed entity are created automatically by the ATM NE. Instances of this managed entity are deleted by the ATM NE or by request of the managing system.

Attributes

Managed Entity ID: This attribute provides a unique name for the managed entity instance in the ATM NE. (R, Set-by-Create) (mandatory)

Period End Time: This attribute records the time at the end of the interval. (R) (mandatory)

Suspect Interval Flag: This attribute is used to indicate that the performance data for the current period may not be reliable. (R) (optional)

Number of Suppressed Intervals: This attribute is non-zero only if the ATM NE is suppressing AAL5 Protocol History Data creation when the current interval terminates with "all-zeroes" performance measurements. (R) (optional)

Sum Of Invalid CS Field Errors: This attribute provides a sum-of-errors count for invalid Convergence Sublayer (CS) field errors. For AAL Type 5, this attribute provides a single count of the number of CS_PDUs discarded due to one of the following error conditions: Invalid Common Part Indicator (CPI), oversized received SDU, or length violation. (R) (mandatory)

CRC Violations: This attribute represents the number of CRC violations that were detected for the incoming AAL PDUs. (R) (mandatory)

Reassembly Timer Expirations: This attribute provides a count of reassembly timer expirations. A negative value indicates that this attribute is not supported. (R) (mandatory if reassembly timer is implemented)

Actions

No actions have been defined for this managed entity.

Notifications

No notifications have been defined for this managed entity.

Relationships

A new instance of this entity is created at the end of each 15 minute interval for each current data object. This managed entity will create a copy of the performance management attributes that are present in the associated current data managed entity at the end of the 15 minute interval. From zero to thirty-two instances of this managed entity shall be supported for each current data managed entity.

3.10.ABR

The ABR managed entity represents the available bit rate bearer service according to ATM Forum TM 4.0.

Instances of this managed entity are created and deleted by request of the managing system.

Attributes

Managed Entity ID: This attribute provides a unique name for the managed entity instance in the ATM NE. (R, Set-by-Create) (mandatory)

Administrative State: This attribute is used to activate (unlock) and deactivate (lock) ABR service category performed by this managed entity. (R, W) (mandatory)

Customised Resource Pointer List: This is an attribute whose value(s) points to instances of the Customised Resource managed entity. This attribute is synchronised with the Bearer Service Pointer List attribute in the Customised Resource managed entity: when Bearer Service Pointer List in the associated instance of the Customised Resource managed entity is updated, the Customised Resource Pointer List is updated accordingly. (R, Default = empty set) (mandatory)

Actions

No actions have been defined for this managed entity.

Notifications

State Change: This notification is used to report changes to the Administrative State attribute of this managed entity. The notification shall identify the state attribute that changed, its old value, and its new value. (mandatory)

Attribute Value Change: This notification is used to report changes to the attributes of this managed entity. The notification shall identify the attribute that changed, its old value, and its new value. (mandatory)

Relationships

Zero or more instances of this managed entity may exist for each instance of the Customer Profile managed entity.

Zero or more instances of this managed entity are associated with zero or more instances of the Customised Resource managed entity by the Customised Resource Pointer List attribute.

This managed entity is related to CUG Independent managed entity through the Service Pointer List attribute of the CUG Independent managed entity.

3.11.ABR Feedback Control

This managed entity contains information on the configuration of congestion control mechanisms for the ABR service category in the NE. It is possible to support more than one mechanism at the same time; at least one congestion control mechanisms should always be supported.

Instances of this managed entity are created automatically and deleted by the ATM NE.

Attributes

Managed Entity ID: This attribute provides a unique name for the managed entity instance in the ATM NE. (R, Set-by-Create) (mandatory)

Supported Feedback Modes: This attribute describes the feedback modes which the network element can support. Valid values are all non-empty subsets of {EFCI Marking, Relative Rate Marking, Explicit Rate Marking}. (R) (mandatory)

Active Feedback Modes: This attribute describes the feedback modes which are currently active in the network element. Valid values are all non-empty subsets of {EFCI Marking, Relative Rate Marking, Explicit Rate Marking}. (R, W) (optional)

Supported Operation Mode: This attribute indicates which operation modes an intermediate ATM NE is using. Valid values are non-empty subsets of Generate Backward RM Cells and Modify Backward RM Cells. (R) (mandatory for intermediate ATM NEs)

Active Operation Mode: This attribute controls which operations mode will be used by an intermediate ATM NE. Valid values are Generate Backward RM Cells or Modify Backward RM Cells. (R,W) (optional)

Use-it-or-lose-it Policy: This attribute indicates whether or not the NE implements a use-it-or-lose-it policy for ABR connections. (R) (optional)

Actions

No actions have been defined for this managed entity.

Notifications

No notifications have been defined for this managed entity.

Relationships

One instance of this managed entity may exist per instance of the ATM NE.

3.12. Abstract Destination

The Abstract Destination managed entity is a representation of how to get to a destination which is independent from the exchange currently processing the call. The destination can be an exchange or a customer installation.

Instances of this managed entity are created and deleted by request of the managing system.

Attributes

Managed Entity ID: This attribute provides a unique name for the managed entity instance in the ATM NE. (R, Set-by-Create) (mandatory)

Max Digits: Indicates the maximum number of digits required by the destination exchange. Further digits will be ignored (R, W) (optional)

Ring Time Limit: Indicates the maximum ringing time for a call to this destination. (R, W) (optional)

Actions

No actions have been defined for this managed entity.

Notifications

Attribute Value Change: This notification is used to report changes to the attributes of this managed entity. The notification shall identify the attribute that changed, its old value, and its new value. (optional)

Managed Entity Creation: This notification is used to report the creation of an instance of this managed entity. (optional)

Managed Entity Deletion: This notification is used to report the deletion of an instance of this managed entity. (optional)

Relationships

Multiple instances of this managed entity may exist per instance of the ATM NE managed entity.

This managed entity is related to Post Analysis Evaluation managed entity through the Abstract Destination Instance pointer attribute of the Post Analysis Evaluation managed entity and related to Analysis Criteria managed entity through the Active Target pointer attribute of the Analysis Criteria managed entity.

3.13. Alarm Record

This managed entity is used to represent logged information that resulted from ATM NE generated alarm notifications.

An instance of this managed entity is created automatically for each notification generated by the managed entities within the ATM NE. Instances of this managed entity are deleted by the ATM NE or by request of the managing system.

Attributes

Managed Entity ID: This attribute provides a unique name for the managed entity instance in the ATM NE. (R, Set-by-Create) (mandatory)

Logging Time: This attribute identifies the time at which the record was entered into the log. (R) (mandatory)

Managed Entity: This attribute identifies the type and instance ID of the managed entity that generated the alarm notification. (R) (mandatory)

Generic Trouble Description: See Table 2-1 for a list of generic troubles. (R) (mandatory)

Specific Problems: This attribute identifies further refinements (e.g., sub-cause indicator information) to the generic trouble description of the alarm. This information is only logged if provided in the alarm notification. (R) (optional)

Severity: This attribute identifies the severity assigned to the alarm notification (i.e., critical, major, minor, warning, indeterminate, and cleared). (R) (mandatory)

Back-up Status: This attribute indicates whether or not the entity emitting the alarm has been backed-up, and services provided to the user have, therefore, not been disrupted. A value of "true" indicates that the entity has been backed-up; a value of "false" indicates that the entity has not been backed-up. (R) (optional)

Back-up Entity: This attribute provides the identity of the managed entity that is providing back-up services to the failed managed entity. If no back-up service is being provided, the value of this parameter shall be NULL. (R) (optional)

Additional Text: This attribute is used to allow for additional text to be supplied with the alarm. Such text may further describe problem and/or failed entity (e.g., name and location). This information is only logged if provided in the alarm notification. (R) (optional)

Proposed Repair Actions: This attribute is used if the cause of the alarm is known and the ATM NE can suggest one or more solutions to the problem. This information is only logged if provided in the alarm notification. (R) (optional)

Actions

No actions have been defined for this managed entity.

Notifications

No notifications have been defined for this managed entity.

Relationships

Multiple instances of this managed entity may be contained in an instance of the Log managed entity.

3.14.Alarm Severity Assignment Profile

This managed entity is used to identify the alarm severity assignments for alarm-reporting managed entities. There may be multiple instances of this managed entity within the ATM NE. Instances of this managed entity are referenced by the "Alarm Severity Assignment Profile Pointer" attribute in the alarm-reporting managed entities (e.g., ATM NE, Equipment, Physical Path Termination Point, etc.).

Instances of this managed entity are created by the ATM NE or by request of the managing system. Instances of this managed entity are deleted by request of the managing system.

Attributes

Managed Entity ID: This attribute provides a unique name for the managed entity instance in the ATM NE. (R, Set at Creation) (mandatory)

Alarm Severity Assignment List: This attribute identifies one or more alarm/severity pairs. (R, W) (mandatory)

Actions

No actions have been defined for this managed entity.

Notifications

Attribute Value Change: This notification is used to report changes to the Alarm Severity Assignment List attribute of this managed entity. The notification shall identify the attribute that changed, its old value, and its new value. (optional)

Managed Entity Creation: This notification is used to report the creation of an instance of this managed entity. (optional)

Managed Entity Deletion: This notification is used to report the deletion of an instance of this managed entity. (optional)

Relationships

Zero or more instances of this managed entity may be contained in each instance of the ATM NE managed entity.

Each instance of this entity may be related to multiple instances of any entity that emits alarm notification and that has the Alarm Severity Assignment Profile Pointer attribute.

3.15.Analysis Criteria

The Analysis Criteria managed entity describes the management information needed to select a possible destination. Call processing attempts to match the information received with an incoming call request against the information defined by each of the instances of this managed entity. For a certain call only one instance has to match the required parameters.

Instances of this managed entity are created and deleted by request of the managing system.

Attributes

Managed Entity ID: This attribute provides a unique name for the managed entity instance in the ATM NE. (R, Set-by-Create) (mandatory)

Active Target: Indicates the analysis result (e.g. local destination pointer, abstract destination pointer, digit manipulation pointer or an indication that call processing needs to determine the default carrier to be used for this call) (R, W) (mandatory)

Destination Code: Indicates the digit string. (R, Set-by-Create) (optional)

Destination Type: Indicates the nature of the address in which the digit string is described in the destination code attribute. (R, Set-by-Create) (optional)

Carrier Data: Points to information about the carrier traffic will be forwarded to. (R, Set-by-Create) (optional)

Calling Party Category: Identifies the category of the calling party according to ITU-T Q.2763. This information may be used by call processing to route the call dependent of the category of the calling party. One of the values of the attribute (‘unused’) may be used to indicate that the criteria is independent from the category of the calling party. (R, W) (mandatory)

Origin: Identifies the origin of a call. This information may be used by call processing to route the call dependent of its origin. One of the values of the attribute (‘unused’) may be used to indicate that the criteria is independent from the origination of the call. (R, W) (mandatory)

Call Type: Indicates the call type associated with this instance. (R, Set-by-Create) (optional)

Actions

No actions have been defined for this managed entity.

Notifications

Attribute Value Change: This notification is used to report changes to the attributes of this managed entity. The notification shall identify the attribute that changed, its old value, and its new value. (optional)

Managed Entity Creation: This notification is used to report the creation of an instance of this managed entity. (optional)

Managed Entity Deletion: This notification is used to report the deletion of an instance of this managed entity. (optional)

Relationships

Multiple instances of this managed entity may exist per instance of the ATM NE managed entity.

Zero or more instances of this managed entity are associated with zero or one instances of the Local Destination, Digit Manipulation and Abstract Destination managed entities by the Active Target pointer attribute.

Zero or more instances of this managed entity may be associated with Carrier Data managed entity by the Carrier Data pointer attribute.

3.16.ATM Access Profile

This managed entity is used to organize data associated ATM Network Interfaces (BICIs, BISSIs, UNIs) and VPC TPs terminating on the ATM NE. One instance of this managed entity shall exist for each ATM Interface terminating on the ATM NE. An instance of the VPC TP managed entity may contain an ATM Access Profile. Instances of this managed entity configure ATM interfaces terminating on the ATM NE.

Instances of this managed entity are create automatically by the ATM NE at ATM NE initialization. Instances of this managed entity are also created and deleted by request of the managing system.

Attributes

Managed Entity ID: This attribute provides a unique name for the managed entity instance in the ATM NE. (R, Set-by-Create) (mandatory)

Local Maximum Number of VPCs Supportable: This attribute identifies the number of VPCs that can be supported by the ATM NE at this end of the interface. (R, Set-by-Create) (optional)

Actual Maximum Number of VPCs Supported: This attribute identifies the maximum number of VPCs that can be simultaneously supported on the interface. If an ILMI is active on a UNI, this value is calculated by ILMI as the smaller of the two local Maximum Number of VPCs at each end of the interface. (R, W) (optional)

Local Maximum Number of VCCs Supportable: This attribute identifies the number of VCCs that can be supported by the ATM NE at this end of the interface. (R, Set-by-Create) (optional)

Actual Maximum Number of VCCs Supported: This attribute identifies the maximum number of VCCs that can be simultaneously supported on the interface. If an ILMI is active on a UNI, this value is calculated by ILMI as the smaller of the two local Maximum Number of VCCs at each end of the interface. (R, W) (optional)

Local Maximum Number of Allocated VPI Bits: This attribute identifies the maximum number of allocated bits of the VPI sub-field that can be supported by the ATM NE at this end of the interface. (R, Set-by-Create) (optional)

Actual Number of Allocated VPI Bits: This attribute identifies the number of allocated bits to be used on the interface. If an ILMI is active on a UNI, this value is calculated by the ILMI as the smaller of the Local Maximum Number of Allocated VPI Bits at each end of the UNI. (R, W) (optional)

Local Maximum Number of Allocated VCI Bits: This attribute identifies the maximum number of allocated bits of the VCI sub-field that can be supported by the ATM NE at this end of the interface. (R, Set-by-Create) (optional)

Actual Number of Allocated VCI Bits: This attribute identifies the number of allocated bits to be used on the interface. If an ILMI is active on a UNI, this value is calculated by the ILMI as the smaller of the Local Maximum Number of Allocated VCI Bits at each end of the UNI. (R, W) (optional)

Total Egress Bandwidth*:* This read/write attribute identifies the total amount of egress bandwidth for an ATM Interface. (R, W) (optional)

Total Ingress Bandwidth*:* This read/write attribute identifies the total amount of ingress bandwidth for an ATM Interface. (R, W) (optional)

VS/VD Support: This attribute provides an indication of whether or not VS/VD control for ABR service is supported at this interface. (R) (optional)

VS/VD Control: This attribute is used to indicate that VS/VD control for ABR service is on or off for this interface. (R, Set-by-Create) (optional)

UPC/NPC: This boolean attribute determines whether or not policing is performed for all connections at the interface or VPC TP. If the attribute is absent, policing will not be performed. If present for a VPC TP, the information in this attribute is used instead of the information in the entity representing the interface. (R,W) (optional).

Actions

No actions have been defined for this managed entity.

Notifications

Attribute Value Change: This notification is used to report changes to the attributes of this managed entity (except the Managed Entity ID attribute). The notification shall identify the attribute that changed, its old value, and its new value. (optional)

Managed Entity Creation: This notification is used to report the creation of an instance of this managed entity. (mandatory)

Managed Entity Deletion: This notification is used to report the deletion of an instance of this managed entity. (mandatory)

Relationships

A single instance of ATM Access Profile managed entity may be contained in the TC Adaptor managed entity.

A single instance of ATM Access Profile managed entity may be contained in the VPC TP managed entity.

Note, some attribute values may be constrained by the values of corresponding attributes in an UNI Info managed entity when the associated TC Adaptor supports a UNI.

3.17 ATM Cell Protocol Monitoring Current Data

This managed entity contains the current performance monitoring data collected as a result of performing ATM layer protocol monitoring.

Instances of this managed entity are created automatically by the ATM NE for each UNI, BICI, and BISSI managed entity. Instances of this managed entity are deleted by the ATM NE.

Attributes

Managed Entity ID: This attribute provides a unique name for the managed entity instance in the ATM NE. (R, Set-by-Create) (mandatory)

Administrative State: This attribute is used to activate (unlock) and deactivate (lock) the data collection function performed by this managed entity. (R, W) (mandatory)

Suspect Flag: This attribute indicates the reliability of the current performance monitoring data collected by the managed entity. This attribute may take on one of two possible values: reliable and unreliable (suspect). (R) (optional)

Elapsed Time: This attribute represents the difference between the current time and the start of the present summary interval. (R) (mandatory)

Threshold Data ID: This attribute provides a pointer to an instance of the Threshold Data managed entity that contains the threshold values for the performance monitoring data collected by this managed entity. (R, W) (mandatory)

Number Of Suppressed Intervals: This attribute is non-zero only if the ATM NE is suppressing ATM Cell Protocol Monitoring History Data creation when the current interval terminates with "all-zeroes" performance measurements. (R) (optional)

Discarded Cells due to protocol errors: This attribute provides a raw, thresholded count of the number of ATM cells that were dropped (per interface) due to an unrecognized field or set of fields in the ATM cell header. (R, S=D, D=0) (mandatory)

Received OAM Cells: This attribute provides a raw, unthresholded count of the number of OAM cells received by the AM NE over the associated interface. (R, S=D, D=0) (mandatory)

Actions

No actions have been defined for this managed entity.

Notifications

Threshold Crossing Alert: This message is used to notify the management system when one of the above values exceeds a pre-set threshold. The following information shall be supplied with this notification: (optional)

- The ID of the Managed Entity Reporting the Threshold Crossing Alert
- The Type of Performance Parameter that Exceeded the Threshold

Relationships

An instance of this managed entity shall exist for each instance of the UNI, BICI, and BISSI managed entity.

3.18.ATM Cell Protocol Monitoring History Data

This managed entity contains all the previous performance monitoring data collected as a result of performing ATM layer protocol monitoring .

Measurement attributes in this managed entity are an exact copy of the attributes in the corresponding ATM Cell Protocol Monitoring Current Data managed entity at the end of the interval. The time at the end of the interval is indicated by the value of the attribute "Period End Time."

Instances of this managed entity are created automatically by the ATM NE. Instances of this managed entity are deleted by the ATM NE or by request of the managing system.

Attributes

Managed Entity ID: This attribute provides a unique name for the managed entity instance in the ATM NE. (R, Set-by-Create) (mandatory)

Period End Time: This attribute records the time at the end of the interval. (R) (mandatory)

Suspect Flag: This attribute indicates the reliability of the performance monitoring data collected by the managed entity. This attribute may take on one of two possible values: reliable and unreliable (suspect). (R) (optional)

Number Of Suppressed Intervals: This attribute is present only if the ATM NE is suppressing ATM Cell Protocol Monitoring History Data creation when the current interval terminates with "all-zeroes" performance measurements. (R) (optional)

Discarded Cells due to Protocol Errors: This attribute provides a count of the number of ATM cells that were discarded (per interface) due to an unrecognized field or set of fields in the ATM cell header. (R) (mandatory)

Received OAM Cells: This attribute provides a count of the number of OAM cells received by the AM NE over the associated interface. (R) (mandatory)

Actions

No actions have been defined for this managed entity.

Notifications

No notifications have been defined for this managed entity.

Relationships

A new instance of this entity is created at the end of each 15 minute interval for each current data object. This managed entity will create a copy of the performance management attributes that are present in the associated current data managed entity at the end of the 15 minute interval. From zero to thirty-two instances of this managed entity shall be supported for each current data managed entity.

3.19.ATM Cell Protocol Monitoring Log Record

This managed entity is used to represent logged information that resulted from performing ATM Cell Protocol Monitoring in the ATM NE.

Instances of this managed entity are automatically created by the ATM NE. Instances of this managed entity are deleted by the ATM NE or by request of the managing system.

Attributes

Managed Entity ID: This attribute provides a unique name for the managed entity instance in the ATM NE. (R, Set-by-Create) (mandatory)

Logging Time: This attribute identifies the time at which the record was entered into the log. (R) (mandatory)

Cell Header Abnormality Type: This attribute identifies the reason for discarding the ATM cell (i.e., unassigned VPI/VCI value or VPI/VCI value out-of-range). (R) (mandatory)

Interface ID: This attribute identifies the instance of the UNI, BICI, or BISSI managed entity that represents the interface over which the errored cell was received. (R) (mandatory)

VPI Value: This attribute identifies the VPI value of the discarded cell. (R) (mandatory)

VCI Value: This attribute identifies the VCI value of the discarded cell. (R) (mandatory)

Actions

No actions have been defined for this managed entity.

Notifications

No notifications have been defined for this managed entity.

Relationships

Multiple instances of this managed entity may exist for each instance of the Latest Occurrence Log managed entity. However, there shall be only one record, per interface, for each abnormality type.

Each instance of this entity is related to one of the UNI, BISSI or BICI managed entity through its pointer attribute: Interface ID.

3.20.ATM Cross Connection

For point-to-point ATM cross-connections, this managed entity is used to represent the cross-connect relationship between two VPL or VCL termination points.

For multipoint ATM cross-connections, this managed entity is used to represent the cross-connect relationship between an instance of the VPL (or VCL) Termination Point managed entity and an instance of the Multipoint Bridge managed entity.

Instances of this managed entity are created automatically by request of the managing system based on ATM Connect and ATM Disconnect actions performed on an instance of the ATM Cross Connect Control managed entity. Instances of this managed entity are deleted by the ATM NE or by request of the managing system.

Attributes

Managed Entity ID: This attribute provides a unique name for the managed entity instance in the ATM NE. (R, Set-by-Create) (mandatory)

Termination Point A: For point-to-point cross connections, this attribute identifies the instance of the VPL (or VCL) Termination Point managed entity that represents one of the two cross-connected VPLs (or VCLs). For multipoint cross connections, this attribute identifies the instance of the VPL (or VCL) Termination Point managed entity that represents one VPL (or VCL) termination point of a particular multipoint cross connection. (R, Set-by-Create) (mandatory)

Termination Point Z: For point-to-point cross connections, this attribute identifies the instance of the VPL (or VCL) Termination managed entity that represents the other cross-connected VPL (or VCL). For multipoint cross connections, this attribute identifies the instance of the Multipoint Bridge managed entity used to support the multipoint cross connection. (R, Set-by-Create) (mandatory)

Administrative State: This attribute is used to activate (unlock) and deactivate (lock) cell flow through the ATM cross-connection. Assigning a VPI or VPI/VCI translation but reserving it for future activation is performed by initially setting this attribute to "locked". (R, W) (mandatory)

Operational State: This attribute identifies whether or not this instance of the ATM Cross Connection managed entity is capable of performing its normal function (i.e., switching cells). (R) (mandatory)

Recovery Type: This attribute is used to configure an ATM cross connection as a "recoverable" cross-connection or "non-recoverable" cross-connection. Recoverable cross-connect Relationships remain intact regardless of the operational state of the supporting VP/VC. A non-recoverable cross-connection is one that is torn down (i.e., released) upon detection of an affecting failure. (R, W) (optional)

Actions

No actions have been defined for this managed entity.

Notifications

Managed Entity Creation: This notification is used to report the creation of an instance of this managed entity. (mandatory)

Managed Entity Deletion: This notification is used to report the deletion of an instance of this managed entity. (mandatory)

State Change: This notification is used to report changes to the Operational State attribute and Administrative State attribute of this managed entity. The notification shall identify the state attribute that changed, its old value, and its new value. (mandatory)

Attribute Value Change: This notification is used to report changes to the attributes of this managed entity (except the Managed Entity ID attribute). The notification shall identify the attribute that changed, its old value, and its new value. (optional)

Relationships

Zero or more instances of the ATM Cross Connection managed entity shall exist for each instance of the ATM Cross Connection Control managed entity.

Each instance of this managed entity is associated with one (for multipoint) or two (for point to point) instances of the VPL (or VCL) Termination Point managed entity by the Termination Point A and Termination Point Z pointer attributes.

Each instance of this managed entity is associated with zero or one instances of the Multipoint Bridge managed entity by the Termination Point Z pointer attribute.

3.21.ATM Cross Connection Control

This managed entity manages the establishment and release of VP/VC cross-connections (e.g., VPI/VCI translations) in the ATM NE.

An instance of this managed entity is created automatically by the ATM NE upon ATM NE initialization. This managed entity cannot be deleted.

Attributes

Managed Entity ID: This attribute provides a unique name for the managed entity in the ATM NE. (R, Set-by-Create) (mandatory)

Operational State: This attribute identifies whether or not the ATM NE is capable of performing its normal functions of establishing and releasing cross-connections. (R) (mandatory)

Actions

ATM Connect: This operation is used to request the ATM Cross Connection Control managed entity instance to establish a point-to-point ATM VPL or VCL cross connection. This request includes parameters that identify the two VPL or VCL terminations to cross-connect, and their associated traffic descriptors (if not already known by the ATM NE). (mandatory)

ATM Disconnect: This operation is used to request the ATM Cross Connection Control managed entity instance to release a particular point-to-point ATM cross connection. (mandatory)

ATM Multipoint Connect: This operation is used to request the ATM Cross Connection Control managed entity instance to establish a multipoint ATM VPL or VCL cross connection. This request includes parameters that identify the multipoint connection type (i.e., multicast, merge, multicast/merge, or full multipoint), the root and leaf VPL or VCL termination points to cross-connect, and the traffic descriptors for the various legs of the multipoint cross-connection. (mandatory if multipoint is supported)

ATM Multipoint Disconnect: This operation is used to request the ATM Cross Connection Control managed entity instance to tear-down (release) an existing multipoint ATM VPL or VCL cross connection. This request includes a parameter that identifies the instance of the Multipoint Bridge managed entity that is supporting the multipoint cross-connection. (mandatory if multipoint is supported)

Add Legs to Multipoint Bridge: This operation is used to request the ATM Cross Connection Control managed entity instance to add one or more legs (VPL or VCL termination points) to an existing multipoint cross-connection. This request includes parameters that identify the Multipoint Bridge managed entity instance supporting the multipoint cross-connection, the VPL or VCL termination points to add to the connection, and the traffic descriptors for the additional legs of the multipoint cross-connection. (mandatory if multipoint is supported)

Remove Legs from Multipoint Bridge: This operation is used to request the ATM Cross Connection Control managed entity instance to remove one or more legs (VPL or VCL termination points) from an existing multipoint cross-connection. This request includes parameters that identify the Multipoint Bridge managed entity instance supporting the multipoint cross-connection and the VPL or VCL termination points to remove from the connection. (mandatory if multipoint is supported)

Notifications

Managed Entity Creation: This notification is used to report the creation of an instance of this managed entity. (mandatory)

Managed Entity Deletion: This notification is used to report the deletion of an instance of this managed entity. (mandatory)

State Change: This notification is used to report changes to the Operational State attribute of this managed entity. The notification shall identify the state attribute that changed (i.e., Operational State), its old value, and its new value. (optional)

Attribute Value Change: This notification is used to report changes to the attributes of this managed entity (except the Managed Entity ID attribute). The notification shall identify the attribute that changed, its old value, and its new value. (optional)

Relationships

One instance of the ATM Cross Connection Control managed entity shall exist for each instance of the ATM NE managed entity.

3.22.ATM MTP Signaling Point

The ATM MTP Signaling Point managed entity class represents the MTP level functions of an ATM signaling entity. For ATM NEs using associated mode signaling, only a subset of MTP3 functions are required.

Instances of this managed entity are created and deleted by request of the managing system.

Attributes

Managed Entity ID: This attribute provides a unique name for the managed entity instance in the ATM NE. (R, Set-by-Create) (mandatory)

Operational State: Indicates if the MTP level functions are operational (in-service) or not operational (out of service). (R) (mandatory)

Originating Point Code: Value of originating point code applicable to the signaling point. This attribute should be equal to either the primary Signaling Point Code (SPC) for the ATM NE, or one of up to three allowed secondary point codes. (R, Set-by-Create) (mandatory)

Network Indicator: This attribute identifies the MTP signaling network with which this managed entity is associated. (R, Set-by-Create) (optional)

Signaling Point Type: This attribute identifies whether the signaling point is a signaling end point or a signaling transfer point or can act as both. Possible values are SEP, STP or STEP. (R, W) (mandatory)

Actions

No actions have been defined for this managed entity.

Notifications

Managed Entity Creation: This notification is used to report the creation of an instance of this managed entity. (mandatory)

Managed Entity Deletion: This notification is used to report the deletion of an instance of this managed entity. (mandatory)

State Change: This notification is used to report changes to the Operational State attribute of this managed entity. The notification shall identify the state attribute that changed (i.e., Operational State), its old value, and its new value. (optional)

Attribute Value Change: This notification is used to report changes to the attributes of this managed entity (except the Managed Entity ID attribute). The notification shall identify the attribute that changed, its old value, and its new value. (optional)

Relationships

One instance of the ATM MTP Signaling Point managed entity is provided for each ATM signaling entity within the ATM NE. Up to four ATM MTP Signaling Point managed entity instances may exist for an ATM NE, but only one may be associated with a BISUP Signaling Point designated as primary.

Instances of this managed entity may contain zero, one ore more ATM Link Set managed entity instances for link sets associated with the represented signaling entity. They also may contain zero, one or more MTP3b Access Point managed entity instances and zero, one or more Signaling Route Set NE Part managed entity instances associated with the represented signaling entity.

3.23.ATM NE

This managed entity is used to represent ATM NEs. The ATM NEs represented by this managed entity may be stand-alone devices or multi-component, geographically distributed systems.

An instance of this managed entity is created automatically by the ATM NE upon ATM NE initialization. The automatic creation of instances of this managed entity shall be reported by the ATM NE to the management system. This managed entity cannot be deleted.

Attributes

Managed Entity ID: This attribute provides a unique name for each ATM NE managed entity instance. (R, Set-by-Create) (mandatory)

External Time: This attribute provides the time-of-day. This attribute functions as a reference for all time-stamp activities in the ATM NE. (R, W) (mandatory)

Location Name: This attribute identifies the specific or general location of the ATM NE. (R, W) (mandatory)

Operational State: This attribute identifies whether or not the ATM NE managed entity is capable of performing its normal functions (i.e., in-service or out-of-service). (R) (mandatory)

Vendor Name: This attribute identifies the vendor of the ATM NE. (R) (optional)

Version: This attribute identifies the version of the ATM NE. A value of NULL shall be used in cases where version information is not available or applicable to the ATM NE being represented. (R) (mandatory)

Alarm Severity Assignment Profile Pointer: This attribute provides a pointer to the instance of the Alarm Severity Assignment Profile managed entity that contains the severity assignments for the alarms reported by this managed entity. When the value of this attribute is set to NULL, default severity assignments shall be used. (R, W) (mandatory)

Actions

No actions have been defined for this managed entity.

Notifications

Alarm: (mandatory) This notification is used to notify the management system when a failure has been detected or cleared. The following parameters shall be supplied with this notification:

- The Nature of the Alarm (i.e., see generic trouble list) (mandatory)
- Specific Problems (optional)
- The ID of the Managed Entity Reporting the Alarm (mandatory)
- The Failed Switch Component or List of Failed (or Possibly Failed) Components (optional)
- Back-up Status
  (This is a Boolean indication as to whether or not the failed entity has been backed-up. (optional)
- Back-up Entity
  This is the ID of the managed entity providing back-up services to the failed entity. This parameter shall be NULL when the value of the "Back-up Status" parameter is *false*. (optional)
- Severity of Failure (critical, major, minor, warning, indeterminate, and cleared) (mandatory)
- Additional Information (optional)
- Proposed Repair Actions (optional)
- Time and Date Failure was Detected (mandatory)

Attribute Value Change: This notification is used to report changes to the Alarm Severity Assignment Profile Pointer and Location Name attributes of this managed entity. The notification shall identify the attribute that changed, its old value, and its new value. (optional)

Managed Entity Creation: This notification is used to report the creation of an instance of this managed entity. (mandatory)

Managed Entity Deletion: This notification is used to report the deletion of an instance of this managed entity. (mandatory)

State Change: This notification is used to report changes to the Operational State attribute of this managed entity. The notification shall identify the state attribute that changed (i.e., the Operational State attribute), its old value, and its new value. (optional)

Relationships

One instance of the ATM NE managed entity would exist for each ATM NE being managed. The ATM NE is assumed to have a relationship to a higher level managed entity, such as a General Purpose Network Element. Such a higher level managed entity is beyond the scope of this document.

All other managed entities in this document are related directly or indirectly to the ATM NE managed entity.

3.24.ATM Signaling Link Set Termination Point

Provides information about a set of interoffice signaling links between an Originating Point Code (OPC), Adjacent Point Code (APC) pair. An ATM Signaling Link Set is composed of individual signaling links represented by ATM Signaling Link managed entities. All signaling links in the same link set have the same bandwidth and use VCI =5.

Instances of this managed entity are created and deleted by request of the managing system. A link set should not be deleted unless all the contained ATM Signaling Link managed entities have been deleted.

Attributes

Managed Entity ID: This attribute provides a unique name for the managed entity instance in the ATM NE. (R, Set-by-Create) (mandatory)

Adjacent Point Code: Value of the signaling point code applicable to the adjacent signaling point (R, Set-by-Create) (mandatory)

Administrative State: Allows the entire link set to be activated (unlocked), deactivated (locked), or inhibited (shutting down). If deactivated, the link set is immediately shut down and calls in progress are terminated. If inhibited, calls in progress are allowed to complete after which the link set is deactivated. (R, W) (optional)

Operational State: Indicates if the entire link set is enabled (available for service) or disabled (not available for service) If any links in the link set are enabled, then the operational state of the link set shall be enabled. (R) (mandatory)

Availability Status: This attribute indicated “dependency” if all links in the link set are unavailable and indicates “degraded” if one or more links are unavailable. (R) (mandatory)

Alarm Status: Indicates highest level outstanding alarm (or “cleared”) that applies to the entire link set. (R) (optional)

Current Problem List: The Current Problem List attribute type identifies the current existing problems, with severity, associated with the managed entity. (R) (optional)

Alarm Severity Assignment Profile Pointer: This attribute identifies an Alarm Severity Assignment Profile managed entity. (R, W) (optional)

Signaling Link Set Name: Eight character name (R, W, Set-by-Create) (optional)

VPCIs Allowed: Lists the VPCIs that may be used with the link set (R, W) (optional)

VPIs Allowed: Lists the VPIs for VPC Termination Points that may be used with the link set (R, W) (optional)

Congestion Control Method: This attribute defines which congestion control method according to ITU-T Q.704 is used. (R, W) (mandatory)

Periodic Link Test Flag: This attribute defines whether the periodic test procedure of ITU-T Q.707 is applied to the links in this signaling link set. (R, W) (optional)

Actions

No actions have been defined for this managed entity.

Notifications

Alarm: (mandatory) This message is used to notify the management system when the entire link set is out of service or the failure is cleared. The following parameters shall be supplied with this notification:

- The Nature of the Alarm (i.e., see generic trouble list) (mandatory)

– Specific Problems (optional)

– The ID of the Managed Entity Reporting the Alarm (mandatory)

- The Failed Switch Component or List of Failed (or Possibly Failed) Components (optional)

– Back-up Status
This is a Boolean indication as to whether or not the failed entity has been backed-up. (optional)

– Back-up Entity
This is the ID of the managed entity providing back-up services to the failed entity. This parameter shall be NULL when the value of the "Back-up Status" parameter is *false*. (optional)

– Severity of Failure (critical, major, minor, warning, indeterminate, and cleared)

– Additional Information (optional)

– Proposed Repair Actions (optional)

– Time and Date Failure was Detected (mandatory)

State Change Notification: Sent if value of administrative or operational state changes. (mandatory)

Attribute Value Change: This notification is used to report changes to the attributes of this managed entity (except the Managed Entity ID attribute). The notification shall identify the attribute that changed, its old value, and its new value. (optional)

Managed Entity Creation: This notification is used to report the creation of an instance of this managed entity. (optional)

Managed Entity Deletion: This notification is used to report the deletion of an instance of this managed entity. (optional)

Relationships

One instance of the ATM Signaling Link Set managed entity exists for each possible OPC/APC pair associated with the managed NE. Instances of this managed entity are contained in a instance of the ATM MTP Signaling Point managed entity.

The links in the link set are defined by the set of contained ATM Interoffice Signaling Link managed entities.

Each ATM Signaling Link Set managed entity may be associated with one Signaling Route NE Part managed entity or optionally, one MTP3b Access Point managed entity. These Relationships are established by the Pointer To The Associated Signaling Link Set attribute in the Signaling Route NE Part managed entity or the Signaling Link Set pointer attribute in the MTP3b Access Point managed entity.

3.25.ATM Signaling Link Termination Point

Provides information about the usage of an ATM VCC as an interoffice signaling channel, and provides notifications needed for management of the signaling channel. All signaling links use VCI =5.

Instances of this managed entity are created and deleted by request of the managing system.

Attributes

Managed Entity ID: This attribute provides a unique name for the managed entity instance in the ATM NE. The Signaling Link Code which is a signaling link identifier that is unique within a link set, and is the same for both the near and far ends of the link shall be included with this attribute. The allowed range for a Signaling Link Code is 00-15. (R, Set-by-Create) (mandatory)

Protocol Pointer: Points to instance of SAAL NNI Protocol Profile managed entity that provides information on the SSCOP and SSCF protocol parameter settings for the signaling link (R, Set-by-Create) (mandatory)

Signaling Data Link Pointer: Points to virtual channel termination point managed entity representing AAL5 functions that is associated with the access signaling link, e.g., an Interworking VCC Termination Point instance. (R, Set-by-Create) (mandatory)

Administrative State: Allows individual signaling links to be activated (unlocked), deactivated (locked), or inhibited (shutting down). If deactivated calls in progress are immediately terminated. If inhibited, calls in progress are allowed to completed before the link is deactivated. Links may be inhibited or uninhibited by either managing system request or autonomously by the ATM NE. (R, W) (mandatory)

Operational State: Indicates if the entire link set is enables (available for service) or disabled (not available for service) If any links in the link set are enabled, then the operational state of the link set shall be enabled. (R) (mandatory)

Alarm Status: Indicates highest level outstanding alarm (or “cleared”) that applies to the link. (R) (optional)

Current Problem List: The Current Problem List attribute type identifies the current existing problems, with severity, associated with the link. (R) (optional)

Alarm Severity Assignment Profile Pointer: This attribute identifies an Alarm Severity Assignment Profile managed entity. (R, W) (optional)

VPCIs and VPs: Lists the VPCIs and VPs controlled by the signaling link. May be used, if needed, to limit the signaling link control to only bearer channels in the VPC that carries the signaling link. (R, W) (optional)

Link TP Status: This attribute contains the possible SS7 functional states of the link as defined in Q.704: (local blocked, remote blocked, local inhibited, remote inhibited, failed, deactivated and combinations of these values.) (R) (mandatory)

Procedural Status: This attribute indicates whether the link is “initializing” or “not initialized.” (R) (mandatory)

Usage State: This attribute indicates whether the link carries no user part traffic or not or if it is congested. 'Idle': The ATM Signaling Link Termination Point carries no user part traffic (test traffic may be present); 'active': The ATM Signaling Link Termination Point is not congested. Currently the link termination point carries user part traffic; 'busy': The ATM Signaling Link Termination Point is congested due to user part traffic. (R) (mandatory)

Actions

No actions have been defined for this managed entity.

Notifications

Alarm: (mandatory) This message is used to notify the management system when the following events occur or the problem is cleared:

- False Link Congestion Detected: MTP3 notification sent when a link is taken out of service because it stays in one congestion level for too long (optional).
- Near-End Forced Link Alarm: MTP3 notification sent when link is made unavailable or available at the near end by administrative action. (optional)
- Link Failure Alarm: MTP3 notification sent when link failure or recovery occurs. (optional)
- SSCOP Failure: Sent if the SSCOP connection fails. (mandatory)

The following parameters shall be supplied with this notification:

- The Nature of the Alarm (i.e., see generic trouble list) (mandatory)
- Specific Problems (optional)
- The ID of the Managed Entity Reporting the Alarm (mandatory)
- The Failed Switch Component or List of Failed (or Possibly Failed) Components (optional)
- Back-up Status
  This is a Boolean indication as to whether or not the failed entity has been backed-up. (optional)
- Back-up Entity
  This is the ID of the managed entity providing back-up services to the failed entity. This parameter shall be NULL when the value of the "Back-up Status" parameter is *false*. (optional)
- Severity of Failure (critical, major, minor, warning, indeterminate, and cleared) (optional)
- Additional Information (optional)
- Proposed Repair Actions (optional)
- Time and Date Failure was Detected (mandatory)

State Change Notification: Sent if value of administrative or operational state changes. (optional)

Attribute Value Change: This notification is used to report changes to the attributes of this managed entity (except the Managed Entity ID attribute). The notification shall identify the attribute that changed, its old value, and its new value. (optional)

Managed Entity Creation: This notification is used to report the creation of an instance of this managed entity. (optional)

Managed Entity Deletion: This notification is used to report the deletion of an instance of this managed entity. (optional)

Relationships

Zero, one or more instances of this managed entity are contained in an instance of the ATM Signaling Link Set Termination Point managed entity.

An instance of this managed entity may contain instances of the SSCOP Current Data managed entity.

One instance of the ATM Interoffice Signaling Link Termination Point managed entity is provided for each managed signaling channel. It is associated with one Signaling VCC Termination Point by the Signaling Data Link Pointer attribute.

Each instance of this managed entity is associated with one instance of an SAAL NNI Protocol Profile managed entity by the Protocol Pointer attribute.

3.26.ATM Traffic Load Current Data

An instance of this managed entity is used to collect and report data associated with the traffic load carried by the ATM NE, its interfaces, and selected instances of its supported Virtual Connections that are PVCs.

Instances of this managed entity are created by the ATM NE or by request of the managing system for selected individual VPL Termination Point and VCL Termination Point managed entities that are associated with PVCs and for individual UNI, BICI and BISSI managed entities. Instances of this managed entity are deleted by the ATM NE or by request of the managing system.

Attributes

Managed Entity ID: This attribute provides a unique name for the managed entity instance in the ATM NE. (R, Set at Creation) (mandatory)

Administrative State: This read/write attribute is used to activate (unlock) and deactivate (lock) the data collection function performed by this managed entity. (R, W) (mandatory)

Suspect Flag: This attribute indicates the reliability of the atmTrafficLoad data collected by the managed entity. This attribute may take on one of two possible values: reliable and unreliable (suspect). (R) (optional)

Elapsed Time: This attribute represents the difference between the current time and the start time of the present summary interval. (R) (optional)

Threshold Data ID: This read/write attribute provides a pointer to an instance of the Threshold Data managed entity that contains the threshold values for the performance monitoring data collected by this managed entity. (R, W) (mandatory)

Number Of Suppressed Intervals: This attribute is present only if the ATM NE is suppressing atmTrafficLoad History Data creation when the current interval terminates with "all-zeroes" performance measurements. (R) (mandatory)

Cells Received: This attribute provides a raw, thresholded count of the number of cells received with either CLP =0 or CLP =1. (R, S=D, D=0) (mandatory)

Cells Transmitted: This attribute provides a raw, thresholded count of the number of cells transmitted with either CLP =0 or CLP =1. (R, S=D, D=0) (mandatory)

Actions

Reset a given Current Data Counter. (Optional.) This operation allows the user to reset a given current data counter within the Current Data managed entity.

Notifications

Threshold Crossing Alert: This message is used to notify the management system when the value of the above count exceeds a pre-set threshold. The following information shall be supplied with this notification: (optional)

- The ID of the Managed Entity Reporting the Threshold Crossing Alert
- The Type of Performance Parameter that Exceeded the Threshold

Relationships

One instance of this managed entity may be created on demand for each instance of the PVC associated VPL Termination Point and VCL Termination Point managed entities.

One instance of this managed entity may be exist for each instance of the UNI, BICI and BISSI managed entities.

3.27.ATM Traffic Load History Data

This managed entity contains all the previous traffic load data for a specific ATM NE that is produced as a result of forming atmTrafficLoad Current Data.

Measurement attributes in the History Data managed entity are an exact copy of the attributes in the corresponding Current Data managed entity at the end of the interval. The time at the end of the interval is indicated by the value of the attribute "Period End Time."

Instances of this managed entity are automatically created by the ATM NE. Instances of this managed entity are deleted by the ATM NE or by request of the managing system.

Attributes

Managed Entity ID: This attribute provides a unique name for the managed entity instance in the ATM NE. (R, Set at Creation) (mandatory)

Period End Time: This attribute records the time at the end of the interval. (R) (mandatory)

Suspect Flag: This attribute indicates the reliability of the performance monitoring data collected by the managed entity. This attribute may take on one of two possible values: reliable and unreliable (suspect). (R) (optional)

Number Of Suppressed Intervals: This attribute is present only if the ATM NE is suppressing atmTrafficLoad History Data creation when the current interval terminates with "all-zeroes" performance measurements. (R) (optional)

Cells Received: This attribute provides a count of the number of cells received with either CLP =0 or CLP =1. (R) (mandatory)

Cells Transmitted: This attribute provides a count of the number of cells transmitted with either CLP =0 or CLP =1. (R) (mandatory)

Actions

No actions have been defined for this managed entity.

Notifications

No notifications have been defined for this managed entity.

Relationships

A new instance of this entity is created at the end of each 15 minute interval for each current data object. This managed entity will create a copy of the performance management attributes that are present in the associated current data managed entity at the end of the 15 minute interval. From zero to thirty-two instances of this managed entity shall be supported for each current data managed entity.

3.28.Attribute Value Change Record

This managed entity is used to represent logged information that resulted from attribute value change notifications.

Instances of this managed entity are automatically created by the ATM NE. Instances of this managed entity are deleted by the ATM NE or by request of the managing system.

Attributes

Managed Entity ID: This attribute provides a unique name for the managed entity instance in the ATM NE. (R, Set-by-Create) (mandatory)

Logging Time: This attribute identifies the time at which the record was entered into the log. (R) (mandatory)

Managed Entity: This attribute identifies the type and instance ID of the managed entity that generated the attribute value change notification. (R) (mandatory)

Attribute Type: This attribute identifies the type of attribute whose value has changed. (R) (mandatory)

Old Attribute Value: This attribute identifies the previous value of the attribute. (R) (mandatory)

New Attribute Value: This attribute identifies the new value of the attribute. (R) (mandatory)

Actions

No actions have been defined for this managed entity.

Notifications

No notifications have been defined for this managed entity.

Relationships

Multiple instances of this managed entity may exist for each instance of and will be contained in the Log managed entity.

3.29.BICI

This managed entity is used to organize data associated with Broadband Inter Carrier Interfaces (BICIs) terminating on the ATM NE. One instance of this managed entity shall exist for each BICI terminating on the ATM NE.

Instances of this managed entity are created and deleted by request of the managing system to configure ATM interfaces terminating on the ATM NE as BICIs.

Attributes

Managed Entity ID: This attribute provides a unique name for the managed entity instance in the ATM NE. (R, Set-by-Create) (mandatory)

TC Adaptor ID - This attribute provides a pointer to the associated instance of the TC Adaptor managed entity. (R, Set-by-Create) (mandatory)

Far-End Carrier Network: This attribute identifies the adjacent carrier to which the BICI transmission path is connected. This attribute is needed to support SVC services only. (R, W) (optional)

Loopback Location Code: This attribute provides the code that shall exist in incoming OAM Loopback cells that are to be looped-back at the BICI termination point represented by the managed entity. (R, W) (optional)

Actions

No actions have been defined for this managed entity.

Notifications

Attribute Value Change: This notification is used to report changes to the attributes of this managed entity (except the Managed Entity ID attribute) . The notification shall identify the attribute that changed, its old value, and its new value. (optional)

Managed Entity Creation: This notification is used to report the creation of an instance of this managed entity. (optional)

Managed Entity Deletion: This notification is used to report the deletion of an instance of this managed entity. (optional)

Relationships

Multiple instances of the BICI managed entity may exist for each instance of the ATM NE managed entity.

Each instance of the BICI managed entity is related to a TC Adaptor managed entity by the TC Adaptor ID attribute.

3.30.BISSI

This managed entity is used to organize data associated with Broadband Inter Switching System Interfaces (BISSIs) terminating on the ATM NE. One instance of this managed entity shall exist for each BISSI terminating on the ATM NE.

Instances of this managed entity are created and deleted by request of the managing system to configure ATM interfaces terminating on the ATM NE as BISSIs.

Attributes

Managed Entity ID: This attribute provides a unique name for the managed entity instance in the ATM NE. (R, Set-by-Create) (mandatory)

TC Adaptor ID - This attribute provides a pointer to the associated instance of the TC Adaptor managed entity. (R, Set-by-Create) (mandatory)

Loopback Location Code: This attribute provides the code that shall exist in incoming OAM Loopback cells that are to be looped-back at the BISSI termination point represented by the managed entity. (R, W) (optional)

Actions

No actions have been defined for this managed entity.

Notifications

Attribute Value Change: This notification is used to report changes to the attributes of this managed entity (except the Managed Entity ID attribute). The notification shall identify the attribute that changed, its old value, and its new value. (optional)

Managed Entity Creation: This notification is used to report the creation of an instance of this managed entity. (optional)

Managed Entity Deletion: This notification is used to report the deletion of an instance of this managed entity. (optional)

Relationships

Multiple instances of the BISSI managed entity may exist for each instance of the ATM NE managed entity.

Each instance of the BISSI managed entity is related to a TC Adaptor managed entity by the TC Adaptor ID attribute.

3.31.BISUP Access Point

The BISUP Access Point managed entity represents the user part signaling functions associated with a single signaling relationship with a destination signaling point.

Note that local ATM NE initiation of VPCI consistency checks will be treated the same as other ATM NE diagnostic testing routines.

Instances of this managed entity are created and deleted by request of the managing system.

Attributes

Managed Entity ID: This attribute provides a unique name for the managed entity instance in the ATM NE. (R, Set-by-Create) (mandatory)

Destination Point Code: Destination Point Code (DPC) for the related far-end signaling point. (R, Set-by-Create) (mandatory)

NNI Access Pointer: Pointer to associated NNI Access managed entity instance. (R, W) (optional)

Provider Entity: Pointer to an associated MTP3b Access Point managed entity. (R, W) (mandatory)

Profile Pointer: Points to the BISUP Timers Profile managed entity. (R, Set-by-Create) (optional)

BISUP Configuration Information (mandatory).

Mode: Specifies the controlled link set as using either associated mode or quasi-associated mode signaling. (R, Set-by-Create)

Version: The version of BISUP that is used on the link set. (R, W)

BISUP Configuration Information (mandatory if ATM NE supports ISC Point Codes).

ISC Point Code: The value of the originating ISC Point Code parameter(R, W)

ISC Include Information: Controls the handling of ISC point codes. If the ISC point code is not received, it determines whether to include or not include the originating point code in the IAMs for outgoing international calls. If the ISC point code is received, it determines whether to discard or include the received originating ISC point code in the outgoing IAMs.

Configuration of Inter-Carrier BISUP Signaling Features (mandatory if DPC is for an interconnecting carrier and BISUP is being used.)

Supported BISUP Features: List of supported features for the route including the following (R, A/R, Default = {})

- Carrier Identification Parameter delivery
- Carrier Selection Information Parameter delivery
- Originating Line Information/Charge Number delivery
- Calling Party Number delivery
- Calling Party Sub-address transfer
- Called Party Sub-address transfer
- AESA for calling party transfer
- Broadband High layer Information transfer
- Broadband Low Layer Information transfer
- AAL Parameters transfer

- Include unrecognized IAM parameters in outgoing IAM
- Include IAM parameters with unrecognized values in outgoing IAM

Actions

Reset: Returns VPCI resources to an idle state. Resets may be for a single call, a single VCI, or resources for all VCIs on a VPCI, but for initial implementations, only VPCIs need to be resetable by the Management System. Action parameters shall identify the ATM interface involved, the VPCI, the type of resources to be reset, and identification of the resources to be set. Reply message shall indicate the success or failure of the reset. (mandatory)

Cancel Reset: Stops the ATM NE from continually trying to reset when the far end is not responding. (mandatory)

Notifications

Reset timer expiration: BISUP notification (mandatory) sent when the BISUP signaling entity invokes a Reset and timer T17b expires. The notifications shall include the following parameters: identification of the ATM interface involved, VPCI, OPC, DPC, network indicator, resource for which reset was attempted, probable cause (timer T17b expirations) event date, and event time.

Reset blocked: BISUP notification (mandatory) sent when BISUP signaling entity invokes a Reset on a VPCI and the VPCI is in a blocked state. The notification shall include the following parameters: identification of the ATM interface involved, VPCI, probable cause (ATM NE Reset of Blocked VPCI), event date, and event time.

Consistency Check Results: BISUP notification (mandatory) sent on completion of a remotely initiated VPCI consistency check. The notification shall include the following parameters: the SPC of the remote signaling entity that initiated the check, VPCI, the results of the test (pass or fail), event date, and event time.

Attribute Value Change: This notification is used to report changes to the attributes of this managed entity (except the Managed Entity ID attribute). The notification shall identify the attribute that changed, its old value, and its new value. (optional)

Managed Entity Creation: This notification is used to report the creation of an instance of this managed entity. (optional)

Managed Entity Deletion: This notification is used to report the deletion of an instance of this managed entity. (optional)

Relationships

Instances of this managed entity are contained in an instance of the BISUP Signaling Point managed entity.

One instance of this managed entity will exist for each OPC/DPC signaling relationship using BISUP.

Each instance of this managed entity may be associated with one instance of the NNI Access managed entity by the NNI Access Pointer attribute.

Each instance of this managed entity may be associated with one instance of the MTP3b Access Point managed entity by the Provider Entity attribute.

Each instance of this managed entity may be associated with one instance of a BISUP Timers Profile managed entity by the Profile Pointer attribute.

3.32.BISUP Signaling Point

Provides information about BISUP functions within an ATM signaling entity and allows their management. An ATM NE may contain zero, one or more ATM signaling entities. Each ATM signaling entity is assigned a signaling point code (SPC).

Instances of this managed entity are created and deleted by request of the managing system.

Attributes

Managed Entity ID: This attribute provides a unique name for the managed entity instance in the ATM NE. (R, Set-by-Create) (mandatory)

Signaling Point Code: The signaling point code assigned to this signaling entity. (R, W) (mandatory)

Primary: True if this signaling point code is the primary SPC for the ATM NE and False if it is a secondary SPC. (R, W) (mandatory)

Automatic Congestion Control Parameters: (optional)

Congestion Level 1: Threshold for congestion level one. (R)

Congestion Level 2: Threshold for congestion level two (R)

Control Duration: The length of the control duration (R, Set-By-Create)

Traffic Amount: The amount of traffic controlled (R, Set-by-Create)

Actions

No actions have been defined for this managed entity.

Notifications

Attribute Value Change: This notification is used to report changes to the attributes of this managed entity (except the Managed Entity ID attribute). The notification shall identify the attribute that changed, its old value, and its new value. (optional)

Managed Entity Creation: This notification is used to report the creation of an instance of this managed entity. (optional)

Managed Entity Deletion: This notification is used to report the deletion of an instance of this managed entity. (optional)

Relationships

Instances of this managed entity are contained in an ATM NE managed entity.

One instance of this managed entity is provided for each signaling entity using BISUP.

This managed entity contains zero, one or more instances of the BISUP Access Point managed entity.

3.33.BISUP Timers Profile

This managed entity provides timer settings for a BISUP Access Point managed entity.

Instances of this managed entity are created automatically by the ATM NE upon ATM NE initialization. Instances of this managed entity are also created and deleted by request of the managing system.

Attributes

Managed Entity ID: This attribute provides a unique name for the managed entity instance in the ATM NE. (R, Set-by-Create) (mandatory)

BISUP Timer Configuration (mandatory)

T1b: Await Release Complete (R, Set-by-Create.)

T4b: User Part Availability (R, Set-by-Create)

T7b: Await Address Complete (R, Set-by-Create)

T12b: Await Blocking Acknowledgment (R, Set-by-Create)

T14b: Await Unblocking Acknowledgment (R, Set-by-Create)

T16b: Await Reset Acknowledgment (R, Set-by-Create)

T17b: Repeat Reset (R, Set-by-Create)

T34b: Segmentation (for later use, not needed for BICI 2.0) (R, Set-by-Create)

T40b: Await IAM Acknowledgment (R, Set-by-Create)

T41b: Await Consistency Check Request Acknowledgment (R, Set-by-Create)

T42b: Await Consistency Check End Acknowledgment (R, Set-by-Create)

Actions

No actions have been defined for this managed entity.

Notifications

Managed Entity Creation: This notification is used to report the creation of an instance of this managed entity. (optional)

Managed Entity Deletion: This notification is used to report the deletion of an instance of this managed entity. (optional)

Relationships

Instances of this managed entity are contained within an ATM NE managed entity.

One instance of this managed entity is provided for each timer configuration to be used within the ATM NE.

Instances of this managed entity may be associated with zero, one or more instances of a BISUP Access Point managed entity by the Profile Pointer attribute in the associated managed entity.

3.34.Calling Line Identification Presentation Dependent

The Calling Line Identification Presentation Dependent managed entity provides the called party with the possibility of receiving identification of the calling party. In addition to the ISDN number, the calling line identity may include a subaddress generated by the calling user and transparently transported by the network. The network shall deliver the calling line identity to the called party during call establishment, regardless of the terminal capability to handle the information.

Instances of this managed entity are created and deleted by the request of the managing system.

Attributes

Managed Entity ID: This attribute provides a unique name for the managed entity instance in the ATM NE. (R, Set-by-Create) (mandatory)

Administrative State: This attribute is used to activate (unlock) and deactivate (lock) the calling line identification presentation function performed by this managed entity. (R, W) (mandatory)

No Restrictions Allowed: This attribute is used to provide the called party with the capability to override the CLIR restriction and have the calling party number presented as described in the CLIP supplementary service as defined in ITU-T Recommendation I.251.3. A TRUE value of this attribute permits the called party CLIP supplementary service to override the calling party CLIR supplementary service. (R, W) (mandatory)

Two Calling Party Number Delivery: This attribute indicates whether two calling party numbers have to be sent to the called party if two were received. (R, W) (optional)

Actions

No actions have been defined for this managed entity.

Notifications

State Change: This notification is used to report changes to the Administrative State attribute of this managed entity. The notification shall identify the state attribute that changed, its old value, and its new value. (mandatory)

Attribute Value Change: This notification is used to report changes to the attributes of this managed entity. The notification shall identify the attribute that changed, its old value, and its new value. (mandatory)

Managed Entity Creation: This notification is used to report the creation of an instance of this managed entity. (mandatory)

Managed Entity Deletion: This notification is used to report the deletion of an instance of this managed entity. (mandatory)

Relationships

Zero or one instance of this managed entity may exist for each instance of the ABR, CBR, UBR or VBR managed entity.

3.35.Calling Line Identification Restriction Dependent

The Calling Line Identification Restriction Dependent managed entity provides the calling party with the possibility to prevent presentation of the calling party's ISDN number, and subaddress information (if any) to the called party. If the called party subscribes to the CLIP Supplementary Service then the called party shall receive an indication that the calling party information is not available due to restriction.

Instances of this managed entity are created and deleted by request of the managing system.

Attributes

Managed Entity ID: This attribute provides a unique name for the managed entity instance in the ATM NE. (R, Set-by-Create) (mandatory)

Administrative State: This attribute is used to activate (unlock) and deactivate (lock) the calling line identification restriction function performed by this managed entity. (R, W) (mandatory)

Calling Line Identification Restriction Options: This attribute allows the subscriber to select the mode in which the calling line identification restriction is applied as described in ITU-T Recommendation I.251.4. Valid options for the mode are: ‘permanent’ to have the service active for all calls, or ‘temporary’ to have the service requested by the user per call. (R, W) (mandatory)

Actions

No actions have been defined for this managed entity.

Notifications

State Change: This notification is used to report changes to the Administrative State attribute of this managed entity. The notification shall identify the state attribute that changed, its old value, and its new value. (mandatory)

Attribute Value Change: This notification is used to report changes to the attributes of this managed entity. The notification shall identify the attribute that changed, its old value, and its new value. (mandatory)

Managed Entity Creation: This notification is used to report the creation of an instance of this managed entity. (mandatory)

Managed Entity Deletion: This notification is used to report the deletion of an instance of this managed entity. (mandatory)

Relationships

Zero or one instance of this managed entity may exist for each instance of the ABR, CBR, UBR or VBR managed entity.

3.36.Calling Number Screening

The Calling Number Screening managed entity identifies the characteristics used for the screening of the Calling Party Directory Number as described in ITU-T Recommendation Q.2951.3.

Instances of this managed entity are created and deleted by request of the managing system.

Attributes

Managed Entity ID: This attribute provides a unique name for the managed entity instance in the ATM NE. (R, Set-by-Create) (mandatory)

Screen Number: If the value of this Boolean attribute is TRUE, the switch will screen the directory number information for validity in case this information is provided on a call by the user equipment. (D=TRUE, R, W) (mandatory)

Default Directory Number: This attribute indicates the default directory number which is an agreed number between the user at the calling side and the network provider. (R, W) (mandatory)

Actions

No actions have been defined for this managed entity.

Notifications

Attribute Value Change: This notification is used to report changes to the attributes of this managed entity. The notification shall identify the attribute that changed, its old value, and its new value. (mandatory)

Managed Entity Creation: This notification is used to report the creation of an instance of this managed entity. (mandatory)

Managed Entity Deletion: This notification is used to report the deletion of an instance of this managed entity. (mandatory)

Relationships

One instance of this managed entity may exist for each instance of the DSS2 Access Signaling Channel Termination Point managed entity.

3.37.Call Routing Office Data

An instance of this managed entity defines routing related office (exchange) data.

One instance of this managed entity is created automatically by the ATM NE upon ATM NE initialization. Instances of this managed entity are deleted by request of the managing system.

Attributes

Managed Entity ID: This attribute provides a unique name for the managed entity instance in the ATM NE. (R, Set-by-Create) (mandatory)

Own International Code: International code of the exchange. (R, W) (mandatory)

Actions

No actions have been defined for this managed entity.

Notifications

Attribute Value Change: This notification is used to report changes to the attributes of this managed entity. The notification shall identify the attribute that changed, its old value, and its new value. (optional)

Managed Entity Creation: This notification is used to report the creation of an instance of this managed entity. (optional)

Managed Entity Deletion: This notification is used to report the deletion of an instance of this managed entity. (optional)

Relationships

One instance of this entity shall exist for each instance of the ATM NE managed entity.

3.38.Carrier Data

The Carrier Data managed entity describes information about carriers that may be used for traffic to a particular destination.

Instances of this managed entity are created and deleted by request of the managing system.

Attributes

Managed Entity ID: This attribute provides a unique name for the managed entity instance in the ATM NE. (R, Set-by-Create) (mandatory)

Carrier Code: Indicates the carrier access code (R, Set-by-Create) (mandatory)

Supported Call Types: Indicates the types of calls the carrier transports (e.g. intra-network, inter-network, international). (R, W, A/R) (optional)

Actions

No actions have been defined for this managed entity.

Notifications

Attribute Value Change: This notification is used to report changes to the attributes of this managed entity. The notification shall identify the attribute that changed, its old value, and its new value. (optional)

Managed Entity Creation: This notification is used to report the creation of an instance of this managed entity. (optional)

Managed Entity Deletion: This notification is used to report the deletion of an instance of this managed entity. (optional)

Relationships

Multiple instances of this managed entity may exist per instance of the ATM NE managed entity.

This managed entity may be related to Analysis Criteria managed entity through the Carrier Data pointer attribute of the Analysis Criteria managed entity.

3.39.CBR

The CBR managed entity represents the constant (deterministic) bit rate bearer service according to ATM Forum TM 4.0. If this service is used there exists a timing relation between sender and receiver.

Instances of this managed entity are created and deleted by request of the managing system.

Attributes

Managed Entity ID: This attribute provides a unique name for the managed entity instance in the ATM NE. (R, Set-by-Create) (mandatory)

Administrative State: This attribute is used to activate (unlock) and deactivate (lock) CBR service category performed by this managed entity. (R, W) (mandatory)

Customised Resource Pointer List: This is an attribute whose value(s) points to instances of the Customised Resource managed entity. This attribute is synchronised with the Bearer Service Pointer List attribute in the Customised Resource managed entity: when Bearer Service Pointer List in the associated instance of the Customised Resource managed entity is updated, the Customised Resource Pointer List is updated accordingly. (R, Default = empty set) (mandatory)

Actions

No actions have been defined for this managed entity.

Notifications

State Change: This notification is used to report changes to the Administrative State attribute of this managed entity. The notification shall identify the state attribute that changed, its old value, and its new value. (mandatory)

Attribute Value Change: This notification is used to report changes to the attributes of this managed entity. The notification shall identify the attribute that changed, its old value, and its new value. (mandatory)

Relationships

Zero or more instances of this managed entity may exist for each instance of the Customer Profile managed entity.

Zero or more instances of this managed entity are associated with zero or more instances of the Customised Resource managed entity by the Customised Resource Pointer List attribute.

This managed entity is related to CUG Independent managed entity through the Service Pointer List attribute of the CUG Independent managed entity.

3.40.CES Service Profile

An instance of this managed entity is a support managed entity used to organize data that describes the CES Service functions of the ATM NE.

Instances of this managed entity are created and deleted by request of the managing system.

Attributes

Managed Entity ID: This attribute provides a unique name for the managed entity instance in the ATM NE. (R, Set-by-Create) (mandatory)

CES Buffered CDV Tolerance: This attribute represents the duration of user data that must be buffered by the CES interworking entity to offset cell delay variation. This timing will be in 10 micro seconds increment. The default value for DS1 CES is 750 seconds and 1000 micro seconds for DS3 CES. (R, W) (mandatory)

Channel Associated Signaling: This attribute selects which AAL1 format should be used. It applies to structured interfaces only. For unstructured interfaces this value , if present, must be set to the default of basic. The valid values are basic, e1Cas, SfCas, ds1EsfCas, j2Cas. (R, W) (mandatory)

Actions

No actions have been defined for this managed entity.

Notifications

Attribute Value Change: This notification is used to report changes to the attributes of this managed entity (except the Managed Entity ID attribute). The notification shall identify the attribute that changed, its old value, and its new value. (optional)

Managed Entity Creation: This notification is used to report the creation of an instance of this managed entity. (optional)

Managed Entity Deletion: This notification is used to report the deletion of an instance of this managed entity. (optional)

Relationships

Zero or more instances of this managed entity shall be contained in the ATM NE managed entity.

Once instance of this managed entity may be associated to zero or more instances of the Interworking VCC Termination Point

3.41.Congestion Discard Current Data

An instance of this managed entity is used to collect and report data associated with congestion-based cell discards performed by the ATM NE at its interfaces.

Instances of this managed entity are created automatically and deleted by the ATM NE for individual UNI, BICI and BISSI managed entities.

Attributes

Managed Entity ID: This attribute provides a unique name for the managed entity instance in the ATM NE. (R, Set at Creation) (mandatory)

Administrative State: This attribute is used to activate (unlock) and deactivate (lock) the data collection function performed by this managed entity. (R, W) (mandatory)

Suspect Flag: This attribute indicates the reliability of the current UPC/NPC Disagreement data collected by the managed entity. This attribute may take on one of two possible values: reliable and unreliable (suspect). (R) (optional)

Elapsed Time: This attribute represents the difference between the current time and the start time of the present summary interval. (R) (mandatory)

Threshold Data ID: This attribute provides a pointer to an instance of the Threshold Data managed entity that contains the threshold values for the performance monitoring data collected by this managed entity. (R, W) (mandatory)

Number Of Suppressed Intervals: This attribute is present only if the ATM NE is suppressing UPC/NPC Disagreement Monitoring History Data creation when the current interval terminates with "all-zeroes" performance measurements. (R) (optional)

All Cells Discarded: This attribute provides a raw, thresholded count of the number of cells, with either CLP =0 or CLP =1, discarded due to congestion. (R, S=D, D=0) (mandatory)

Priority Cells Discarded: This attribute provides a raw, thresholded count of the number of cells with CLP=0 discarded due to congestion. (R, S=D, D=0) (mandatory)

Actions

No actions have been defined for this managed entity.

Notifications

Threshold Crossing Alert: This message is used to notify the management system when the value of the above count exceeds a pre-set threshold. The following information shall be supplied with this notification: (optional)

- The ID of the Managed Entity Reporting the Threshold Crossing Alert
- The Type of Performance Parameter that Exceeded the Threshold

Relationships

One instance of this managed entity may exist for each instance of the UNI, BICI and BISSI managed entities.

3.42.Congestion Discard History Data

This managed entity contains all the previous congestion discard data for a specific ATM NE that is produced as a result of forming Congestion Discard Current Data.

Measurement attributes in the History Data managed entity are an exact copy of the attributes in the corresponding Current Data managed entity at the end of the interval. The time at the end of the interval is indicated by the value of the attribute "Period End Time."

Instances of this managed entity are created automatically by the ATM NE. Instances of this managed entity are deleted by the ATM NE or by request of the managing system.

Attributes

Managed Entity ID: This attribute provides a unique name for the managed entity instance in the ATM NE. (R, Set at Creation) (mandatory)

Period End Time: This attribute records the time at the end of the interval. (R) (mandatory)

Suspect Flag: This attribute indicates the reliability of the performance monitoring data collected by the managed entity. This attribute may take on one of two possible values: reliable and unreliable (suspect). (R) (optional)

Number Of Suppressed Intervals: This attribute is present only if the ATM NE is suppressing UPC/NPC Disagreement Monitoring History Data creation when the current interval terminates with "all-zeroes" performance measurements. (R) (optional)

All Cells Discarded: This attribute provides a count of the number of cells, with either CLP =0 or CLP =1, discarded due to congestion. (R) (mandatory)

Priority Cells Discarded: This attribute provides a raw, thresholded count of the number of cells with CLP=0 discarded due to congestion. (R) (mandatory)

Actions

No actions have been defined for this managed entity.

Notifications

No notifications have been defined for this managed entity.

Relationships

A new instance of this entity is created at the end of each 15 minute interval for each current data object. This managed entity will create a copy of the performance management attributes that are present in the associated current data managed entity at the end of the 15 minute interval. From zero to thirty-two instances of this managed entity shall be supported for each current data managed entity.

3.43.Connected Line Identification Presentation Dependent

The Connected Line Identification Presentation Dependent managed entity provides the calling party with the possibility of receiving identification of the connected party.

Instances of this managed entity are created and deleted by request of the managing system.

Attributes

Managed Entity ID: This attribute provides a unique name for the managed entity instance in the ATM NE. (R, Set-by-Create) (mandatory)

Administrative State: This attribute is used to activate (unlock) and deactivate (lock) the connected line identification presentation function performed by this managed entity. (R, W) (mandatory)

No COLP Restrictions Allowed: This attribute is used to provide the calling party with the capability to override the COLR restriction and have the connected party number presented as described in the COLP supplementary service. A TRUE value of this attribute permits the called party COLP supplementary service to override the calling party COLR supplementary service. (R, W) (mandatory)

Actions

No actions have been defined for this managed entity.

Notifications

State Change: This notification is used to report changes to the Administrative State attribute of this managed entity. The notification shall identify the state attribute that changed, its old value, and its new value. (mandatory)

Attribute Value Change: This notification is used to report changes to the attributes of this managed entity. The notification shall identify the attribute that changed, its old value, and its new value. (mandatory)

Managed Entity Creation: This notification is used to report the creation of an instance of this managed entity. (mandatory)

Managed Entity Deletion: This notification is used to report the deletion of an instance of this managed entity. (mandatory)

Relationships

Zero or one instance of this managed entity may exist for each instance of the ABR, CBR, UBR or VBR managed entity.

3.44.Connected Line Identification Restriction Dependent

The Connected Line Identification Restriction Dependent managed entity provides the called party with the possibility to prevent presentation of the connected party's ISDN number, and subaddress information (if any) to the calling party.

Instances of this managed entity are created and deleted by request of the managing system.

Attributes

Managed Entity ID: This attribute provides a unique name for the managed entity instance in the ATM NE. (R, Set-by-Create) (mandatory)

Administrative State: This attribute is used to activate (unlock) and deactivate (lock) the connected line identification restriction function performed by this managed entity. (R, W) (mandatory)

Connected Line Identification Restriction Options: This attribute allows the subscriber to select the mode in which the connected line identification restriction is applied. Valid options for the mode are: ‘permanent’ to have the service active for all calls, or ‘temporary’ to have the service requested by the user per call. (R, W) (mandatory)

Actions

No actions have been defined for this managed entity.

Notifications

State Change: This notification is used to report changes to the Administrative State attribute of this managed entity. The notification shall identify the state attribute that changed, its old value, and its new value. (mandatory)

Attribute Value Change: This notification is used to report changes to the attributes of this managed entity. The notification shall identify the attribute that changed, its old value, and its new value. (mandatory)

Managed Entity Creation: This notification is used to report the creation of an instance of this managed entity. (mandatory)

Managed Entity Deletion: This notification is used to report the deletion of an instance of this managed entity. (mandatory)

Relationships

Zero or one instance of this managed entity may exist for each instance of the ABR, CBR, UBR or VBR managed entity.

3.45.Connected Number Screening

The Connected Number Screening managed entity identifies characteristics used for the screening of the Connected Line Directory Number as described in ITU-T Recommendation Q.2951.5.

Instances of this managed entity are created and deleted by request of the managing system.

Attributes

Managed Entity ID: This attribute provides a unique name for the managed entity instance in the ATM NE. (R, Set-by-Create) (mandatory)

Screen Number: If the value of this Boolean attribute is TRUE, the switch will screen the directory number information for validity in case this information is provided on a call by the user equipment. (D=TRUE, R, W) (mandatory)

Default Directory Number: This attribute indicates the default directory number which is an agreed number between the user at the calling side and the network provider. (R, W) (mandatory)

Actions

No actions have been defined for this managed entity.

Notifications

Attribute Value Change: This notification is used to report changes to the attributes of this managed entity. The notification shall identify the attribute that changed, its old value, and its new value. (mandatory)

Managed Entity Creation: This notification is used to report the creation of an instance of this managed entity. (mandatory)

Managed Entity Deletion: This notification is used to report the deletion of an instance of this managed entity. (mandatory)

Relationships

One instance of this managed entity may exist for each instance of the DSS2 Access Signaling Channel Termination Point managed entity.

3.46.CUG Independent

The CUG Independent (Closed User Group Independent) managed entity is used to store the closed user group general subscription options specified by ITU-T Recommendation Q.2955.1. An instance of this managed entity may exist for each Closed User Group the user belongs to.

An instance of this managed entity can only be deleted, if it is not referenced by a CUG Subscription Option Dependent managed entity.

Instances of this managed entity are created and deleted by request of the managing system.

Attributes

Managed Entity ID: This attribute provides a unique name for the managed entity instance in the ATM NE. (R, Set-by-Create) (mandatory)

Administrative State: This attribute is used to activate (unlock) and deactivate (lock) the functions of the managed entity. (R, W) (mandatory)

CUG Index: The CUG Index of general subscription option as described in ITU-T Recommendation Q.2955.1 must be explicitly assigned upon object creation. No two instances of the CUG Independent managed entity contained within a single instance may have identical values for attribute CUG Index. (R) (mandatory)

CUG Interlock Code: This attribute must be assigned explicitly upon instance creation. No multiple instances of the CUG Independent managed entity contained within a single instance are allowed to have identical combinations of attribute CUG Interlock Code and CUG Data Network Identification. (R) (mandatory)

CUG Data Network Identification: This attribute contains the data network identification which is signalled during set-up of a CUG call and serves (in conjunction with the CUG Interlock Code) to uniquely identify the CUG in the international network. It can be thought of as the area code of the CUG. (R) (mandatory)

CUG Barring: This attribute maintains the Intra-CUG restriction of the general subscription options in ITU-T Recommendation Q.2955.1. Valid values are: ‘none’, ’incoming calls barred’ or ‘outgoing calls barred’. When the value of CUG Barring is ‘outgoing calls barred’, this CUG must not be a preferential CUG (denoted by Preferred CUG Index in CUG Subscription Option Dependent managed entity). (R, W) (mandatory)

Customised Resource Pointer List: This attribute’s value(s) points to instances of the Customised Resources managed entity. This attribute is synchronised with the Supplementary Service Independent Pointer List attribute in the Customised Resource managed entity: when Supplementary Service Independent Pointer List in the associated instance of the Customised Resource managed entity is updated, the Customised Resource Pointer is updated accordingly. The Customised Resource Pointer List and the Service Pointer List attributes can only be used mutually exclusive. This means that one of them has to be empty. (R) (mandatory)

Service Pointer List: This attribute points to instances of the Bearer Service managed entity e.g. ABR, CBR, UBR, VBR. (R, W, A/R) (mandatory)

Actions

No actions have been defined for this managed entity.

Notifications

State Change: This notification is used to report changes to the Administrative State attribute of this managed entity. The notification shall identify the state attribute that changed, its old value, and its new value. (mandatory)

Attribute Value Change: This notification is used to report changes to the attributes of this managed entity. The notification shall identify the attribute that changed, its old value, and its new value. (mandatory)

Managed Entity Creation: This notification is used to report the creation of an instance of this managed entity. (mandatory)

Managed Entity Deletion: This notification is used to report the deletion of an instance of this managed entity. (mandatory)

Relationships

Zero or more instances of this managed entity may exist for each instance of the Customer Profile managed entity.

Zero or one instance of this managed entity is associated with zero or more instances of the ABR, CBR, UBR, VBR managed entities by the Service Pointer List attribute or zero or more instances of this managed entity are associated with zero or more instances of the Customised Resource managed entity by the Customised Resource Pointer List attribute.

3.47.CUG Subscription Option Dependent

The CUG Subscription Option Dependent managed entity is used to store the specific characteristics of each CUG of a user. This managed entity shall be instantiated for each CUG of a user if specific characteristics exist.

Instances of this managed entity are created and deleted by request of the managing system.

Attributes

Managed Entity ID: This attribute provides a unique name for the managed entity instance in the ATM NE. (R, Set-by-Create) (mandatory)

Administrative State: This attribute is used to activate (unlock) and deactivate (lock) CUG subscription option function performed by this managed entity. (R, W) (mandatory)

Preferred CUG Index: This attribute indicates the index of the preferred CUG. Valid values are: 'null' or 'CUG index'. The value of attribute Preferred CUG Index should not be 'null' when Inter CUG Value is 'none' or 'incoming access'. (R, W) (mandatory)

Inter CUG Access: This attribute provides an inter CUG access of per service subscription option as described in ITU-T Recommendation Q.2955.1. Valid values are: 'none', 'outgoing permanent access', 'outgoing per call access', 'incoming access', 'outgoing permanent and incoming access', 'outgoing per call and incoming access'. (R, W) (mandatory)

Actions

No actions have been defined for this managed entity.

Notifications

State Change: This notification is used to report changes to the Administrative State attribute of this managed entity. The notification shall identify the state attribute that changed, its old value, and its new value. (mandatory)

Attribute Value Change: This notification is used to report changes to the attributes of this managed entity. The notification shall identify the attribute that changed, its old value, and its new value. (mandatory)

Managed Entity Creation: This notification is used to report the creation of an instance of this managed entity. (mandatory)

Managed Entity Deletion: This notification is used to report the deletion of an instance of this managed entity. (mandatory)

Relationships

Zero or more instances of this managed entity may exist for each instance of the ABR, CBR, UBR or VBR managed entity.

3.48.Customer Profile

This managed entity represents a single point of reference used to bind together a range of services and resources for customer administration purposes. It represents the characteristics of the Directory Number(s) assigned to an individual subscriber, independent of the access type and bearer service. Each instance of the Customer Profile managed entity includes a Directory Number Pointer List attribute that represents the Directory Number(s) assigned to the Customer Profile managed entity and an Access Pointer List attribute that represents Access(es) also assigned to the Customer Profile managed entity.

Instances of other managed entities which are related through direct or indirect containment or by a direct pointer relationship with a the Customer Profile managed entity instance can not be related in the same way to a different Customer Profile managed entity.

Instances of this managed entity are created and deleted by request of the managing system.

Attributes

Managed Entity ID: This attribute provides a unique name for the managed entity instance in the ATM NE. (R, Set-by-Create) (mandatory)

Access Pointer List: This attribute is pointing to instances of a logical access managed entity, e.g. a DSS2 Access Signaling Channel Termination Point. (R, W, A/R) (mandatory)

Directory Number Pointer List: This attribute points to instances of managed entities representing a directory number, e.g. the Directory Number E.164 managed entity. More than one entry in this list is allowed only if an instance of Multiple Subscriber Number Independent managed entity is contained in this Customer Profile. (R, W, A/R) (mandatory)

Directory Number Pointer: This is a pointer attribute pointing to an instance of a managed entity representing a directory number, e.g. the Directory Number E.164 or Directory Number AESA managed entities. (R, W, A/R) (mandatory)

Directory Number Pointer List: This attribute is used as a pointer to instances of managed entities representing a directory number, e.g. the Directory Number E.164 and/or Directory Number AESA managed entities. (R, W, A/R) (mandatory)

Actions

No actions have been defined for this managed entity.

Notifications

No notifications have been defined for this managed entity.

Relationships

Multiple instances of this managed entity may exist per instance of the ATM NE managed entity.

Each instance of this managed entity may be related to zero or more instances of Directory Number E.164 managed entity through the pointer attribute Directory Number Pointer List.

Each instance of this managed entity may be related to zero or more instances of DSS2 Access Signaling Channel Termination Point managed entity through the pointer attribute Access Pointer List.

3.49.Customised Resource

The Customised Resource managed entity is a managed entity that represents the service provisioning for a subscriber. It allows association of a set of services and/or one User Data managed entity to a directory number.

When no Customised Resource managed entities are contained in a Customer Profile managed entity, then all services and user data contained in this Customer Profile managed entity are applicable to all directory numbers associated with this managed entity.

If one or more Customised Resource managed entities are contained in a Customer Profile managed entity, then only those services / user data (contained in this Customer Profile managed entity) are applicable to a certain directory number (associated with the Customer Profile managed entity) which are explicitly associated to this directory number managed entity using a Customised Resource managed entity.

Instances of this managed entity are created and deleted by request of the managing system.

Attributes

Managed Entity ID: This attribute provides a unique name for the managed entity instance in the ATM NE. (R, Set-by-Create) (mandatory)

Bearer Service Pointer List: This attribute references multiple bearer services (service categories). (R, W, A/R) (mandatory)

Supplementary Service Independent Pointer List: This is a set-valued attribute whose value(s) points to instances of managed entities representing an independent supplementary service, e.g. CUG Independent. (R, W, A/R) (mandatory)

User Data Pointer: This attribute describes a single pointer to an instance of the User Data managed entity. (R, W) (mandatory)

Directory Number Pointer: This is a pointer attribute pointing to an instance of a managed entity representing a directory number, e.g. the Directory Number E.164 or Directory Number AESA managed entities. (R, W, A/R) (mandatory)

Actions

No actions have been defined for this managed entity.

Notifications

No notifications have been defined for this managed entity.

Relationships

Multiple instances of this managed entity may exist per instance of the Customer Profile managed entity.

One or more instances of this managed entity may be related with one instance of the User Data managed entity through the pointer attribute User Data Pointer.

Each instance of this managed entity may be related with one instance of the Directory Number E.164 or Directory Number AESA managed entity through the pointer attribute Directory Number Pointer.

3.50.Diagnostic Control

This entity specifies the type of diagnostic routine to be performed on a set of managed entities. Diagnostic tests may be scheduled using a separate scheduling entity or they may be initiated by a management request. At the end of each scheduled diagnostic, a notification will be emitted from the Diagnostic Control managed entity to report the result of the diagnostic.

Instances of this managed entity are created and deleted by request of the managing system, but they must refer to the type of diagnostic supported by the ATM NE.

Attributes

Managed Entity ID: This attribute provides a unique name for the managed entity instance in the ATM NE. (R, Set-by-Create) (mandatory)

Diagnostic Managed Entity List: This attribute specifies a list of managed entity instances for which diagnostics are supported and which are to be diagnosed. (R, W) (mandatory)

Diagnostic Terminate Mode: This attribute specifies how a diagnostic will terminate in the event that a failure result occurs in one of the diagnostic phases. Valid modes are Normal mode and Immediate mode. (R, W) (mandatory)

- Normal Terminate Mode: The diagnostic will try to complete, if possible, the entire set of specified phases and iterations regardless of any failed phases encountered on that object.
- Immediate Terminate Mode: The diagnostic will skip the remaining phases if failure occurs on that object.

Diagnostic Report Mode: This read/write attribute specifies how to report the result of a failed diagnostic. Valid report modes are Summary mode and Detailed mode. (R, W) (mandatory)

- Summary Report Mode: If an managed entity failed in one or more phases, only an overall indication of failure will be reported for that object.
- Detailed Report Mode: If an managed entity failed in one or more phases, the phases in which failure occurs will also be reported (non-reported phases imply pass).

Diagnostic Type: This read/write attribute specifies the type of the diagnostic routine to be performed on an instance. It may also specify the phases and number of iterations for each phase to be run. Diagnostic test types may be locally defined or may be globally available standardized test types. (R, W) (mandatory)

Actions

Abort Diagnostic: If supported by the ATM NE, this service is used by a managing system to abort a currently active (running) diagnostic on one or more managed entities. (optional)

Invoke Diagnostic Control: This service is used by a managing system to “stimulate” the Diagnostic Control managed entity to perform a diagnostic on a set of managed entities. (mandatory)

Report Diagnostic Status: If supported by the ATM NE, this service is used by a management system to report the status of a supposedly active (running) diagnostic test on one or more managed entities. The status will be reported as “running”, “not running”, or “stalled.” Optionally a current (partial) diagnostic report may be requested. The form of this report will be that specified by the Diagnostic Report Mode attribute. (optional)

Attribute Value Change: This notification is used to report changes to the attributes of this managed entity (except the Managed Entity ID attribute). The notification shall identify the attribute that changed, its old value, and its new value. (optional)

Managed Entity Creation: This notification is used to report the creation of an instance of this managed entity. (optional)

Managed Entity Deletion: This notification is used to report the deletion of an instance of this managed entity. (optional)

Notifications

Scheduled Diagnostic Report: This message is emitted periodically from the Diagnostic Control managed entity to report the result of the periodic diagnostic performed on entities specified in Diagnostic Control. If the currently running diagnostic process is aborted before the completion of the diagnostic, then the value 'aborted' shall be returned in the parameter of the notification. (optional)

Relationships

One instance of this managed entity shall exist for each diagnostic test configured by a managing system.

3.51.Digit Manipulation

Instances of this managed entity define rules to manipulate a digit string as a result of the digit analysis process or for the manipulation of the digit string to be forwarded to an adjacent exchange. Digit manipulation rules may suppress digits, replace digits or insert digits to a received digit string.

Instances of this managed entity are created and deleted by request of the managing system.

Attributes

Managed Entity ID: This attribute provides a unique name for the managed entity instance in the ATM NE. (R, Set-by-Create) (mandatory)

Digit Suppress: Defines which sequence of digits needs to be suppressed. (R, W, A/R) (optional)

Digit Comb Insert: Defines which sequence of digits needs to be inserted and where. (R, W, A/R) (optional)

Digit Comb Replace: Defines which sequence of digits needs to be replaced and by what. (R, W, A/R) (optional)

Destination Type: Indicates the nature of the address of the new digit string. (R, Set-by-Create) (optional)

Actions

No actions have been defined for this managed entity.

Notifications

Attribute Value Change: This notification is used to report changes to the attributes of this managed entity. The notification shall identify the attribute that changed, its old value, and its new value. (optional)

Managed Entity Creation: This notification is used to report the creation of an instance of this managed entity. (optional)

Managed Entity Deletion: This notification is used to report the deletion of an instance of this managed entity. (optional)

Relationships

Multiple instances of this managed entity may exist per instance of the ATM NE managed entity.

This managed entity is related Analysis Criteria managed entity through the Active Target pointer attribute of the Analysis Criteria managed entity and may be related to Route Data managed entity through the Digit Manipulation Pointer pointer attribute of the Route Data managed entity.

3.52.Direct Dialing In Independent

The Direct Dialing In Independent managed entity enables a user to call directly via a public ISDN to a user on a private ISDN by use of the public ISDN numbering plan as described in ITU RecommendationQ.2951.1.

Instances of this managed entity are created and deleted by request of the managing system.

Attributes

Managed Entity ID: This attribute provides a unique name for the managed entity instance in the ATM NE. (R, Set-by-Create) (mandatory)

Administrative State: This attribute is used to activate (unlock) and deactivate (lock) the functions of the managed entity. (R, W) (mandatory)

Called Party Number Representation Type: This attribute specifies the format (nature of address) of the called party number to be delivered to the called party. (R, W) (mandatory)

Number Of Digits Not To Transmit: This attribute specifies the number of digits to be stripped out of the original dialled number before it is delivered to the private exchange for the direct dialled in supplementary service as described in ITU-T Recommendation I.252.1. (R, W) (optional)

Actions

No actions have been defined for this managed entity.

Notifications

State Change: This notification is used to report changes to the Administrative State attribute of this managed entity. The notification shall identify the state attribute that changed, its old value, and its new value. (mandatory)

Attribute Value Change: This notification is used to report changes to the attributes of this managed entity. The notification shall identify the attribute that changed, its old value, and its new value. (mandatory)

Managed Entity Creation: This notification is used to report the creation of an instance of this managed entity. (mandatory)

Managed Entity Deletion: This notification is used to report the deletion of an instance of this managed entity. (mandatory)

Relationships

Zero or one instance of this managed entity may exist for each instance of the Customer Profile managed entity.

3.53.Directory Number AESA

The Directory Number AESA managed entity represents an ATM end-system address (AESA) based on ISO NSAP according to ATM Forum UNI 4.0 Signaling Specification.

The attributes Customer Profile Pointer and Customised Resource Pointer List are synchronized with Directory Number Pointer List in the Customer Profile managed entity and with the Directory Number Pointer List in the Customised Resource managed entity, respectively. For example, when Directory Number Pointer List in the associated instance of the Customer Profile managed entity is updated, the Customer Profile Pointer is updated accordingly.

Instances of this managed entity are created and deleted by request of the managing system.

Attributes

Managed Entity ID: This attribute provides a unique name for the managed entity instance in the ATM NE. (R, Set-by-Create) (mandatory)

Administrative State: This attribute is used to activate (unlock) and deactivate (lock) the functions of the managed entity. (R, W) (mandatory)

AESA Directory Number: This attribute represents an ATM end-system address (AESA) based on ISO NSAP according to ATM Forum UNI 4.0 Signaling Specification. The AESA Directory Number is a single-valued, attribute, set only at creation time. The AESA Directory Number is updated implicitly if the attribute values of the referenced localDestination object are modified. (R, Set-by-Create) (mandatory)

Customised Resource Pointer: This is a pointer attribute pointing to an instance of the Customised Resource managed entity. This attribute is synchronized with the Directory Number Pointer attribute in the Customised Resource managed entity: when Directory Number Pointer in the associated instance of the Customised Resource managed entity is updated, the Customised Resource Pointer is updated accordingly. (R) (mandatory)

Customer Profile Pointer: This attribute is used as a pointer to an instance of the Customer Profile managed entity. The attribute value is null if no directory number is assigned to the Customer Profile. This attribute is synchronized with the Directory Number Pointer List attribute in the Customer Profile managed entity: when Directory Number Pointer List in the associated instance of the Customer Profile managed entity is updated, the Customer Profile Pointer is updated accordingly. (R) (mandatory)

Local Destination Pointer: This attribute describes the pointer to Local Destination. The initial digit string part of the AESA Directory Number (or the subscriber number part of the E.164 number) shall match with one of the Initial Subscriber Codes of the referenced managed entity instance. The AESA Directory Number shall not be excluded by one of the Excluded Subscriber Codes from the referenced managed entity. (R) (mandatory)

Actions

No actions have been defined for this managed entity.

Notifications

Attribute Value Change: This notification is used to report changes to the attributes of this managed entity. The notification shall identify the attribute that changed, its old value, and its new value. (mandatory)

Managed Entity Creation: This notification is used to report the creation of an instance of this managed entity. (mandatory)

Managed Entity Deletion: This notification is used to report the deletion of an instance of this managed entity. (mandatory)

State Change: This notification is used to report changes to the Administrative State attribute of this managed entity. The notification shall identify the state attribute that changed, its old value, and its new value. (mandatory)

Relationships

Multiple instances of this managed entity may exist per instance of the ATM NE managed entity.

One or more instances of this managed entity may be related to one instance of the Customer Profile managed entity through the pointer attribute Customer Profile Pointer.

Each instance of this managed entity may be related to one instance of the Customised Resource managed entity through the pointer attribute Customised Resource Pointer.

3.54.Directory Number E.164

The Directory Number E.164 managed entity represents directory numbers belonging to the numbering plan of the ISDN era as defined in CCITT RecommendationE.164.

Instances of this managed entity are created and deleted by request of the managing system.

Attributes

Managed Entity ID: This attribute provides a unique name for the managed entity instance in the ATM NE. (R, Set-by-Create) (mandatory)

Administrative State: This attribute is used to activate (unlock) and deactivate (lock) the functions of the managed entity. (R, W) (mandatory)

E.164 Directory Number: This attribute represents directory numbers belonging to the Numbering Plan for the ISDN Era defined in E.164. The E.164 Directory Number is a single-valued, attribute, set only at creation time. The E.164 Directory Number is updated implicitly if the attribute values of the referenced Local Destination managed entity are modified. (R, Set-by-Create) (mandatory)

Customised Resource Pointer: This is a pointer attribute pointing to an instance of the Customised Resource managed entity. This attribute is synchronized with the Directory Number Pointer attribute in the Customised Resource managed entity: when Directory Number Pointer in the associated instance of the Customised Resource managed entity is updated, the Customised Resource Pointer is updated accordingly. (R) (mandatory)

Customer Profile Pointer: This attribute is used as a pointer to an instance of the Customer Profile managed entity. The attribute value is null if no directory number is assigned to the Customer Profile. This attribute is synchronized with the Directory Number Pointer List attribute in the Customer Profile managed entity: when Directory Number Pointer List in the associated instance of the Customer Profile managed entity is updated, the Customer Profile Pointer is updated accordingly. (R) (mandatory)

Local Destination Pointer: This attribute describes the pointer to Local Destination. The Directory Number E.164 shall be member of the local area defined by the Local Area Code, and the initial digit string part of the subscriber number part of the E.164 Directory Number shall match with one of the Initial Subscriber Codes of the referenced managed entity instance. The Directory Number E.164 shall not be excluded by one of the Excluded Subscriber Codes from the referenced managed entity. (R) (mandatory)

Actions

No actions have been defined for this managed entity.

Notifications

Attribute Value Change: This notification is used to report changes to the attributes of this managed entity. The notification shall identify the attribute that changed, its old value, and its new value. (mandatory)

Managed Entity Creation: This notification is used to report the creation of an instance of this managed entity. (mandatory)

Managed Entity Deletion: This notification is used to report the deletion of an instance of this managed entity. (mandatory)

State Change: This notification is used to report changes to the Administrative State attribute of this managed entity. The notification shall identify the state attribute that changed, its old value, and its new value. (mandatory)

Relationships

Multiple instances of this managed entity may exist per instance of the ATM NE managed entity.

One or more instances of this managed entity may be related with one instance of the Customer Profile managed entity through the pointer attribute Customer Profile Pointer.

Each instance of this managed entity may be related with one instance of the Customised Resource managed entity through the pointer attribute Customised Resource Pointer.

3.55.DSS2 Access Signaling Channel Termination Point

Provides information about the configuration of an ATM VCC as an access signaling channel, and provides notifications needed for management of the signaling channel. All signaling channels use a default of VCI =5.

Instances of this managed entity are created and deleted by request of the managing system.

Attributes

Managed Entity ID: This attribute provides a unique name for the managed entity instance in the ATM NE. (R, Set-by-Create) (mandatory)

Version: Version of signaling supported on the associated signaling channel. Possible versions are listed below. (R, Set-by-Create) (mandatory)

- ATM Forum 3.0
- ATM Forum 3.1
- ATM Forum 4.0
- ITU-T DSS2 (1995)

VPCIs and VPs: Lists of the VPCIs with pointers to VPC Termination Points controlled by the signaling channel. Unless otherwise set by the management system, VPCI =VPI. (R, A/R) (mandatory)

Protocol Pointer: Points to instance of SAAL UNI Protocol Profile managed entity that provides information on the SSCOP and SSCF-UNI protocol parameter settings for the signaling channel (R, Set-by-Create) (mandatory)

Signaling Data Link Pointer: Points to Signaling VCC Termination Point managed entity associated with the access signaling channel. (R, Set-by-Create) (mandatory)

Administrative State: Allows the SSCOP, ,SSCF, and DSS2 functions of individual signaling channels to be activated (unlocked) or deactivated (locked). (R, W) (mandatory)

Operational State: Indicates if the SSCOP, SSCF, and DSS2 functions of the access signaling channel are enabled (available for service) or disabled (not available for service (R) (mandatory)

Alarm Status: Indicates highest level outstanding alarm (or “cleared”) that applies to the SSCOP, SSCF, and DSS2 levels of the access signaling channel. (R) (mandatory)

Current Problem List: The Current Problem List attribute type identifies the current existing problems, with severity, associated with the SSCOP, SSCF, and DSS2 functions of the access signaling channel. (R) (mandatory)

Alarm Severity Assignment Profile Pointer: This attribute identifies an associated Alarm Severity Assignment Profile managed entity. (R, W) (mandatory)

Configuration of Access Signaling Features (optional)

Supported Features: List of supported features for the access signaling channel, including the following (R, A/R, Default = {})

- Broadband High Layer Information transfer (BHLIxfer)
- Broadband Low Layer Information transfer (BLLIxfer)
- Broadband Low Layer Information Selection (BLLIsel)
- AAL Parameters Transfer

Customer Profile Pointer: This attribute is used as a pointer to an instance of the Customer Profile managed entity. This attribute is synchronized with the Access Pointer List attribute in the Customer Profile managed entity: when

Access Pointer List in the associated instance of the Customer Profile managed entity is updated, the Customer Profile Pointer is updated accordingly. (R, Default = NULL) (mandatory)

Address Presentation Format: This attribute identifies the address format supported by the VPs, which are controlled by the signaling channel. Possible values are native E.164, AESA (according to ATM Forum UNI 4.0), or both. (R, A/R, Default = both formats) (mandatory)

Connection Identification Offering: This attribute indicates which procedure is used for the selection of VPCI and VCI at the destination UNI. Valid values are 'exclusive VPCI, exclusive VCI', 'exclusive VPCI, any VCI, and 'no indication'. (R, W, D= 'exclusive VPCI, exclusive VCI') (mandatory)

Actions

Restart SVCs: The ATM NE should restart all SVCs of the UNI under the control of the associated signaling channel. (mandatory)

Notifications

Alarm: (mandatory) This message is used to notify the management system when the following events occur or the failure is cleared:

- SSCOP Failure: Sent if the SSCOP connection fails or a failure is cleared. (optional)
- Restart: Sent if an SVC associated with the signaling channel is not properly released, and cannot be automatically restarted. (mandatory)

The following parameters shall be supplied with this notification:

- The Nature of the Alarm (i.e., see generic trouble list) (mandatory)
- Specific Problems (optional)
- The ID of the Managed Entity Reporting the Alarm (mandatory)
- The Failed Switch Component or List of Failed (or Possibly Failed) Components (optional)
- Back-up Status
  This is a Boolean indication as to whether or not the failed entity has been backed-up. (optional)
- Back-up Entity
  This is the ID of the managed entity providing back-up services to the failed entity. This parameter shall be NULL when the value of the "Back-up Status" parameter is *false.* (optional)
- Severity of Failure (critical, major, minor, warning, indeterminate, and cleared) (mandatory)
- Additional Information (optional)
- Proposed Repair Actions (optional)
- Time and Date Failure was Detected (mandatory)

State Change Notification: Sent if value of administrative or operational state changes. (mandatory)

Attribute Value Change: This notification is used to report changes to the attributes of this managed entity (except the Managed Entity ID attribute). The notification shall identify the attribute that changed, its old value, and its new value. (optional)

Managed Entity Creation: This notification is used to report the creation of an instance of this managed entity. (optional)

Managed Entity Deletion: This notification is used to report the deletion of an instance of this managed entity. (optional)

Relationships

One instance of the DSS2 Access Signaling Channel Termination Point managed entity is provided for each managed access signaling channel. It is associated with one Signaling VCC Termination Point by the Signaling Data Link Pointer attribute.

DSS2 Access Signaling Channel Termination Point managed entities are contained in an ATM NE managed entity instance.

Each instance of this managed entity is associated with one instance of an SAAL UNI Protocol Profile managed entity by the Protocol Pointer attribute.

Each instance of this managed entity is associated with zero, one or more instances or a VPC Termination Point managed entity by the VPCIs and VPs attribute.

3.56.Equipment

This managed entity is used to represent the various externally manageable physical components of the ATM NE that are not modeled via the Plug-in Unit or Equipment Holder managed entity.

An instance of this managed entity is created automatically by the ATM NE upon initialization/installation of the externally manageable physical component in the ATM NE. Instances of this managed entity are also created and deleted by request of the managing system.

Attributes

Managed Entity ID: This attribute provides a unique name for the managed entity instance in the ATM NE. (R, Set-by-Create) (mandatory)

Administrative State: This attribute is used to activate (unlock) and deactivate (lock) the function performed by the ATM NE component. This attribute may not be present in all instances of this managed entity. (R, W) (optional)

Location Name: This attribute identifies the specific or general location of the ATM NE component. (R, W) (mandatory)

Operational State: This attribute identifies whether or not the ATM NE component is capable of performing its normal functions (i.e., in-service or out-of-service). (R) (mandatory)

Vendor Name: This attribute identifies the vendor of the ATM NE component. (R) (optional)

Version: This attribute identifies the version of the ATM NE component. (R) (mandatory)

User Label: This attribute is used to assign a user friendly name to the associated managed entity. (R, W) (mandatory)

Alarm Severity Assignment Profile Pointer: This attribute provides a pointer to the instance of the Alarm Severity Assignment Profile managed entity that contains the severity assignments for the alarms reported by this managed entity. When the value of this attribute is set to NULL, default severity assignments shall be used. (R, W) (mandatory)

Actions

No actions have been defined for this managed entity.

Notifications

Alarm: (mandatory) This notification is used to notify the management system when a failure has been detected or cleared. The following parameters shall be supplied with this notification:

- The Nature of the Alarm (i.e., see generic trouble list) (mandatory)
- Specific Problems (optional)
- The ID of the Managed Entity Reporting the Alarm (mandatory)
- The Failed Switch Component or List of Failed (or Possibly Failed) Components (mandatory)
- Back-up Status (This is a Boolean indication as to whether or not the failed entity has been backed-up.) (optional)
- Back-up Entity (This is the ID of the managed entity providing back-up services to the failed entity. This parameter shall be NULL when the value of the "Back-up Status" parameter is *false*.) (optional)
- Severity of Failure (critical, major, minor, warning, indeterminate, and cleared) (mandatory)
- Additional Information (optional)

- Proposed Repair Actions (optional)

- Time and Date Failure was Detected (mandatory)

Attribute Value Change: This notification is used to report changes to the Alarm Severity Assignment Profile Pointer and Location Name attributes of this managed entity. The notification shall identify the attribute that changed, its old value, and its new value. (optional)

Managed Entity Creation: This notification is used to report the creation of an instance of this managed entity. (mandatory)

Managed Entity Deletion: This notification is used to report the deletion of an instance of this managed entity. (mandatory)

State Change: This notification is used to report changes to the Operational State attribute and Administrative State attribute of this managed entity. The notification shall identify the state attribute that changed, its old value, and its new value. (mandatory)

Relationships

Multiple instances of this managed entity may exist per instance of and be contained in the ATM NE managed entity.

Instances of this managed entity may be associated with and contained in other Equipment managed entities to represent equipment/sub-equipment Relationships.

This managed entity is related to one instance of the Alarm Severity Assignment Profile managed entity through its pointer attribute: Alarm Severity Assignment Profile Pointer.

3.57.Equipment Holder

This managed entity represents physical resources of the ATM NE that are capable of holding other physical resources. Examples of resources represented by instances of this managed entity are racks, shelves, drawers, and slots. An instance of this managed entity shall exist for each rack, shelf, drawer, and slot of the ATM NE.

Instances of this managed entity are created automatically and reported by the ATM NE upon ATM NE initialization. Instances of this managed entity are also created by request of the managing system.

Attributes

Managed Entity ID: This attribute provides a unique name for the managed entity instance in the ATM NE. (R, Set-by-Create) (mandatory)

Equipment Holder Type: This attribute indicates whether the Equipment Holder instance is being used to represent a rack, shelf, drawer, or slot. (R) (mandatory)

Equipment Holder Address: This attribute identifies the physical location of the resource represented by the Equipment Holder instance. (R) (mandatory)

Acceptable Plug-in Unit Types: This attribute identifies the types of plug-in units that can be supported by the slot. This attribute only applies when the Equipment Holder instance represents a slot. (R, W) (optional)

Slot Status: This attribute provides a Boolean indication as to whether or not the slot is empty or full. This attribute only applies when the Equipment Holder instance represents a slot. (R) (mandatory)

Software Load: This attribute identifies the software load, if there is any, which is currently designated as the one to be loaded to the plug-in unit whenever an automatic reload of software is needed. This attribute only applies when the Equipment Holder instance represents a slot. (R, W) (mandatory if the unit supports software)

Actions

No actions have been defined for this managed entity.

Notifications

Attribute Value Change: This notification is used to report changes to the Acceptable Plug-in Unit Types, Slot Status, and Software Load attributes of this managed entity. The notification shall identify the attribute that changed, its old value, and its new value. (optional)

Managed Entity Creation: This notification is used to report the creation of an instance of this managed entity. (mandatory)

Managed Entity Deletion: This notification is used to report the deletion of an instance of this managed entity. (mandatory)

Relationships

An instance of this managed entity shall exist for each rack, shelf, drawer, and slot of the ATM NE. Instances of this managed entity shall support nested containment Relationships that match the nested containment Relationships supported by the ATM NE's racks, shelves, drawers, and slots.

An instance of Equipment Holder (that represent a slot) may contain an instances of the Plug-in Unit managed entity to model the containment of plug-in units (e.g., circuit packs) within slots of the ATM NE.

3.58.Event Forwarding Discriminator

This managed entity is used to define the conditions that shall be satisfied by potential reports related to managed entities for the report to be forwarded to the desired destination.

Instances of this managed entity are created automatically by the ATM NE upon ATM NE initialization. Instances of this managed entity are also created and deleted by request of the managing system.

Attributes

Managed Entity ID: This attribute provides a unique name for the managed entity in the ATM NE. (R, Set-by-Create) (mandatory)

Discriminator Construct: This attribute specifies the test conditions which will be used by the Event Forwarding Discriminator in testing potential reports. For example, the discriminator construct may be set such that all alarms with severity not equal to "minor" are sent to a “Destination” via the M4 Interface. (R, W) (mandatory)

Destination: This attribute identifies the destination to which reports that have passed the test conditions will be sent. The destination may be a single application entity title or multiple application entity titles. (R, W) (mandatory)

Administrative State: This attribute is used to activate (unlock) and deactivate (lock) the functions of the managed entity. (R, W) (mandatory)

Operational State: This attribute identifies whether or not the managed entity is capable of performing its normal functions (i.e., in-service or out-of-service). (R) (mandatory)

Actions

No actions have been defined for this managed entity.

Notifications

Attribute Value Change: This notification is used to report changes to the Discriminator Construct and Destination attributes of this managed entity. The notification shall identify the attribute that changed, its old value, and its new value. (optional)

Managed Entity Creation: This notification is used to report the creation of an instance of this managed entity. (optional)

Managed Entity Deletion: This notification is used to report the deletion of an instance of this managed entity. (optional)

State Change: This notification is used to report changes to the Operational State attribute and Administrative State attribute of this managed entity. The notification shall identify the state attribute that changed, its old value, and its new value. (optional)

Relationships

Multiple instances of the Event Forwarding Discriminator managed entity may exist for and be contained in each instance of the ATM NE managed entity.

3.59.Group Combination

Instances of this managed entity group a possible set of Virtual Path Groups. They can be used to distribute the traffic over several Virtual Path Groups.

Instances of this managed entity are created and deleted by request of the managing system.

Attributes

Managed Entity ID: This attribute provides a unique name for the managed entity instance in the ATM NE. (R, Set-by-Create) (mandatory)

List of VPGs: Pointer list to the selected Virtual Path Groups. (R, W) (mandatory)

Used Algorithm: Identifies the algorithm to select a Virtual Path Group of the list of VPGs (e.g. sequential, cyclic). (R, W) (mandatory)

Actions

No actions have been defined for this managed entity.

Notifications

Attribute Value Change: This notification is used to report changes to the attributes of this managed entity. The notification shall identify the attribute that changed, its old value, and its new value. (optional)

Managed Entity Creation: This notification is used to report the creation of an instance of this managed entity. (optional)

Managed Entity Deletion: This notification is used to report the deletion of an instance of this managed entity. (optional)

Relationships

Multiple instances of this managed entity may exist per instance of the ATM NE managed entity.

Each instance of this managed entity is associated with zero or more instances of the Virtual Path Group managed entity by the List of VPGs pointer attribute.

This managed entity may be related to Route Data managed entity through the Assoc Group Comp or VPG pointer attribute of the Route Data managed entity.

3.60.Interworking VCC Termination Point

An instance of this managed entity represents a point in the ATM NE where the interworking of the a service (e.g., frame relay, SMDS) or underlying physical infrastructure (e.g. nxDSO/DS1/DS3/E3/J2) takes place. At this point ATM cells are generated from bit stream (e.g. nxDSO/DS1/DS3/E3/Frame Relay) or bit stream is re-constructed from ATM cells.

Instances of this managed entity are created automatically and deleted by the ATM NE. Instances of this managed entity are also created and deleted by request of the managing system.

Attributes

Managed Entity ID: This attribute provides a unique name for the managed entity instance in the ATM NE. (R, Set-by-Create) (mandatory)

VPI Value: This attribute identifies the VPI value associated with this Interworking VCC Termination Point. (R) (mandatory)

Service Profile Pointer: This attribute provides a pointer to the instance of a service profile, such as the CES Service Profile. (R, W) (mandatory)

AAL Profile Pointer: This attribute provides a pointer to an the instance of AAL Profile managed entities. (R, W) (mandatory)

Termination Points List: This attribute provides an ordered list of Termination points which are being interworked. (R) (mandatory)

Operational State: This attribute identifies whether or not the Interworking VCC termination point is capable of performing its normal functions (in-service or out-of-service). (R) (mandatory)

Administrative State: This attribute is used to inhibit (lock) and allow (unlock) the flow of cells through Interworking VCC termination point. However, the value of this attribute shall not affect the ability of Interworking VCC termination point to perform OAM processing functions. (R, W) (mandatory)

Alarm Status: This attribute is used to indicate the existence of an alarm condition for the interworking VCC termination point. (R) (optional)

Current Problem List: This attribute identifies the current existing problems, with severity, associated with the interworking VCC termination point. (R) (optional)

Alarm Severity Assignment Profile Pointer: This attribute provides a pointer relationship to an Alarm severity assignment profile. (R, W) (optional)

Connectivity Pointer: This attribute serves as a pointer to the instance of the VCL Termination point managed entity instance in the ATM NE. (R) (mandatory)

Actions

Loopback OAM Cell: This operation is used to request the Interworking VCC Termination Point to insert a loopback OAM cell into the ATM cell stream, verify its return, and report the results of the loopback (i.e., passed or failed) back to the management system. Along with each request will be the location where the inserted OAM cell shall loop-back and an indication as to whether a *segment or end-to-end* OAM cell shall be used. The Loopback Location Code attribute value of the UNI where the loopback is to take place may be used to identify the loopback location. Additionally, a globally unique default value (e.g., ”end-point”) may also be used to perform a loopback at the end of a VCC. (mandatory)

Add Interworked TP: This optional operation adds a new termination point (e.g. nxDSO/DS1/DS3/E3/J2/ Frame Relay) to the Termination Points List. The traffic characteristics of the interworked ATM VCC must be able to accommodate the additional termination point. (mandatory)

Remove Interworked TP: This optional operation removes a termination point from the Termination Points List. (mandatory)

Notifications

Alarm: (mandatory) This message is used to notify the management system when a failure has been detected or cleared. The following parameters shall be supplied with this notification:

- The Nature of the Alarm (i.e., communications alarm) (mandatory)
- Specific Problems (optional)
- The ID of the Managed Entity Reporting the Alarm (mandatory)
- The Failed Switch Component or list of Failed (or possibly Failed) components (mandatory)
- Back-up Status (This is a Boolean indication as to whether or not the failed entity has been backed up.) (optional)
- Backed-up Entity (This is the ID of the managed entity providing back-up services to the failed entity. This parameter shall be NULL when the value of the "Back-up Status" parameter is *false*.) (optional)
- Severity of Failure (critical, major, minor, warning, indeterminate, and cleared) (mandatory)
- Additional Information (optional)
- Proposed Repair Actions (optional)
- Time and Date Failure was Detected (mandatory)

Attribute Value Change: This notification is used to report changes to the Alarm Severity Assignment Profile Pointer, Service Profile Pointer, or AAL Profile Pointer of this managed entity. The notification shall identify the attribute that changed, its old value, and its new value. (optional)

Managed Entity Creation: This notification is used to report the creation of an instance of this managed entity. (mandatory)

Managed Entity Deletion: This notification is used to report the deletion of an instance of this managed entity. (mandatory)

State Change: This notification is used to report changes to the Operational State attribute of this managed entity. The notification shall identify the state attribute that changed (i.e., Operational State), its old value, and its new value. (optional)

Relationships

One instance of this managed entity shall exist for each occurrence of transformation of data stream into ATM cells.

This managed entity is related to the ATM NE managed entity through containment.

This managed entity is related to one Service Profile managed entity through the Service Profile Pointer attribute.

This managed entity is related to one AAL1 Profile, AAL3/4 Profile, or AAL5 Profile managed entity through the AAL Profile Pointer attribute.

3.61.Latest Occurrence Log

This managed entity is used to group multiple log records (e.g., ATM Cell Protocol Monitoring Log Record instances) to form a latest occurrence log. If no other log record contained in the Latest Occurrence Log instance has values of the attributes identified by the Key Attribute List attribute equal to the attribute values of the log record to be added, the log record is created and contained in the Latest Occurrence Log. However, if there exists a log record contained in the Latest Occurrence Log instance having values of the attributes identified by the Key Attribute List attribute equal to the attribute values of the log record to be added, the older existing log record contained in the Latest Occurrence Log is replaced by the new log record.

Instances of this managed entity are created automatically by the ATM NE upon ATM NE initialization. Instances of this managed entity cannot be deleted.

Attributes

Managed Entity ID: This attribute provides a unique name for the managed entity instance in the ATM NE. (R, Set-by-Create) (mandatory)

Administrative State: This attribute is used to activate (unlock) and deactivate (lock) the logging function of the ATM NE. (R, W) (mandatory)

Log Full Action: This attribute is used to identify the action the ATM NE shall take when the log space is full. The Valid values for this attribute are “wrap around” and “halt”. The default value for this attribute shall be “wrap around.” (R, W) (mandatory)

Log Record Types: This attribute identifies the type(s) of log records grouped by the Latest Occurrence Log managed entity. ATM Cell Protocol Monitoring Log Record is a valid value for this attribute. (R) (mandatory)

Key Attribute List: This attribute indicates the list of attribute types to be used as keys to uniquely identify the entries in a Latest Occurrence Log. For example, in support of ATM Cell Level Protocol Monitoring, this attribute shall identify the attributes in the ATM Cell Protocol Monitoring Log Record managed entity called "Abnormality Type" and "Interface ID". (R, W) (mandatory)

Operational State: This attribute identifies whether or not the managed entity is capable of logging information (i.e., in-service or out-of-service). (R) (mandatory)

Actions

No actions have been defined for this managed entity.

Notifications

Attribute Value Change: This notification is used to report changes to the Key Attribute List and Log Full Action attributes of this managed entity. The notification shall identify the attribute that changed, its old value, and its new value. (optional)

Managed Entity Creation: This notification is used to report the creation of an instance of this managed entity. (optional)

Managed Entity Deletion: This notification is used to report the deletion of an instance of this managed entity. (optional)

State Change: This notification is used to report changes to the Operational State attribute and Administrative State attribute of this managed entity. The notification shall identify the state attribute that changed, its old value, and its new value. (optional)

Relationships

Multiple instances of this managed entity may be contained per the ATM NE managed entity. At a minimum, one instance of this managed entity is required for containing instances of the ATM Cell Protocol Monitoring Log Record managed entity.

3.62.List of Route TPs

Instances of this managed entity describe the possible set of Route Data instances that meet the traffic characteristics defined by the Post Analysis Evaluation criteria that point to the instance. An instance of this managed entity points to at least one instance of the managed entity Route Data that describes details of a particular route.

Instances of this managed entity are created and deleted by request of the managing system.

Attributes

Managed Entity ID: This attribute provides a unique name for the managed entity instance in the ATM NE. (R, Set-by-Create) (mandatory)

List of Routes: Pointer list to the selected Route Data instances. (R, W) (mandatory)

Used Algorithm: Identifies the algorithm to select a route of the list of routes (e.g. sequential, cyclic). (R, W) (mandatory)

Actions

No actions have been defined for this managed entity.

Notifications

Attribute Value Change: This notification is used to report changes to the attributes of this managed entity. The notification shall identify the attribute that changed, its old value, and its new value. (optional)

Managed Entity Creation: This notification is used to report the creation of an instance of this managed entity. (mandatory)

Managed Entity Deletion: This notification is used to report the deletion of an instance of this managed entity. (mandatory)

Relationships

Multiple instances of this managed entity may exist per instance of the ATM NE managed entity.

Zero or more instances of this managed entity are associated with zero or more instances of the Route Data managed entity by the List of Routes pointer attribute.

This managed entity is related to Post Analysis Evaluation managed entity through the Active List of Route TPs pointer attribute of the Post Analysis Evaluation managed entity.

3.63.Local Destination

The Local Destination managed entity represents a set of directory numbers that are located on the NE where the call is currently processed.

Instances of this managed entity are created and deleted by request of the managing system.

Attributes

Managed Entity ID: This attribute provides a unique name for the managed entity instance in the ATM NE. (R, Set-by-Create) (mandatory)

Local Area Code: Indicates the local area code of the local destination. This attribute is required only for E.164 addresses or subfields (e.g. in AESA E.164 directory numbers according to UNI 4.0) (R, W) (optional)

Initial Subscriber Codes: Defines (together with the local area code) a range of codes that can belong to a local destination. (R, W) (mandatory)

Excluded Subscriber Codes: Defines codes which have to be excluded from the range of valid codes, despite they are part of the Initial Subscriber Codes. (R, W, A/R) (mandatory)

Ring Time Limit: Indicates the maximum ringing time for a call to this destination. (R, W) (optional)

AddressType: This attribute specifies whether the local destination groups E.164 (native E.164, AESA E.164) or AESA (ICD, DCC) addresses. (R) (mandatory)

Actions

No actions have been defined for this managed entity.

Notifications

Attribute Value Change: This notification is used to report changes to the attributes of this managed entity. The notification shall identify the attribute that changed, its old value, and its new value. (optional)

Managed Entity Creation: This notification is used to report the creation of an instance of this managed entity. (mandatory)

Managed Entity Deletion: This notification is used to report the deletion of an instance of this managed entity. (mandatory)

Relationships

Multiple instances of this managed entity may exist per instance of the ATM NE managed entity.

This managed entity is related to Analysis Criteria managed entity through the Active Target pointer attribute of Analysis Criteria managed entity.

3.64.Log

This managed entity is used to group multiple instances of the Managed Entity Creation Log Record, Managed Entity Deletion Log Record, State Change Log Record, Attribute Value Change Log Record, and/or Alarm Record managed entities to form a log. This managed entity contains information that, among other things, allows the management system to control the behavior of the log.

Instances of this managed entity are created automatically by the ATM NE upon ATM NE initialization. Instances of this managed entity cannot be deleted.

Attributes

Managed Entity ID: This attribute provides a unique name for the managed entity instance in the ATM NE. (R, Set at Creation) (mandatory)

Administrative State: This attribute is used to activate (unlock) and deactivate (lock) the logging function of the ATM NE. (R, W) (mandatory)

Discriminator Construct: This attribute specifies the test conditions which will be used by the Log entity in testing potential log records. (R, W) (optional)

Log Record Types: This attribute identifies the type(s) of log records grouped by the log managed entity. Valid values for this attribute are: Managed Entity Creation Log Record, Managed Entity Deletion Log Record, State Change Log Record, Attribute Value Change Log Record, and/or Alarm Record. (R) (mandatory)

Log Full Action: This attribute is used to identify the action the ATM NE shall take when the log space is full. The valid values for this attribute are "wrap-around" and "halt". The default value for this attribute shall be "wrap-around". (R, W) (mandatory)

Operational State: This attribute identifies whether or not the entity is capable of logging information (i.e., in-service or out-of-service). (R) (mandatory)

Actions

No actions have been defined for this managed entity.

Notifications

Attribute Value Change: This notification is used to report changes to the Log Full Action attribute of this managed entity. The notification shall identify the attribute that changed, its old value, and its new value. (optional)

Managed Entity Creation: This notification is used to report the creation of an instance of this managed entity. (mandatory)

Managed Entity Deletion: This notification is used to report the deletion of an instance of this managed entity. (mandatory)

State Change: This notification is used to report changes to the Operational State attribute and Administrative State attribute of this managed entity. The notification shall identify the state attribute that changed, its old value, and its new value. (optional)

Relationships

Multiple instances of this managed entity may be contained per the ATM NE managed entity. Instances of this managed entity are used to contain instances of the Managed Entity Creation Log Record, Managed Entity Deletion Log Record, State Change Log Record, Attribute Value Change Log Record, and/or Alarm Record managed entities.

3.65.Managed Entity Creation Log Record

This managed entity is used to represent logged information that resulted from managed entity creation events.

An instance of this managed entity is created automatically by the ATM NE upon creation of other managed entities in the ATM NE. Instances of this managed entity can be deleted by the ATM NE or by request of the managing system.

Attributes

Managed Entity ID: This attribute provides a unique name for the managed entity instance in the ATM NE. (R) (mandatory)

Logging Time: This attribute identifies the time at which the record was entered into the log. (R) (mandatory)

Managed Entity: This attribute identifies the type and instance ID of the managed entity that was created. (R) (mandatory)

Actions

No actions have been defined for this managed entity.

Notifications

No notifications have been defined for this managed entity.

Relationships

Multiple instances of this managed entity may be contained in an instance of the Log managed entity.

3.66.Managed Entity Deletion Log Record

This managed entity is used to represent logged information that resulted from managed entity deletion events.

An instance of this managed entity is created automatically by the ATM NE upon deletion of other managed entities in the ATM NE. Instances of this managed entity can be deleted by the ATM NE or by request of the managing system.

Attributes

Managed Entity ID: This attribute provides a unique name for the managed entity instance in the ATM NE. (R) (mandatory)

Logging Time: This attribute identifies the time at which the record was entered into the log. (R) (mandatory)

Managed Entity: This attribute identifies the type and instance ID of the managed entity that was deleted. (R) (mandatory)

Actions

No actions have been defined for this managed entity.

Notifications

No notifications have been defined for this managed entity.

Relationships

Multiple instances of this managed entity may be contained in an instance of the Log managed entity.

3.67.MTP3b Access Point

This managed entity provides information on an MTP Access Point signaling entity and allows management of individual signaling entities.

The Service Access Point Address identifies one ATM Signaling Route Set NE Part instance by its point code and the network indicator of its superior MTP Signaling Point.

Instances of this managed entity are created and deleted by request of the managing system.

Attributes

Managed Entity ID: This attribute provides a unique name for the managed entity instance in the ATM NE. (R, Set-by-Create) (mandatory)

Signaling Link Set Pointer: Pointer to the ATM Signaling Link Set Termination Point managed entity representing the controlled signaling link set (R, W) (optional)

Service Access Point Address: This attribute contains the network indicator, destination point code (DPC) and service indicator to identify the access point to the MTP3b. (R, Set-by-create) (mandatory)

User Entity Names: Names of Service Access Points of Users like BISUP and SSCOP managed entities. (R, Set-by-Create) (mandatory)

Operational State: Indicates if the MTB3b signaling functions are operational (in-service) or not operational (out of service). (R) (mandatory)

SP Type: This attribute identifies whether the signaling point is able to act as a signaling end point or an signaling transfer point or can act as both. Possible values are: SEP, STP, STEP. (R, W) (mandatory if quasi-associated signaling is supported)

Actions

No actions have been defined for this managed entity.

Notifications

Attribute Value Change: This notification is used to report changes to the attributes of this managed entity (except the Managed Entity ID attribute). The notification shall identify the attribute that changed, its old value, and its new value. (optional)

Managed Entity Creation: This notification is used to report the creation of an instance of this managed entity. (mandatory)

Managed Entity Deletion: This notification is used to report the deletion of an instance of this managed entity. (mandatory)

State Change Notification: Sent if value of administrative or operational state changes. (mandatory)

Relationships

Instances of this managed entity are contained by an ATM MTP Signaling Point managed entity.

An instance of this managed entity may be associated with exactly one Signaling Route Set NE Part managed entity instance by the Service Access Point Address attribute.

User Service Access Points, E.g., BISUP Access Points, are identified by the User Entity Names attribute.

An instance of this managed entity may be related to one ATM Signaling Link Set Termination Point managed entity by the Signaling Link Set attribute.

3.68.Multiple Subscriber Number Independent

The Multiple Subscriber Number Screening managed entity supplementary service provides the possibility for assigning multiple numbers (not necessarily consecutive) to a single public or private interface as described in ITU RecommendationQ.2951.2. This enables the selection of multiple distinct terminals attached to the same interface. The service provider shall fix the length of the numbers to be transmitted to the user's installation. They may comprise the least significant digit up to the full ISDN number as defined in CCITT RecommendationE.164. The digit(s) significant for terminal differentiation shall be an integral part of the ISDN numbering scheme.

Instances of this managed entity are created and deleted by request of the managing system.

Attributes

Managed Entity ID: This attribute provides a unique name for the managed entity instance in the ATM NE. (R, Set-by-Create) (mandatory)

Administrative State: This attribute is used to activate (unlock) and deactivate (lock) the functions of the managed entity. (R, W) (mandatory)

Associated Default Directory Number: This attribute specifies the default directory number for the ISDN supplementary service MSN (R, W) (mandatory)

Called Party Number Representation Type: This attribute specifies the format (nature of address) of the called party number to be delivered to the called party. Values are: ‘national’, ‘international’ or ‘unknown’. If the value is ‘unknown’ the two attributes Number of Digits for Calling Identification and Number of Digits for Terminal Identifier shall be present to determine to the number of digits to be transmitted to the user. (R, W) (mandatory)

Number of Digits for Calling Identification: This attribute identifies the number of digits for the MSN supplementary service as described in ITU-T Recommendation I.251.2. (R, W) (optional)

Number of Digits for Terminal Identifier: This attribute identifies the number of digits allocated to enable all terminals in a point-to-multipoint configuration to react in the same way as they would if the supplementary service MSN were not subscribed to as described in ITU-T Recommendation I.251.2. (R, W) (optional)

Actions

No actions have been defined for this managed entity.

Notifications

State Change: This notification is used to report changes to the Administrative State attribute of this managed entity. The notification shall identify the state attribute that changed, its old value, and its new value. (mandatory)

Attribute Value Change: This notification is used to report changes to the attributes of this managed entity. The notification shall identify the attribute that changed, its old value, and its new value. (mandatory)

Managed Entity Creation: This notification is used to report the creation of an instance of this managed entity. (mandatory)

Managed Entity Deletion: This notification is used to report the deletion of an instance of this managed entity. (mandatory)

Relationships

Zero or one instance of this managed entity may exist for each instance of the Customer Profile managed entity.

Each instance of this managed entity is associated to an instance of a Directory Number E.164 through the Associated Default Directory Number attribute.

3.69.Multipoint Bridge

This managed entity is used to represent the logical ATM bridging function required of ATM NEs to support multipoint VCL and VPL cross-connections.

Instances of this managed entity are created and deleted by the ATM NE or by request of the managing system.

Attributes

Managed Entity ID: This attribute provides a unique name for the managed entity instance in the ATM NE. (R, Set-by-Create) (mandatory)

Administrative State: This attribute is used to activate (unlock) and deactivate (lock) an entire multipoint cross-connection in the ATM NE. In order to inhibit/enable cell flow across an individual leg of a multipoint cross-connection, the management system would re-set the Administrative State attribute in the instance of the ATM Cross Connection managed entity that connects that leg to the Multipoint Bridge. (R, W) (mandatory)

Multipoint Connection Type: This attribute identifies whether the multipoint cross-connection is a multicast, merge, multicast/merge, or full multipoint cross-connection. (R) (mandatory)

NOTE: While this attribute has multiple values which allow for several different forms of "multipoint" cross-connections, it should be noted that the ATM Forum UNI specification only defines point-to-multipoint (i.e., multicast) connections at this time. Therefore, all other forms of multipoint support beyond point-to-multipoint arrangements are optional.

Primary VP/VC Link Termination Point: For broadcast, merge, and multicast/merge cross-connect types, this attribute identifies the VPL or VCL Termination Point managed entity instance that generates traffic to be broadcasted and/or receives traffic that has been merged. This parameter shall be set to NULL for full multipoint cross-connection types. (R, Set-by-Create) (mandatory)

Common VP/VC Link Termination Points: This attribute is used to identify all VPL or VCL Termination Point managed entities involved in the multipoint cross-connection except that identified by the Primary VP/VC Link Termination Point attribute. (R) (mandatory)

Operational State: This attribute identifies whether or not this instance of the Multipoint Bridge managed entity is capable of performing its normal function (i.e., copying/merging and switching cells). (R) (mandatory)

Actions

No actions have been defined for this managed entity.

Notifications

Attribute Value Change: This notification is used to report changes to the attributes of this managed entity (except the Managed Entity ID attribute). The notification shall identify the attribute that changed, its old value, and its new value. (optional)

Managed Entity Creation: This notification is used to report the creation of an instance of this managed entity. (mandatory)

Managed Entity Deletion: This notification is used to report the deletion of an instance of this managed entity. (mandatory)

State Change: This notification is used to report changes to the Operational State attribute and Administrative State attribute of this managed entity. The notification shall identify the state attribute that changed, its old value, and its new value. (optional)

Relationships

Zero or more instances of this managed entity shall exist for each instance of the ATM NE managed entity.

Each instance of this managed entity is associated with two or more instances of the VPL (or VCL) Termination Point managed entities by the Primary VP/VC Link Termination Point and Common VP/VC Link Termination Points pointer attributes.

This managed entity is related to the ATM Cross Connection managed entity through the Termination Point Z pointer attribute of the ATM Cross Connection managed entity.

3.70.NNI Access

Instances of this managed entity are used to group the VPCs between two (adjacent) signaling points which are controlled by the same signaling protocol.

Instances of this managed entity are created and deleted by request of the managing system.

Attributes

Managed Entity ID: This attribute provides a unique name for the managed entity instance in the ATM NE. (R, Set-by-Create) (mandatory)

Network Border: Indicates whether the link represents an intra-network or an inter network link. (R, W) (mandatory)

Link Type: Indicates whether the interface is a national or an international interface. (R, W) (mandatory)

Assoc. Signaling Route Set: Pointer to managed entity instance identifying the Signaling Route Set NE Part managed entity for the NNI. (R, Set-by-Create) (mandatory)

Origin for Routing: Determines the origin assigned to the interface. It can be used for origin dependent routing. (R, W) (mandatory)

Network Type: Indicates if an access belongs to a national transit network. (R, Set-by-Create) (optional)

Actions

No actions have been defined for this managed entity.

Notifications

Attribute Value Change: This notification is used to report changes to the attributes of this managed entity (except the Managed Entity ID attribute). The notification shall identify the attribute that changed, its old value, and its new value. (optional)

Managed Entity Creation: This notification is used to report the creation of an instance of this managed entity. (optional)

Managed Entity Deletion: This notification is used to report the deletion of an instance of this managed entity. (optional)

Relationships

Instances of this managed entity are contained in an ATM NE managed entity.

One instance of this managed entity is provided for each OPC/DPC pair using a given signaling protocol.

Instances of this managed entity contain instances of the Virtual Path Group managed entity.

An instance of this managed entity may be associated with one instance of the BISUP Access Point managed entity. This relationship is established by the NNI Access Pointer attribute pointer in the BISUP Access Point managed entity.

3.71.OAM Continuity Monitor

This managed entity models a Continuity Check OAM Flow. If it is contained by a VPL TP or VCL TP entity, then it represents the termination of a Segment OAM flow. If it is contained by a VPC TP or VCC TP, then it represents the termination of an End-to-End OAM Flow.

Instances of this managed entity are created and deleted by the ATM NE or by request of the managing system.

Attributes

Managed Entity ID: This attribute provides a unique name for the managed entity instance in the ATM NE. (R, Set-by-Create) (mandatory)

Sink Mechanism Flag: This attribute indicates whether the sink mechanism is active. (R, Set at Creation) (mandatory)

Source Mechanism Flag: This attribute indicates whether the source mechanism is active. (R, Set at Creation) (mandatory)

Operational State: This attribute indicates whether this entity is capable of performing it normal function. (R) (mandatory)

Flow Direction: This attribute indicates in which direction the monitoring is made, in relation to the VPL TP or VCL TP that contains this entity, as Into-NE or Out-of-NE (R, Set at Creation) (mandatory)

Actions

Control CC: This action is used to activate or de-activate sink and source mechanisms for the Continuity Check monitoring. (mandatory)

Notifications

Attribute Value Change: This notification is used to report changes to the attributes of this managed entity (except the Managed Entity ID attribute). The notification shall identify the attribute that changed, its old value, and its new value. (optional)

Managed Entity Creation: This notification is used to report the creation of an instance of this managed entity. (optional)

Managed Entity Deletion: This notification is used to report the deletion of an instance of this managed entity. (optional)

State Change: This notification is used to report changes to the Operational State attribute of this managed entity. (optional)

Loss of Continuity: This notification is sent when the VP/VC being monitored is detected as disrupted. (mandatory)

Relationships

Zero, one or two instances of this managed entity may be contained in a VPL TP or VCL TP managed entity for each monitored direction (None, Into-NE, Out-of-NE)

Zero or one instance of this managed entity may be contained in a VPC TP or VCC TP managed entity.

3.72.OAM Performance Monitor

This managed entity models a non-intrusive and intrusive PM OAM Flow.

Instances of this managed entity are created and deleted by the ATM NE or by request of the managing system.

Attributes

Managed Entity ID: This attribute provides a unique name for the managed entity instance in the ATM NE. (R, Set-by-Create) (mandatory)

Sink Mechanism Flag: This attribute indicates whether the sink mechanism is active. (R, Set at Creation) (mandatory)

Source Mechanism Flag: This attribute indicates whether the source mechanism is active. (R, Set at Creation) (mandatory)

Operational State: This attribute indicates whether this entity is capable of performing it normal function. (R) (mandatory)

In Monitoring Blocking Size: This attribute indicates the average monitoring block size associated with the incoming direction of a monitored ATM Cell flow. (R, Set at Creation) (optional)

Out Monitoring Blocking Size: This attribute indicates the average monitoring block size associated with the outgoing direction of a monitored ATM Cell flow. (R, Set at Creation) (optional)

Monitored Flow: This attribute which is used in the case of non-intrusive PM, indicates the monitored flow as Segment or End-to-End. (R, Set at Creation) (optional)_

Flow Direction: This attribute indicates in which direction the monitoring is made, in relation to the VPL TP or VCL TP that contains this entity, as Into-NE or Out-of-NE (R, Set at Creation) (mandatory)

Actions

Control PM: This action is used to activate or de-activate sink and source mechanisms, as well as, Far-End Monitoring and backward PM reporting.

Notifications

Attribute Value Change: This notification is used to report changes to the attributes of this managed entity (except the Managed Entity ID attribute). The notification shall identify the attribute that changed, its old value, and its new value. (optional)

Managed Entity Creation: This notification is used to report the creation of an instance of this managed entity. (optional)

Managed Entity Deletion: This notification is used to report the deletion of an instance of this managed entity. (optional)

State Change: This notification is used to report changes to the Operational State attribute of this managed entity. (optional)

Relationships

Zero, one, two, three or four instances of this managed entity may be contained in a VPL TP or VCL TP managed entity for each monitored direction and flow. (None, Into-NE-Segment, Out-of-NE-Segment, Into-NE-End-to-End, Out-of-NE-End-to-End)

Zero or one instance of this managed entity may be contained in a VPC TP or VCC TP managed entity.

3.73.OAM VP-VC Current Data

This managed entity contains the current PM data collected for the connection being monitored, related to VP and VC OAM flows. OAM PM data is described in [I.610].

Instances of this managed entity are created by the ATM NE. Instances of this managed entity are deleted by the ATM NE or by request of the managing system.

Attributes

Managed Entity ID: This attribute provides a unique name for the managed entity instance in the ATM NE. (R, Set-by-Create) (mandatory)

Administrative State: This attribute is used to activate (unlock) or de-activate (lock) the data collection function performed by this entity. (R) (mandatory)

Suspect Interval Flag: This attribute is used to indicate that the performance data for the current period may not be reliable. (R) (optional)

Elapsed Time: This attribute represents the difference between the current time and the start of the present period. (R) (optional)

Threshold Data ID: This attribute provides a pointer to an instance of the Threshold Data managed entity that contains the threshold values for the performance monitoring data collected by this managed entity. (R, W) (optional)

Number of Suppressed Intervals: This attribute is non-zero only if the History data creation is suppressed when current intervals terminates with all-zeros. (R) (optional)

Lost Cells: This attribute contains the count of detected lost cells. (R) (optional)

Misinserted Cells: This attribute contains the count of detected misinserted cells. (R) (optional)

User Cells: This attribute contains the count of detected user cells. (R) (optional)

FE Lost Cells: This attribute contains the count of detected far end lost cells. (R) (optional)

FE Misinserted Cells: This attribute contains the count of detected far end misinserted cells. (R) (optional)

FE User Cells: This attribute contains the count of detected far end user cells. (R) (optional)

Actions

No actions are defined for this entity.

Notifications

Attribute Value Change: This notification is used to report changes to the attributes of this managed entity (except the Managed Entity ID attribute). The notification shall identify the attribute that changed, its old value, and its new value. (optional)

Managed Entity Creation: This notification is used to report the creation of an instance of this managed entity. (optional)

Managed Entity Deletion: This notification is used to report the deletion of an instance of this managed entity. (optional)

State Change: This notification is used to report changes to the Operational State attribute of this managed entity. (optional)

Threshold Crossing Alert: This notification is used to notify the management system when the value of the counts exceed a pre-set threshold. (optional)

Relationships

An instance of this managed entity shall be contained by each Performance Monitor managed entity.

This managed entity is related with one instance of the Threshold Data managed entity through its pointer attribute: Threshold Data ID.

3.74.OAM VP-VC History Data

This managed entity models a non-intrusive and intrusive PM OAM Flow.

Instances of this managed entity are created automatically by the ATM NE. Instances of this managed entity are deleted by the ATM NE or by request of the managing system.

Attributes

Managed Entity ID: This attribute provides a unique name for the managed entity instance in the ATM NE. (R, Set-by-Create) (mandatory)

Period End Time: This attribute represents the time at the end of the recorded period. (R) (mandatory)

Suspect Interval Flag: This attribute is used to indicate that the performance data for the current period may not be reliable. (R) (optional)

Number of Suppressed Intervals: This attribute is non-zero only if the History data creation is suppressed when current intervals terminates with all-zeros. (R) (optional)

Lost Cells: This attribute contains the count of detected lost cells. (R) (optional)

Misinserted Cells: This attribute contains the count of detected misinserted cells. (R) (optional)

User Cells: This attribute contains the count of detected user cells. (R) (optional)

FE Lost Cells: This attribute contains the count of detected far end lost cells. (R) (optional)

FE Misinserted Cells: This attribute contains the count of detected far end misinserted cells. (R) (optional)

FE User Cells: This attribute contains the count of detected far end user cells. (R) (optional)

Actions

No actions are defined for this entity.

Notifications

Notifications are defined for this entity.

Relationships

A new instance of this entity is created at the end of each 15 minute interval for each current data object. This managed entity will create a copy of the performance management attributes that are present in the associated current data managed entity at the end of the 15 minute interval. From zero to thirty-two instances of this managed entity shall be supported for each current data managed entity.

3.75.Physical Path Termination Point

This managed entity is used to represent the points in the ATM NE where physical paths terminate and physical path level functions (e.g., path overhead functions) are performed.

An instance of this managed entity is created automatically by the ATM NE for each physical path terminating on the ATM NE or by request of the managing system. Instances of this managed entity are deleted by request of the managing system.

Attributes

Managed Entity ID: This attribute provides a unique name for the managed entity instance in the ATM NE. (R, Set-by-Create) (mandatory)

Administrative State: This attribute is used to activate (unlock) and deactivate (lock) the functions performed by this managed entity. (R, W) (mandatory)

Physical Path Type: This attribute identifies the type of physical path being terminated (e.g., DS1, DS3, SONET STS-3c, etc.). (R) (mandatory)

Port ID: This attribute identifies the port on the line card where the physical path terminates. (R) (mandatory)

Framing Format: This attribute represents the physical framing format associated with the physical path being terminated. (R) (mandatory if interface could have framing options)

Operational State: This attribute identifies whether or not the managed entity is capable of performing its normal functions (i.e., in-service or out-of-service). (R) (mandatory)

Alarm Severity Assignment Profile Pointer: This attribute provides a pointer to the instance of the Alarm Severity Assignment Profile managed entity that contains the severity assignment for the alarms reported by this managed entity. When the value of this attribute is set to NULL, default severity assignments shall be used. (R, W) (mandatory)

Actions

No actions have been defined for this managed entity.

Notifications

Alarm: (mandatory) This notification is used to notify the management system when a failure has been detected or cleared. The following parameters shall be supplied with this notification:

- The Nature of the Alarm (i.e., see generic trouble list)
- Specific Problems (optional)
- The ID of the Managed Entity Reporting the Alarm
- The Failed Switch Component or List of Failed (or Possibly Failed) Components
- Back-up Status (This is a Boolean indication as to whether or not the failed entity has been backed-up.)
- Back-up Entity (This is the ID of the managed entity providing back-up services to the failed entity.

  This parameter shall be NULL when the value of the "Back-up Status" parameter is *false*.)
- Severity of Failure (critical, major, minor, warning, indeterminate, and cleared)
- Additional Information (optional)
- Proposed Repair Actions (optional)
- Time and Date Failure was Detected

Attribute Value Change: This notification is used to report changes to the attributes of this managed entity (except the Managed Entity ID attribute). The notification shall identify the attribute that changed, its old value, and its new value. (optional)

Managed Entity Creation: This notification is used to report the creation of an instance of this managed entity. (mandatory)

Managed Entity Deletion: This notification is used to report the deletion of an instance of this managed entity. (mandatory)

State Change: This notification is used to report changes to the Operational State attribute of this managed entity. The notification shall identify the state attribute that changed (i.e., Operational State), its old value, and its new value. (optional)

Relationships

Zero or more instances of the Physical Path Termination Point managed entity shall be contained in an instance of the ATM NE managed entity.

Instances of this managed entity shall be associated with an instance of the Plug-in Unit managed entity.

3.76.Plug-in Units

This managed entity is used to represent equipment that is inserted (plugged into) and removed from slots of the ATM NE.

An instance of this managed entity is created automatically by the ATM NE upon the insertion of the plug-in unit into the ATM NE slot. Instances of this managed entity are also created and deleted by request of the management system.

Attributes

Managed Entity ID: This attribute provides a unique name for the managed entity instance in the ATM NE. (R, Set at Creation) (mandatory)

Administrative State: This attribute is used to activate (unlock) and deactivate (lock) the functions performed by the plug-in unit. This attribute may not be present in all instances of this managed entity. (R, W) (mandatory)

Availability Status: This attribute is used to further describe the state of the managed entity. Valid values for this attribute shall include "Available", "In Test", "Failed", "Power Off", "Not Installed", "Off Line", and "Dependency". This last value is used to indicate that the plug-in unit cannot operate because some other resource on which it depends is unavailable. (R) (mandatory)

Operational State: This attribute identifies whether or not the plug-in unit is capable of performing its normal functions (i.e., in-service or out-of-service). (R) (mandatory)

Plug-in Unit Type: This attribute identifies the plug-in unit type. This attribute may be any printable string (e.g., CLEI code). (R) (mandatory)

Vendor Name: This attribute identifies the vendor of the plug-in unit. (R) (optional)

Version: This attribute identifies the version of the plug-in unit. (R) (mandatory)

Alarm Severity Assignment Profile Pointer: This attribute provides a pointer to the instance of the Alarm Severity Assignment Profile managed entity that contains the severity assignments for the alarms reported by this managed entity. When the value of this attribute is set to NULL, default severity assignments shall be used. (R, W) (mandatory)

Actions

No actions have been defined for this managed entity.

Notifications

Alarm: (mandatory) This message is used to notify the management system when a failure has been detected or cleared. The following parameters shall be supplied with this notification:

- The Nature of the Alarm (i.e., see generic trouble list) (mandatory)
- Specific Problems (optional)
- The ID of the Managed Entity Reporting the Alarm (mandatory)
- The Failed Switch Component or List of Failed (or Possibly Failed) Components (mandatory)
- Back-up Status (This is a Boolean indication as to whether or not the failed entity has been backed-up.) (optional)
- Back-up Entity (This is the ID of the managed entity providing back-up services to the failed entity.

  This parameter shall be NULL when the value of the "Back-up Status" parameter is *false.*) (optional)
- Severity of Failure (critical, major, minor, warning, indeterminate, and cleared)

- Additional Information (optional)
- Proposed Repair Actions (optional)
- Time and Date Failure was Detected (mandatory)

Attribute Value Change: This notification is used to report changes to the Availability Status, Vendor Name, Version, and Alarm Severity Assignment Profile Pointer attributes of this managed entity. The notification shall identify the attribute that changed, its old value, and its new value. (optional)

Managed Entity Creation: This notification is used to report the creation of an instance of this managed entity. (mandatory)

Managed Entity Deletion: This notification is used to report the deletion of an instance of this managed entity. (mandatory)

State Change: This notification is used to report changes to the Operational State attribute and Administrative State attribute of this managed entity. The notification shall identify the state attribute that changed, its old value, and its new value. (optional)

Relationships

One instance of this managed entity may be contained by an instance of the Equipment Holder managed entity that represents a slot.

This managed entity is related with one instance of the Alarm Severity Assignment Profile managed entity through its pointer attribute: Alarm Severity Assignment Profile Pointer.

3.77.Post Analysis Evaluation

Instances of this managed entity point to a set of routes via which the related destination can be reached. The referenced routes meet the traffic requirements described by the attributes of Post Analysis Evaluation.

Call processing attempts to match the requirements of a call with those of the various Post Analysis Evaluation instances related to the prior selected Abstract Destination. For a certain call only one instance has to match the required parameters.

Instances of this managed entity are created and deleted by request of the managing system.

Attributes

Managed Entity ID: This attribute provides a unique name for the managed entity instance in the ATM NE. (R, Set-by-Create) (mandatory)

Abstract Destination Instance: Pointer to an instance of the Abstract Destination managed entity. (R, W) (mandatory)

Requested Service Category: Indicates the supported bearer capabilities. (aligns with Bearer in ITU-T [Q.824.6]) (R, W) (mandatory)

Requested Bandwidth Egress: Indicates the supported bandwidth egress. (R, W) (mandatory)

Requested Bandwidth Ingress: Indicates the supported bandwidth ingress. (R, W) (mandatory)

Transit Delay Limit: Indicates the supported transit delay. (R, W) (mandatory)

Active List of Route TPs: Pointer to the selected list of Route Termination Points supporting the requested parameters. (R, W) (mandatory)

Actions

No actions have been defined for this managed entity.

Notifications

Attribute Value Change: This notification is used to report changes to the attributes of this managed entity. The notification shall identify the attribute that changed, its old value, and its new value. (optional)

Managed Entity Creation: This notification is used to report the creation of an instance of this managed entity. (optional)

Managed Entity Deletion: This notification is used to report the deletion of an instance of this managed entity. (optional)

Relationships

Multiple instances of this managed entity may exist per instance of the ATM NE managed entity.

Zero or more instances of this managed entity are associated with Abstract Destination managed entity by the Abstract Destination Instance pointer attribute and with the List of Route TPs managed entity by the Active List of Route TPs pointer attribute.

3.78.Route Data

Instances of this managed entity describe signaling related information for a route. In case the digit string to be forwarded to an adjacent exchange needs to be manipulated, this managed entity provides a pointer to an instance of the managed entity Digit Manipulation, where the manipulation rules can be defined.

Instances of this managed entity are created and deleted by request of the managing system.

Attributes

Managed Entity ID: This attribute provides a unique name for the managed entity instance in the ATM NE. (R, Set-by-Create) (mandatory)

Send TNS: Indicates whether the TNS signaling field needs to be sent. (R, W) (optional)

Digit Manipulation Pointer: Pointer to a Digit Manipulation instance. (R, W) (optional)

Assoc. Group Comb or VPG: Pointer to the result (either Virtual Path Group or Group Comb). (R, W) (mandatory)

Actions

No actions have been defined for this managed entity.

Notifications

Attribute Value Change: This notification is used to report changes to the attributes of this managed entity. The notification shall identify the attribute that changed, its old value, and its new value. (optional)

Managed Entity Creation: This notification is used to report the creation of an instance of this managed entity. (mandatory)

Managed Entity Deletion: This notification is used to report the deletion of an instance of this managed entity. (mandatory)

Relationships

Multiple instances of this managed entity may exist per instance of the ATM NE managed entity.

Zero or more instances of this managed entity may be associated with Digit Manipulation managed entity by the Digit Manipulation Pointer pointer attribute and are associated with Virtual Path Group or Group Combination managed entity by the Assoc Group Comb or VPG pointer attributes.

This managed entity is related to List of Route TPs managed entity through the pointer attribute List of Routes of the List of Route TPs managed entity.

3.79.SAAL NNI Protocol Profile

Provides information about the SSCOP and SSCF protocol configuration usage of ATM signaling links. An instance of this managed entity would apply to zero, one or more interoffice signaling channels. The timer configuration defaults are based on a link speed of 64Kbps, but they could apply over a larger range (See [Q.2140]).

Instances of this managed entity are created by the ATM NE or by request of the managing system. Instances of this managed entity are deleted by request of the managing system. This managed entity must be compatible with the associated signaling link usage. Once a profile is created it may only be changed by deletion and re-creation. Deletion should be denied if the profile is associated with any active signaling links.

Attributes

Managed Entity ID: This attribute provides a unique name for the managed entity instance in the ATM NE. (R, Set-by-Create) (mandatory)

Signaling Mode: Choice of: Associated Mode, Quasi Associated Mode (for later use). (R, Set-by-Create) (optional)

Proving Information: Controls type of proving that will be used. Choice of : Normal (Always Normal Proving), Emergency (Always Emergency Proving) or Neutral (Follow MTP3 Request). (R, W, D =Neutral) (mandatory)

SSCOP Timers and Parameters (mandatory):

Buffer Release: Indicator determines whether or not SSCOP can release its transmission buffer and transmission queue on connection release and can selectively release messages from the transmission buffer when older messages are still outstanding (R, Set-by-Create, D=False)

Max Information Field Size: Parameter k, the maximum information field size. (R, D=4096 Octets)

Max SSCOP-UU: Parameter j, the maximum SSCOP-UU field j. (R, D=4 Octets)

Max CC: Maximum number of transmissions of BGN, END, ER, or RS PDUs. (R, Set-by-create, D=4 PDUs)

Max PD: Maximum of SD PDUs before transmission of a POLL PDU. (R, Set-by-create, D=500 PDUs)

Maximum SSCOP Credit to Peer: This attribute defines the absolute value (PDUs) of the size of the receive window given to the peer. This value is added to VR(R) to generate VR(MR). VR(MR) is mapped to N(MR) by transmission of STAT, USTAT, RS RSAK, ER, ERAK, BGN or BGAK PDUs. (R, Set-by-Create, D=16 for Access Channels, D=128 Interoffice)

Max STAT: Maximum number of list elements in a STAT PDU. (R, Set-by-create, D=67 PDUs)

Timer CC: This timer protects transmission of the PDUs during SSCOP connection/release, resynchronization., or recovery. (R, Set-by-create, D=200 ms for interoffice non-satellite links and 700 ms for satellite links[6])

Timer Keep Alive: Set somewhat larger than the time between a transmitted POLL and the expected receipt of a STAT. (R, Set-by-create, D=100 ms)

Timer No Response: Minimum time interval in which at least one STAT PDU must be received. (R, Set-by-create, D=1500 ms)

Timer Poll: determines when the next POLL PDU is sent. (R, Set-by-create, D=100 ms)

Timer Idle: The sum of Timer Idle and Timer No Response is the maximum time between received STATs. (R, Set-by-create, D=100 ms)

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[6] It will be necessary for the managing system to know the link type in order to set this default value correctly when creating an instance of this managed entity.

SSCF-NNI Timers and Parameters (mandatory)

Timer T1: During alignment, the time between link release and the next link re-establish action. (R, Set-by-create, D=5 seconds)

Timer T2: (R, Set-by-create, D=120 seconds)

Timer T3: The time between proving PDUs The Timer T3 default value, is equal to 60/n1 seconds. (R, Set-by-create, D = derived value)

n1: Number of PDUs sent during normal proving. The n1 default value, is equal to (4200 + 15.2(X-173)), where X is the anticipated signaling link (VCC) peak cell rate in cells/second and must be greater than or equal to 173. (R, Set-by-Create)

SAAL Layer Timers and Parameters (mandatory)

Max NRP: Maximum number of retransmitted PDUs during proving. (R, Set-by-Create, D=1)

Timer REPEAT SREC: Timer that indicates time since last SSCOP recovery. If SSCOP recovery occurs before this timer expires, the connection is released. (R, Set-by-Create, D=1 hour)

Timer NO CREDIT: Length of time a PDU is waiting for transmission with no credit. If timer expires, the connection is released. (R, Set-by-Create, D=1500 ms)

SAAL Layer Timers and Parameters (optional)

T sup: Super-block size in seconds (R, Set-by-Create, D=120 seconds)

T loss: STAT loss limit in seconds. (R, Set-by-Create, D=1300 ms)

Alpha: Exponential smoothing factor (R, Set-by-Create, D=0.1)

Thres: Threshold for comparing the running quality of service. (R, Set-by-Create, D=0.244)

Tau: Error monitoring interval. (R, Set-by-Create, D=100 ms)

N: Number of monitoring intervals needed to span time when messages are not released from buffers as a result of a 400 ms error event. (R, Set-by-Create, D=9)

N Block: Number of monitoring intervals in a block for Algorithm 2, which is concerned with intermediate error rates. (R, Set-by-Create, D=3)

Congestion Thresholds: Lists onset, abatement, and discard threshold values for interoffice signaling link congestion for levels 1, 2, and 3. If multiple measures of congestion are used for monitoring congestion, then all measures must cross the threshold before related congestion controls are invoked or removed (logical AND). (R, W) (optional)

Actions

No actions have been defined for this managed entity.

Notifications

Attribute Value Change: This notification is used to report changes to the attributes of this managed entity (except the Managed Entity ID attribute). The notification shall identify the attribute that changed, its old value, and its new value. (optional)

Managed Entity Creation: This notification is used to report the creation of an instance of this managed entity. (mandatory)

Managed Entity Deletion: This notification is used to report the deletion of an instance of this managed entity. (mandatory)

Relationships

Instances of this managed entity are contained in an ATM NE managed entity.

One instance of this managed entity will exist for each combination of interoffice signaling parameters that need to be supported within the ATM NE managed entity.

An instance of the SAAL NNI Protocol Profile managed entity is associated with zero, one or more VC termination points used for an interoffice signaling channel. In an instance of the ATM Signaling Link Termination Point managed entity, the Protocol Pointer attribute will point to the applicable SAAL NNI Protocol Profile managed entity, and the Signaling Data Link Pointer attribute will point to the associated Signaling VCC Termination Point managed entity.

3.80.SAAL UNI Protocol Profile

Provides information about the SSCOP and SSCF protocol configuration usage of ATM access signaling channels. An instance of this managed entity would apply to zero, one or more access signaling channels. The timer configuration defaults are based on a link speed of 10Kbps, but they could apply over a larger range (See ITU-T Recommendation Q.2130)

Instances of this managed entity are created by the ATM NE or by request of the managing system. Instances of this managed entity are deleted by request of the managing system. This managed entity must be compatible with the associated signaling channel usage. Once a profile is created it may only be changed by deletion and re-creation. Deletion should be denied if the profile is associated with any active signaling channels.

Attributes

Managed Entity ID: This attribute provides a unique name for the managed entity instance in the ATM NE. (R, Set-by-Create) (mandatory)

SSCOP Timers and Parameters (mandatory):

Buffer Release: Indicator determines whether or not SSCOP can release its transmission buffer and transmission queue on connection release and can selectively release messages from the transmission buffer when older messages are still outstanding (R, Set-by-Create, D=True)

Max Information Field Length: Parameter k, the maximum information field size.(R, D=4096 Octets)

Max SSCOP-UU: Parameter j, the maximum SSCOP-UU field j. (R, D=4 Octets)

Max CC: Maximum number of transmissions of BGN, END, ER, or RS PDUs. (R, Set-by-create, D=4 PDUs)

Max PD: Maximum of SD PDUs before transmission of a POLL PDU. (R, Set-by-create, D=25 PDUs)

Maximum SSCOP Credit to Peer: This attribute defines the absolute value (PDUs) of the size of the receive window given to the peer. This value is added to VR(R) to generate VR(MR). VR(MR) is mapped to N(MR) by transmission of STAT, USTAT, RS RSAK, ER, ERAK, BGN or BGAK PDUs. (R, Set-by-Create, D=16 PDUs)

Max STAT: Maximum number of list elements in a STAT PDU. (R, Set-by-create, D=67 PDUs)

Timer CC: This timer protects transmission of the PDUs during SSCOP connection/release, resynchronization, or recovery. (R, Set-by-create, D=1000 ms)

Timer Keep Alive: Set somewhat larger than the time between a transmitted POLL and the expected receipt of a STAT. (R, Set-by-create, D=2000 ms)

Timer No Response: Minimum time interval in which at least one STAT PDU must be received. (R, Set-by-create, D=7000 ms)

Timer Poll: determines when the next POLL PDU is sent. (R, Set-by-create, D=750 ms)

Timer Idle: The sum of Timer Idle and Timer No Response is the maximum time between received STATs. (R, Set-by-create, D=15,000 ms)

Actions

No actions have been defined for this managed entity.

Notifications

Attribute Value Change: This notification is used to report changes to the attributes of this managed entity (except the Managed Entity ID attribute). The notification shall identify the attribute that changed, its old value, and its new value. (optional)

Managed Entity Creation: This notification is used to report the creation of an instance of this managed entity. (mandatory)

Managed Entity Deletion: This notification is used to report the deletion of an instance of this managed entity. (mandatory)

Relationships

Instances of this managed entity are contained in an ATM NE managed entity.

One instance of this managed entity will exist for each combination of access signaling parameters that need to be supported with the ATM NE managed entity.

One instance of the SAAL UNI Protocol Profile managed entity is provided for each VC TTP used for an access signaling channel. The Protocol Pointer attribute in the DSS2 Access Signaling Channel Termination Point managed entity will point to the applicable SAAL UNI Protocol Profile managed entity.

3.81.Signaling Route NE Part

The Signaling Route NE Part managed entity instances contained in the same Signaling Route Set NE Part comprise the information to decide via which Signaling Link Set Termination Point instances (as possible first segment of the route in network view) signaling messages shall be routed and actually can be routed to the respective destination signaling point. Each single Signaling Route NE Part instance contains the respective information for a specific Signaling Link Set Termination Point.

The Signaling Route NE Part managed entity defines the management capabilities of the resources which define a specific route segment (Link Set to be traversed) and its priority within the route set as seen from the own SP.

The priority in which the Signaling Route NE Parts are used, is defined by means of assigning priorities to all involved Signaling Route NE Parts within one Signaling Route Set NE Part. If from a particular Signaling Route Set NE Part two or more Signaling Route NE Parts are used with the same priority, load sharing between these Signaling Route NE Parts may occur.

Instances of this managed entity are created and deleted by request of the managing system.

Attributes

Managed Entity ID: This attribute provides a unique name for the managed entity instance in the ATM NE. (R, Set-by-Create) (mandatory)

Pointer to the associated signaling link set: (R, Set-by-Create) (mandatory)

Operational State: The value of this attribute is 'enabled' if both the associated Signaling Link Set TP is in the operational state 'enabled' and no TFP message concerning the respective destination has been received from the destination having as point code the Adjacent Point Code of the respective signLinkSetTp. (R) (mandatory)

Administrative State: The administrative State attribute describes whether it is administratively permitted to route messages towards the respective destination point via the referenced signLinkSetTp (R, W) (mandatory)

Availability Status: This attribute gives additional information about the availability of the Signaling Route NE Part instance. It is furthermore needed to map some of the MTP functional states (prohibited: Availability Status = {dependency}, restricted: Availability Status ={degraded}) and is used for the case that the route is locked not by the OS, but e.g. by a local administrator (Administrative State =unlocked and Availability Status = offline). (R) (mandatory)

Usage State: This attribute is used to cover restriction of a route. Its value is set to 'busy', if the route is restricted ('transfer restricted' is a national option). (R) (optional)

Priority: This attribute determines, if the Signaling Route NE Part is used as current route. The Signaling Route NE Part instances with operational state = 'enabled' contained in the same Signaling Route Set NE Part are chosen in ascending order as current routes (The lower the value, the higher the priority). (R, W -This attribute is writeable only together with the attribute Priority Mode.) (mandatory)

Priority Mode: This attribute is necessary in case of creating a Signaling Route NE Part instance or modifying its Priority attribute. It describes the influence of the management action on the Priority attributes of other Signaling Route NE Part instances contained in the same Signaling Route Set NE Part. (R,W - only together with the writing of attribute Priority) (optional)

Load Sharing information: This attribute contains specific information for target specific load sharing via the current routes working on a route basis. (R, W) (optional)

SLS List: This attribute may be used if load sharing over link sets toward a specific destination is done. It indicates which SLSs are assigned to this Signaling Route NE Part, in case it is a current route (i.e., the messages with these SLSs are sent over the allocated link set. It has to be ensured that all SLSs are covered and no SLS exists more than one time within the SLS List attributes of the current routes. (R, Set-by-Create) (optional)

Actions

No actions have been defined for this managed entity.

Notifications

State Change Notification: Sent if value of administrative or operational state or availability status changes. (mandatory)

Attribute Value Change: This notification is used to report changes to the attributes of this managed entity (except the Managed Entity ID attribute). The notification shall identify the attribute that changed, its old value, and its new value. (optional)

Managed Entity Creation: This notification is used to report the creation of an instance of this managed entity. (mandatory)

Managed Entity Deletion: This notification is used to report the deletion of an instance of this managed entity. (mandatory)

Relationships

Instances of this managed entity are contained in an instance of the Signaling Route Set NE Part managed entity.

An instance of this managed entity must not be created, if the associated Signaling Link Set Termination Point it wants to point to is not existing. This association is established by the Pointer To The Associated Link Set attribute. An instance of this managed entity can only be associated with exactly one the Signaling Link Set Termination Point managed entity instance.

In case of quasi-associated signaling, one instance of the Signaling Link Set Termination Point managed entity can be associated with more than one Signaling Route NE Part managed entity instance.

An instance of the Signaling Link Set Termination Point managed entity must not be deleted, if there is at least one Signaling Route NE Part associated with it.

3.82.Signaling Route Set NE Part

This Managed Entity groups together information which is available in the own network element A concerning a specific signaling point of the network element B within the same network. This information comprises among other things the identification of the destination (the signaling point of the network element B), its accessibility from the own MTP3b Signaling Point of network element A via the SS No. 7 network and if it is allowed to route messages towards this signaling destination.

The Signaling Route Set NE Part managed entity defines the management capabilities of the resources which represent a specific destination SP and its accessibility as seen from the own SP.

Instances of this managed entity are created and deleted by request of the managing system.

Attributes

Managed Entity ID: This attribute provides a unique name for the managed entity instance in the ATM NE. = DPC (R, Set-by-Create) (mandatory)

Operational State: This attribute describes whether the respective destination signaling point is accessible ('enabled') or not ('disabled'). If the operational states of all Signaling Route NE Part instances contained in a Signaling Route Set NE Part are 'disabled', then the operational state of the Signaling Route Set NE Part is 'disabled'. In any other case it is 'enabled'. (R) (mandatory)

Administrative State: This attribute describes whether it is administratively permitted to route SS7 MSUs towards the respective destination point. Before the administrative state of a Signaling Route Set NE Part can be set to 'unlocked', there must be at least one Signaling Route NE Part contained within the Signaling Route Set NE Part. (R, W) (mandatory)

Congestion Information: This attribute is used to reflect route set congestion. (R) (optional)

Load Sharing Information: This attribute contains specific information for target specific load sharing via the current routes working on a route set basis. (R, W) (optional)

Remote Exchange Label: This attribute specifies the remote exchange which contains the MTP Signaling Point with the point code equal to the Managed Entity Id of this Signaling Route Set NE Part. (R, W) (optional)

Alarm Status: This attribute is used to indicate the existence of an alarm condition for the Signaling Route Set NE Part (R) (optional).

Current Problem List: This attribute identifies the current existing problems, with severity, associated with the Signaling Route Set NE Part (R) (optional).

Actions

No actions have been defined for this managed entity.

Notifications

State Change Notification: Sent if value of administrative or operational state changes. (mandatory)

Change In Link set To Adjacent Signaling Point: - Sent if the Route which is actually used for routing towards the Route Set changes (optional)

Alarm: (mandatory) This notification is used to notify the management system when the Signaling Route Set is unavailable. (optional)

The following parameters shall be supplied with this notification:

- The Nature of the Alarm (i.e., see generic trouble list) (mandatory)
- Specific Problems (optional)

- The ID of the Managed Entity Reporting the Alarm (mandatory)

- Back-up Status (This is a Boolean indication as to whether or not the failed entity has been backed-up.) (optional)

- Back-up Entity (This is the ID of the managed entity providing back-up services to the failed entity. This parameter shall be NULL when the value of the "Back-up Status" parameter is *false*.) (optional)

- Severity of Failure (critical, major, minor, warning, indeterminate, and cleared)

- Additional Information (optional)

- Proposed Repair Actions (optional)

- Time and Date Failure was Detected (mandatory)

Remote User Part Unavailable: Sent if a User at the destination represented by the Signaling Route Set NE Part is unavailable (optional)

Attribute Value Change: This notification is used to report changes to the attributes of this managed entity (except the Managed Entity ID attribute). The notification shall identify the attribute that changed, its old value, and its new value. (optional)

Managed Entity Creation: This notification is used to report the creation of an instance of this managed entity. (mandatory)

Managed Entity Deletion: This notification is used to report the deletion of an instance of this managed entity. (mandatory)

Relationships

Instances of this managed entity are contained in an instance of the ATM MTP Signaling Point managed entity.

An instance of this entity must not be deleted, if it still contains instances of other entities, e.g. of Signaling Route NE Part.

An activation or deactivation of a Signaling Route Set NE Part must lead to the activation, respectively deactivation, of all contained Signaling Route NE Part managed entities.

An instance of this managed entity can be associated with more than one the MTP3b Access Point managed entity instances.

An instance of the MTP3b Access Point managed entity is associated with exactly one Signaling Route Set NE Part managed entity instance. This relationship is established by the Service Access Point Address attribute in the associated MTP3b Access Point managed entity.

3.83.Signaling VCC Termination Point

An instance of this managed entity represents a point in the ATM NE where the AAL5 interworking functions for a signaling channel takes place. At this point ATM cells are generated from signaling messages or signaling messages are recovered from ATM cells.

Instances of this managed entity are created and deleted by request of the managing system.

Attributes

Managed Entity ID: This attribute provides a unique name for the managed entity instance in the ATM NE. (R, Set-by-Create) (mandatory)

Signaling Termination Point: This attribute either points to the associated DSS2 Access Signaling Channel Termination Point or ATM Signaling Link Termination Point managed entity, or he value this attribute is set to NULL if these associated managed entities do not exist. (R, W) (mandatory)

Operational State: This attribute identifies whether or not the Signaling VCC termination point is capable of performing its normal functions (in-service or out-of-service) (R) (optional).

Administrative State: This attribute is used to inhibit (lock) and allow (unlock) the flow of cells through Signaling VCC termination point. However, the value of this attribute shall not affect the ability of Signaling VCC termination point to perform OAM processing functions (R, W) (mandatory).

Alarm Status: This attribute is used to indicate the existence of an alarm condition for the Signaling VCC termination point (R) (optional).

Current Problem List: This attribute identifies the current existing problems, with severity, associated with the Signaling VCC termination point (R) (optional).

Alarm Severity Assignment Profile Pointer: This attribute provides a pointer relationship to an Alarm Severity Assignment Profile managed entity (R, W) (optional).

Connectivity Pointer: This attribute serves as a pointer to the instance of the VCL Termination point managed entity instance in the ATM NE. (R, Set-by-Create) (mandatory)

Actions

Loopback OAM Cell: This operation is used to request the Signaling VCC Termination Point to insert a loopback OAM cell into the ATM cell stream, verify its return, and report the results of the loopback (i.e., passed or failed) back to the management system. Along with each request will be the location where the inserted OAM cell shall loop-back and an indication as to whether a *segment or end-to-end* OAM cell shall be used. The Loopback Location Code attribute value of the managed entity representing the interface point-where the loopback is to take place may be used to identify the loopback location. Additionally, a globally unique default value (e.g., ”end-point”) may also be used to perform a loopback at the end of a VCC. (optional)

Notifications

Alarm: (optional) This message is used to notify the management system when a failure has been detected or cleared. The following parameters shall be supplied with this notification:

- The Nature of the Alarm (i.e., communications alarm) (mandatory)

- Specific Problems (optional)

- The ID of the Managed Entity Reporting the Alarm (mandatory)

- The Failed Switch Component or list of Failed (or possibly Failed) components (optional)

- Back-up Status (This is a Boolean indication as to whether or not the failed entity has been backed-up.) (optional)

- Backed-up Entity (optional) (This is the ID of the managed entity providing back-up services to the failed entity. This parameter shall be NULL when the value of the "Back-up Status" parameter is False.) (optional)

- Severity of Failure (critical, major, minor, warning, indeterminate, and cleared) (mandatory)

- Additional Information (optional)

- Proposed Repair Actions (optional)

- Time and Date Failure was detected (mandatory)

Attribute Value Change: This notification is used to report changes to the Alarm Severity Assignment Profile Pointer, Service Profile Pointer, or AAL Profile Pointer of this managed entity. The notification shall identify the attribute that changed, its old value, and its new value. (mandatory)

Managed Entity Creation: This notification is used to report the creation of an instance of this managed entity. (mandatory)

Managed Entity Deletion: This notification is used to report the deletion of an instance of this managed entity. (mandatory)

State Change: This notification is used to report changes to the Operational State attribute of this managed entity. The notification shall identify the state attribute that changed (i.e., Operational State), its old value, and its new value. (optional)

Relationships

Instances of this managed entity are contained in an ATM NE managed entity.

Each instance of this managed entity is associated with an ATM Signaling Link Termination Point managed entity or a DSS2 Access Signaling Channel Termination Point managed entity by the Signaling Termination Point attribute and by the Signaling Data Link Pointer attribute in the related managed entity.

Each instance of this managed entity is related to a VCL Termination Point managed entity by the Connectivity Pointer attribute.

One instance of this managed entity shall exist for each occurrence of transformation of signaling messages into ATM cells.

3.84.Software

This managed entity is used to represent logical information stored in equipment, including programs and data tables.

An instance of this managed entity shall be automatically created by the ATM NE to report to the management system the currently installed software in the related entity (i.e., ATM NE, equipment or Plug In Unit.).

Instances of this managed entity are created and deleted by the ATM NE or by request of the managing system.

Attributes

Managed Entity ID: This attribute provides a unique name for the managed entity instance in the ATM NE. (R) (mandatory)

Administrative State: This attribute is used to activate (unlock) and deactivate (lock) software that has been installed in the ATM NE. For example, this attribute may be used to administer the activation and deactivation of multiple software entities in the ATM NE, particularly useful when downloading new software in the ATM NE. (R, W) (mandatory)

Operational State: This attribute identifies whether or not the software being represented is capable of performing its normal functions (i.e., in-service or out-of-service). (R) (mandatory)

Vendor Version: This attribute identifies the version of the software. (R) (mandatory)

Alarm Severity Assignment Profile Pointer: This attribute provides a pointer to the instance of the Alarm Severity Assignment Profile managed entity that contains the severity assignments for the alarms reported by this managed entity. When the value of this attribute is set to NULL, default severity assignments shall be used. (R, W) (mandatory)

Actions

No actions have been defined for this managed entity.

Notifications

Attribute Value Change: This notification is used to report changes to the Vendor Name, Version, and Alarm Severity Assignment Profile Pointer attributes of this managed entity. The notification shall identify the attribute that changed, its old value, and its new value. (optional)

Managed Entity Creation: This notification is used to report the creation of an instance of this managed entity. (mandatory)

Managed Entity Deletion: This notification is used to report the deletion of an instance of this managed entity. (mandatory)

State Change: This notification is used to report changes to the Operational State attribute and Administrative State attribute of this managed entity. The notification shall identify the state attribute that changed, its old value, and its new value. (mandatory)

Relationships

Multiple instances of this managed entity may be contained in an instance of the ATM NE, Equipment, and Plug-in Unit managed entities.

This entity is related with one instance of the Alarm Severity Assignment Profile managed entity through its pointer attribute: Alarm Severity Assignment Profile Pointer.

3.85.SSCOP Current Data

Provides measurements for one ATM access or interoffice signaling channel to allow performance monitoring of it.

Instances of this managed entity are created and deleted by the ATM NE or by request of the managing system.

Attributes

Managed Entity ID: This attribute provides a unique name for the managed entity instance in the ATM NE. (R, Set-by-Create) (mandatory)

Administrative State: This attribute is used to activate (unlock) and deactivate (lock) the data collection function performed by this managed entity. (R, W) (mandatory)

Suspect Flag: This attribute indicates the reliability of the current performance monitoring data collected by the managed entity. This attribute may take on one of two possible values: reliable and unreliable (suspect). (R) (mandatory)

Elapsed Time: This attribute represents the difference between the current time and the start of the present summary interval. (R) (mandatory)

Threshold Data ID: This attribute provides a pointer to an instance of the Threshold Data managed entity that contains the threshold values for the performance monitoring data collected by this managed entity. (R, W) (optional)

Number of Suppressed Intervals: This attribute is non-zero only if the ATM NE is suppressing history data creation when the current interval terminates with “all-zeroes” performance measurements. (R) (mandatory)

SSCOP Connection Monitoring Counter: Sum of errors count for the receive side of the signaling channel that shall count the following events (R, S=D, D=0) (mandatory):

– SSCOP Abnormal Disconnects: events that are characterized by the expiration of Timer No Response attribute in the associated ATM Signaling Channel Profile managed entity. These events are communicated with MAA-ERROR code P.

– SSCOP Initiation Failures: events that are characterized by the number of expires of Timer CC exceeding Max CC in the associated ATM Signaling Channel Profile managed entity, which are communicated with MAA-ERROR code O, or by receipt of a connection reject message BGREJ PDU.

– SSCOP Connection Initialization: events that are a connection re-establishment or a connection resynchronization, BGN PDU or RESYNC PDU.

SSCOP Errored PDUs: Sum of errors count for the receive side of the signaling channel that shall count the following events (R, S=D, D=0) (mandatory):

– SSCOP Unexpected PDUs: PDUs received on the signaling channel that are characterized by MAA-ERRORS A-M) (R, S=D, D=0) (mandatory)

– SSCOP Invalid PDUs: PDUs received on the signaling channel with invalid length. These PDUs are characterized by MAA-ERROR code U, undefined PDU type code (i.e., "0000"), or "not 32 bit aligned". (R, S=D, D=0) (mandatory)

– SSCOP Unexpected PDU Values: PDUs received on the signaling channel that are characterized by PDU N(S), N(PS), or N(R) errors or list elements error in STAT/USTAT PDUs. These events are communicated to layer management with MAA-ERRORs Q through T. (R, S=D, D=0) (mandatory)

Actions

No actions have been defined for this managed entity.

Notifications

Threshold Crossing Alert: This message is used to notify the management system when the value of the above count exceeds a pre-set threshold. The following information shall be supplied with this notification: (optional)

- The ID of the Managed Entity Reporting the Threshold Crossing Alert
- The Type of Performance Parameter that Exceeded the Threshold

Relationships

Instances of this managed entity are contained in a DSS2 Access Signaling Channel Termination Point managed entity or an ATM Signaling Link Termination Point managed entity.

One instance of the SSCOP Current Data managed entity is provided for each DSS2 Access Signaling Channel Termination Point managed entity or ATM Signaling Link Termination Point managed entity that is to be monitored. At least 10 percent of the total number of access signaling channels and all interoffice signaling links should be capable of being monitored simultaneously.

3.86.SSCOP History Data

This is a managed entity that contains the past performance monitoring data collected about one ATM access or interoffice signaling channel.

Instances of this managed entity are created automatically by the ATM NE. Instances of this entity are deleted by the ATM NE and request of the managing system.

Attributes

Managed Entity ID: This attribute provides a unique name for the managed entity instance in the ATM NE. (R) (mandatory)

Period End Time: This attribute records the time at the end of the interval. (R) (mandatory)

Suspect Flag: This attribute indicates the reliability of the current performance monitoring data collected by the managed entity. This attribute may take on one of two possible values: reliable and unreliable (suspect). (R) (mandatory)

Number of Suppressed Intervals: This attribute is non-zero only if the ATM NE is suppressing history data creation when the current interval terminates with “all-zeroes” performance measurements. (R) (mandatory)

SSCOP Connection Monitoring Counter: Sum of errors count for the receive side of the signaling channel that shall count the following events (R) (mandatory):

– SSCOP Abnormal Disconnects: events that are characterized by the expiration of Timer No Response attribute in the associated ATM Signaling Channel Profile managed entity. These events are communicated with MAA-ERROR code P.

– SSCOP Initiation Failures: events that are characterized by the number of expires of Timer CC exceeding Max CC in the associated ATM Signaling Channel Profile managed entity, which are communicated with MAA-ERROR code O, or by receipt of a connection reject message BGREJ PDU.

– SSCOP Connection Initialization: events that are a connection re-establishment or a connection resynchronization, BGN PDU or RESYNC PDU.

SSCOP Errored PDUs: Sum of errors count for the receive side of the signaling channel that shall count the following events (R, S=D, D=0) (mandatory):

– SSCOP Unexpected PDUs: –PDUs received on the signaling channel that are characterized by MAA-ERRORS A-M) (R) (mandatory)

– SSCOP Invalid PDUs: PDUs received on the signaling channel with invalid length. These PDUs are characterized by MAA-ERROR code U, undefined PDU type code (i.e., "0000"), or "not 32 bit aligned". (R, S=D, D=0) (mandatory)

– SSCOP Unexpected PDU Values: PDUs received on the signaling channel that are characterized by PDU N(S), N(PS), or N(R) errors or list elements error in STAT/USTAT PDUs. These events are communicated to layer management with MAA-ERRORs Q through T. (R, S=D, D=0) (mandatory)

Actions

No actions have been defined for this managed entity.

Notifications

No notifications have been defined for this managed entity.

Relationships

A new instance of this entity is created at the end of each 15 minute interval for each current data object. This managed entity will create a copy of the performance management attributes that are present in the associated current data managed entity at the end of the 15 minute interval. From zero to thirty-two instances of this managed entity shall be supported for each current data managed entity.

3.87.State Change Record

This managed entity is used to represent logged information that resulted from state change notifications.

Instances of this managed entity are created automatically by the ATM NE. Instances of this managed entity are deleted by the ATM NE or by request of the managing system.

Attributes

Managed Entity ID: This attribute provides a unique name for the managed entity instance in the ATM NE. (R) (mandatory)

Logging Time: This attribute identifies the time at which the record was entered into the log. (R) (mandatory)

Managed Entity: This attribute identifies the type and instance ID of the managed entity that generated the state change notification. (R) (mandatory)

State Attribute Type: This attribute identifies the type of attribute (i.e., operational state or administrative state attribute) whose value has changed. (R) (mandatory)

Old State Attribute Value: This attribute identifies the previous value of the state attribute. (R) (mandatory)

New State Attribute Value: This attribute identifies the new value of the state attribute. (R) (mandatory)

Actions

No actions have been defined for this managed entity.

Notifications

No notifications have been defined for this managed entity.

Relationships

Multiple instances of this managed entity may be contained in an instance of the Log managed entity.

3.88.Sub-addressing Dependent

The Sub-addressing Dependent managed entity provides the called user with the capability to expand his addressing capacity beyond the one given by the ISDN number. In case a called party sub-address is presented by a calling user, it is delivered unaffected to the called user.

Instances of this managed entity are created and deleted by request of the managing system.

Attributes

Managed Entity ID: This attribute provides a unique name for the managed entity instance in the ATM NE. (R, Set-by-Create) (mandatory)

Administrative State: This attribute is used to activate (unlock) and deactivate (lock) the sub-addressing function performed by this managed entity. (R, W) (mandatory)

Actions

No actions have been defined for this managed entity.

Notifications

State Change: This notification is used to report changes to the Administrative State attribute of this managed entity. The notification shall identify the state attribute that changed, its old value, and its new value. (mandatory)

Attribute Value Change: This notification is used to report changes to the attributes of this managed entity. The notification shall identify the attribute that changed, its old value, and its new value. (mandatory)

Managed Entity Creation: This notification is used to report the creation of an instance of this managed entity. (mandatory)

Managed Entity Deletion: This notification is used to report the deletion of an instance of this managed entity. (mandatory)

Relationships

Zero or more instances of this managed entity may exist for each instance of the ABR, CBR, UBR or VBR managed entity.

3.89.TC Adaptor

An instance of this managed entity represents a point in the ATM NE where the adaptation of the ATM Layer to the underlying physical infrastructure (e.g., SDH or PDH transport network) takes place. ITU-T Recommendation I.321 [I.321] identifies this adaptation function as one of many functions performed at the Transmission Convergence (TC) Sublayer of the BISDN protocol stack. This managed entity is responsible for generating alarms that report the (in)ability of the managed entity to delineate ATM cells from the payload of a terminated digital transmission path.

An instance of this managed entity is created automatically by the ATM NE for each instance of the Physical Path Termination Point managed entity. Instances of this managed entity can also be created and deleted by request of the managing system.

Attributes

Managed Entity ID: This attribute provides a unique name for the managed entity instance in the ATM NE. (R, Set-by-Create) (mandatory)

Administrative State: This attribute is used to activate (unlock) and deactivate (lock) the functions performed by this managed entity. (R, W) (mandatory)

Operational State: This attribute identifies whether or not the managed entity is capable of performing its normal functions (i.e., in-service or out-of-service). (R) (mandatory)

Physical Path Termination Point ID: This attribute provides a pointer to the associated instance of the Physical Path Termination Point managed entity. (R) (mandatory)

Alarm Severity Assignment Profile Pointer: This attribute provides a pointer to the instance of the Alarm Severity Assignment Profile managed entity that contains the severity assignments for the alarms reported by this managed entity. When the value of this attribute is set to NULL, default severity assignments shall be used. (R) (mandatory)

Cell Scrambling Control: This attribute is used to activate/deactivate the ATM cell scrambling function. This attribute is only present for ATM interfaces where ATM cell scrambling may be controlled (i.e., activated/deactivated). The ATM Forum UNI specification requires cell scrambling for ATM/SONET interfaces but allows cell scrambling to be controlled (i.e., turned on and off) for ATM/DS3 interfaces. (R, W) (mandatory for interfaces with scrambling options)

Actions

No actions have been defined for this managed entity.

Notifications

Alarm: (mandatory) This message is used to notify the management system when a Loss of Cell Delineation condition has been detected or cleared. The following parameters shall be supplied with this notification:

- The Nature of the Alarm (i.e., Loss of Cell Delineation) (mandatory)
- Specific Problems (optional)
- The ID of the Managed Entity Reporting the Alarm (mandatory)
- Back-up Status (This is a Boolean indication as to whether or not the failed entity has been backed-up) (optional)
- Back-up Entity (This is the ID of the managed entity providing back-up services to the failed entity. This parameter shall be NULL when the value of the “Back-up Status” parameter is *false.*) (optional)
- The Failed Switch Component or List of Failed (or Possibly Failed) Components (mandatory)
- Severity of Failure (critical, major, minor, warning, indeterminate, or cleared) (mandatory)
- Additional Information (optional)

- Proposed Repair Actions (optional)

- Time and Date Failure was Detected (mandatory)

Attribute Value Change: This notification is used to report changes to the Cell Scrambling Control and Alarm Severity Assignment Profile Pointer attributes of this managed entity. The notification shall identify the attribute that changed, its old value, and its new value. (optional)

Managed Entity Creation: This notification is used to report the creation of an instance of this managed entity. (mandatory)

Managed Entity Deletion: This notification is used to report the deletion of an instance of this managed entity. (mandatory)

Relationships

Zero or more instances of this managed entity shall be contained in the ATM NE managed entity.

Each instance of this managed entity is associated with one instance of the Physical Path Termination Point managed entity by the Physical Path Termination Point ID pointer attribute.

This managed entity is related to the UNI, BICI and BISSI managed entities through the TC Adapter ID pointer attribute of the UNI, BICI and BISSI managed entities.

One instance of the ATM Access Profile managed entity shall be contained in the TC Adaptor managed entity.

3.90.TC Adaptor Protocol Monitoring Current Data

This managed entity contains the current performance monitoring data collected as a result of performing Transmission Convergence level protocol monitoring.

An instance of this managed entity is created automatically by the ATM NE for each TC Adaptor managed entity. Instances of this managed entity can be deleted by the ATM NE or by request of the managing system.

Attributes

Managed Entity ID: This attribute provides a unique name for the managed entity instance in the ATM NE. (R) (mandatory)

Administrative State: This attribute is used to activate (unlock) and deactivate (lock) the data collection function performed by this managed entity. (R, W) (mandatory)

Suspect Flag: This attribute indicates the reliability of the current performance monitoring data collected by the managed entity. This attribute may take on one of two possible values: reliable and unreliable (suspect). (R) (optional)

Elapsed Time: This attribute represents the difference between the current time and the start of the present summary interval. (R) (mandatory)

Threshold Data ID: This attribute provides a pointer to an instance of the Threshold Data managed entity that contains the threshold values for the performance monitoring data collected by this managed entity. (R, W) (optional)

Number Of Suppressed Intervals: This attribute is present only if the ATM NE is suppressing TC Adaptor Protocol Monitoring History Data creation when the current interval terminates with "all-zeroes" performance measurements. (R) (optional)

Discarded Cells due to HEC violations: This attribute provides a raw, thresholded count of the number of ATM cells that were discarded (per interface) due to an HEC violation. (R, S=D, D=0) (mandatory)

Actions

No actions have been defined for this managed entity.

Notifications

Threshold Crossing Alert: This message is used to notify the management system when the value of the above count exceeds a pre-set threshold. The following information shall be supplied with this notification: (optional)

- The ID of the Managed Entity Reporting the Threshold Crossing Alert
- The Type of Performance Parameter that Exceeded the Threshold

Relationships

An instance of this managed entity shall exist for each instance of the corresponding TC Adaptor managed entity.

3.91.TC Adaptor Protocol Monitoring History Data

This managed entity contains all the previous performance monitoring data collected as a result of performing Transmission Convergence level protocol monitoring .

Measurement attributes in the History Data managed entity are an exact copy of the attributes in the corresponding Current Data managed entity at the end of the interval. The time at the end of the interval is indicated by the value of the attribute "Period End Time."

Instances of this managed entity are automatically created by the ATM NE. Instances of this managed entity are deleted by the ATM NE or by request of the managing system.

Attributes

Managed Entity ID: This attribute provides a unique name for the managed entity instance in the ATM NE. (R, Set-by-Create) (mandatory)

Period End Time: This attribute records the time at the end of the interval. (R) (mandatory)

Suspect Flag: This attribute indicates the reliability of the performance monitoring data collected by the managed entity. This attribute may take on one of two possible values: reliable and unreliable (suspect). (R) (optional)

Number Of Suppressed Intervals: This attribute is present only if the ATM NE is suppressing TC Adaptor Protocol Monitoring History Data creation when the current interval terminates with "all-zeroes" performance measurements. (R) (optional)

Discarded Cells due to HEC violations: This attribute provides a count of the number of ATM cells that were dropped (per interface) due to an HEC violation. (R) (mandatory)

Actions

No actions have been defined for this managed entity.

Notifications

No notifications have been defined for this managed entity.

Relationships

A new instance of this entity is created at the end of each 15 minute interval for each current data object. This managed entity will create a copy of the performance management attributes that are present in the associated current data managed entity at the end of the 15 minute interval. From zero to thirty-two instances of this managed entity shall be supported for each current data managed entity.

3.92.Threshold Data

This managed entity contains threshold values for the performance monitoring parameters maintained in one or more instances of other managed entities (e.g., the ATM Cell Protocol Monitoring Data managed entity).

Instances of this managed entity are created automatically by the ATM NE upon ATM NE initialization. Instances of this managed entity are also created and deleted by request of the managing system.

Attributes

Managed Entity ID: This attribute provides a unique name for the managed entity instance in the ATM NE. (R, Set-by-Create) (mandatory)

Performance Parameter and Threshold Value: This attribute identifies one or more performance monitoring parameters (e.g., Discarded Cells due to HEC Violations) and their associated threshold value. (R, W) (mandatory)

Actions

No actions have been defined for this managed entity.

Notifications

Attribute Value Change: This notification is used to report changes to the Performance Parameter and Threshold Value attribute of this managed entity. The notification shall identify the attribute that changed, its old value, and its new value. (mandatory)

Relationships

Zero or more instances of this managed entity may be contained in an instance of the ATM NE managed entity.

This managed entity may be related to multiple instances of the Current Data type managed entities, which have the Threshold Data ID attribute that points to an instance of this managed entity.

3.93.Traffic Descriptor

This managed entity specifies traffic and QoS parameters for virtual channel or virtual path connections. Where ingress and egress parameters are mentioned they may take different values.

Instances of this managed entity are created automatically by the ATM NE upon ATM NE initialization. Instances of this managed entity are also created and deleted by request of the managing system.

Attributes

Managed Entity ID: This attribute provides a unique name for the managed entity instance in the ATM NE. (R, Set-by-Create) (mandatory)

Profile Name: A user defined name for the managed entity instances. (R, W) (optional)

Service Category: Indicates the service category as defined in ATM-Forum TM 4.0. Valid values are CBR, rt-VBR, nrt-VBR, UBR, ABR. (R, Set-by-Create) (mandatory)

Conformance Definition: Indicates the type of conformance as defined in ATM-Forum TM 4.0. Valid values are CBR.1, VBR.1, VBR.2, VBR.3, UBR.1, UBR.2, ABR. The correspondence between Conformance Definition and Service Category as specified in ATM-Forum 4.0 should be enforced by the NE. (R, Set-by-Create) (mandatory)

Peak Cell Rate - Ingress and Egress: These parameters are required for traffic of all service categories (CBR, rt-VBR, nrt-VBR, ABR, UBR). They apply to CLP =0 flow for ABR and apply to CLP =0+1 flow otherwise. (R, Set-by-Create) (mandatory)

Cell Delay Variation Tolerance in relation to the PCR - Ingress and Egress: These parameters are required for all service categories (CBR, rt-VBR, nrt-VBR, ABR, UBR). They apply to CLP =0 flow for ABR and apply to CLP =0+1 flow otherwise.(R, Set-by-Create) (optional)

[Note: I.371 will require the following additional attribute per requirements: Cell Delay Variation Tolerance in relation to the SCR Ingress & Egress: These parameters apply to real-time and non-real-time VBR. They apply to CLP =0+1 traffic flow for VBR.1 and apply to CLP =0 traffic flow VBR.2 and VBR.3.]

Sustainable Cell Rate - Ingress and Egress: These parameters are required for real-time and non-real-time VBR traffic. They apply to CLP =0+1 traffic flow for VBR.1 and apply to CLP =0 traffic flow for VBR.2 and VBR.3. (R, Set-by-Create) (optional)

Maximum Burst Size - Ingress and Egress: These parameters are required for real-time and non-real-time VBR traffic. They apply to CLP =0+1 traffic flow for VBR.1 and apply to CLP =0 traffic flow for VBR.2 and VBR.3. (R, Set-by-Create) (optional)

Minimum Cell Rate - Ingress and Egress: These parameters are required for ABR traffic. (R, Set-by-Create) (optional)

Initial Cell Rate - Ingress and Egress: These parameters are required for ABR traffic. (R, Set-by-Create) (optional)

Transient Buffer Exposure - Ingress and Egress: These parameters are required for ABR traffic. (R, Set-by-Create) (optional)

Rate Decrease Factor - Ingress and Egress: These parameters are required for ABR traffic. (R, Set-by-Create) (optional)

Rate Increase Factor - Ingress and Egress: These parameters are required for ABR traffic. (R, Set-by-Create) (optional)

Fixed Round Trip Time: This parameters is required for ABR traffic. (R, Set-by-Create) (optional)

Nrm - Ingress and Egress: These parameters apply to ABR and are optional in the ABR context. (R, Set-by-Create, D=32) (optional)

Trm - Ingress and Egress: These parameters apply to ABR and are optional in the ABR context.(R, Set-by-Create, D=100) (optional)

CDF - Ingress and Egress: These parameters apply to ABR and are optional in the ABR context.(R, Set-by-Create, D=1/16) (optional)

ADTF - Ingress and Egress: These parameters apply to ABR and are optional in the ABR context.(R, Set-by-Create, D=0.5) (optional)

CLR - Ingress and Egress: Maximum permissible Cell Loss Ratio. These parameters apply to CBR and real-time and non-real-time VBR. They apply to CLP =0+1 flow for CBR.1 and VBR.1, and they apply for CLP =0 flow for VBR.2 and VBR.3. (R, Set-by-Create) (optional for NMS, mandatory for NE)

Actions

No actions have been defined for this managed entity.

Notifications

Attribute Value Change: This notification is used to report changes to the attributes of this managed entity. The notification shall identify the attribute that changed, its old value, and its new value. (optional)

Managed Entity Creation: This notification is used to report the creation of an instance of this managed entity. (mandatory)

Managed Entity Deletion: This notification is used to report the deletion of an instance of this managed entity. (mandatory)

Relationships

Zero or more instances of this managed entity may be contained in an instance of ATM NE managed entity.

Each instance of this entity may be related to zero or more instances of VCL Termination Point or VPL Termination Point entities through their pointer attribute: Traffic Descriptor Pointer.

3.94.UBR

The UBR managed entity represents the unspecified bit rate bearer service according to ATM Forum TM 4.0.

Instances of this managed entity are created and deleted by request of the managing system.

Attributes

Managed Entity ID: This attribute provides a unique name for the managed entity instance in the ATM NE. (R, Set-by-Create) (mandatory)

Administrative State: This attribute is used to activate (unlock) and deactivate (lock) UBR service category performed by this managed entity. (R, W) (mandatory)

Customised Resource Pointer List: This is an attribute whose value(s) points to instances of the Customised Resource managed entity. This attribute is synchronised with the Bearer Service Pointer List attribute in the Customised Resource managed entity: when Bearer Service Pointer List in the associated instance of the Customised Resource managed entity is updated, the Customised Resource Pointer List is updated accordingly. (R, Default = empty set) (mandatory)

Actions

No actions have been defined for this managed entity.

Notifications

State Change: This notification is used to report changes to the Administrative State attribute of this managed entity. The notification shall identify the state attribute that changed, its old value, and its new value. (mandatory)

Attribute Value Change: This notification is used to report changes to the attributes of this managed entity. The notification shall identify the attribute that changed, its old value, and its new value. (mandatory)

Relationships

Zero or more instances of this managed entity may exist for each instance of the Customer Profile managed entity.

Zero or more instances of this managed entity are associated with zero or more instances of the Customised Resource managed entity by the Customised Resource Pointer List attribute.

This managed entity is related to CUG Independent managed entity through the Service Pointer List attribute of the CUG Independent managed entity.

3.95.UNI

This managed entity is used to organize data associated with User Network Interfaces (UNIs) terminating on the ATM NE. One instance of this managed entity shall exist for each UNI terminating on the ATM NE. A UNI may be single-user or multiple-user. Multiple user UNIs are used for interfaces with VP multiplexers that support one or more V-UNIs.

Instances of this managed entity are created and deleted by request of the managing system.

Attributes

Managed Entity ID: This attribute provides a unique name for the managed entity instance in the ATM NE. (R, Set-by-Create) (mandatory)

TC Adaptor ID - This attribute provides a pointer to the associated instance of the TC Adaptor managed entity. (R, Set-by-Create) (mandatory)

Loopback Location Code: This attribute provides the code that shall exist in incoming OAM Loopback cells that are to be looped-back at the UNI termination point represented by the managed entity. (R, W) (optional)

Actions

No actions have been defined for this managed entity.

Notifications

Attribute Value Change: This notification is used to report changes to the attributes of this managed entity (except the Managed Entity ID attribute). The notification shall identify the attribute that changed, its old value, and its new value. (optional)

Managed Entity Creation: This notification is used to report the creation of an instance of this managed entity. (optional)

Managed Entity Deletion: This notification is used to report the deletion of an instance of this managed entity. (optional)

Relationships

Multiple instances of the UNI managed entity may exist for each instance of the ATM NE managed entity.

Each instance of the UNI managed entity is related to a TC Adaptor managed entity by the TC Adaptor ID attribute.

As noted in the attribute descriptions, some attribute values may be constrained by the values of corresponding attributes in an associated UNI Info managed entity.

3.96.UNI Info

This managed entity is used to organize data associated with individual UNI users. It may organize data associated with an individual Virtual UNI (multiple-user UNI) or with a single user UNI.

Instances of this managed entity are created and deleted by request of the managing system.

Attributes

Managed Entity ID: This attribute provides a unique name for the managed entity instance in the ATM NE. (R, Set-by-Create) (mandatory)

ATM Termination Pointer: This attribute provides a pointer to either the VPL Termination Point managed entities that are associated with a remote UNI (multiple-user UNI case) or to the associated TC Adaptor managed entity (single-user UNI case). (mandatory)

Local Maximum Number of VPCs Supportable: This attribute identifies the maximum number of VPCs that the local ATM NE can support at its end of the interface for the associated user. (R, W) (mandatory for multiple-user UNI if ILMI is active, optional for multiple-user UNI if ILMI is not active, not used for a single-user UNI)

Actual Maximum Number of VPCs Supported: This attribute identifies the maximum number of VPCs that may be active for the associated user. For a multiple-user UNI, this value is calculated by the ILMI functions if ILMI is active. (R, W-if ILMI not active, R if ILMI is active). (mandatory for multiple-user UNI if ILMI is active, optional for multiple-user UNI if ILMI is not active, not used for a single-user UNI)

Local Maximum Number of VCCs Supportable: This attribute identifies the maximum number of VCCs that the local ATM NE can support for the associated user. (R, W) (mandatory for multiple-user UNI if ILMI is active, optional for multiple-user UNI if ILMI is not active, not used for a single-user UNI)

Actual Maximum Number of VCCs Supported: This attribute identifies the maximum number of VCCs that can be supported for the associated user. For a multiple-user UNI, if ILMI is active, this value is calculated by the ILMI functions as the smaller of the two Local Maximum Number of VCCs at each end of the interface. (R, W-if ILMI not active, R if ILMI is active). (mandatory for multiple-user UNI if ILMI is active, optional for multiple-user UNI if ILMI is not active, not used for a single-user UNI)

Network Maximum Number of Allocated VPI Bits: This attribute identifies the number of allocated bits of the VPI sub-field that can be supported for the associated user on the UNI for the multiple-user UNI case. (R, W) (mandatory for multiple-user UNI if ILMI is active, optional for multiple-user UNI if ILMI is not active, not used for a single-user UNI)

Actual Number of Allocated VPI Bits: This attribute identifies the number of allocated bits of the VPI sub-field to be used for the associated user on the UNI for the multiple-user UNI case. If ILMI is active, this value is calculated by the ILMI functions as the smaller of the Network Maximum Number of Allocated VPI Bits and the user side Local Maximum Number of Allocated VPI Bits. (R, W-if ILMI not active, R if ILMI is active) (mandatory for multiple-user UNI if ILMI is active, optional for multiple-user UNI if ILMI is not active, not used for a single-user UNI)

Local Maximum Number of Allocated VCI Bits: This attribute identifies the number of allocated bits of the VCI sub-field. that the local ATM NE can support at its end of the interface for the associated user. It must be equal to or less than the Actual Number of Allocated VCI Bits for an associated UNI interface. (R, W) (mandatory for multiple-user UNI if ILMI is active, optional for multiple-user UNI if ILMI is not active, not used for a single-user UNI)

Actual Number of Allocated VCI Bits: This attribute identifies the number of allocated bits of the VCI sub-field to be used on the interface. For a multiple-user UNI, if ILMI is active, value is calculated by the ILMI functions as the smaller of the Local Maximum Number of Allocated VCI Bits at each end of the interface. (R, W-if ILMI not active, R if ILMI is active) (mandatory for multiple-user UNI if ILMI is active, optional for multiple-user UNI if ILMI is not active, not used for a single-user UNI)

Local Maximum SVCC VPI: This attribute identifies the maximum VPI value that the ATM NE can use for SVCCs for the associated user. (R, Set-by-Create) (only needed for SVC service, mandatory if ILMI is active, otherwise optional)

Actual Maximum SVCC VPI: This attribute identifies the maximum VPI value that may be used for SVCCs for the associated user. If ILMI is active , this value is calculated by the ILMI functions as the smaller of the Local Maximum SVCC VPI values at each end (R, W-if ILMI not active, R if ILMI is active) (only needed for UNIs supporting SVC service, mandatory if ILMI is active, otherwise optional)

Local Minimum SVCC VCI: This attribute identifies the minimum VCI value that the local ATM NE can use for SVCCs for the associated user. (R, Set-by-Create) (only needed for SVC service, mandatory if ILMI is active, otherwise optional)

Actual Minimum SVCC VCI: This attribute identifies the minimum VCI value that may be used for SVCCs for the associated user. If ILMI is active, this value is calculated by the ILMI functions as the larger of the Local Minimum SVCC VCI values at each end. (R, W-if ILMI not active, R if ILMI is active) (only needed for UNIs supporting SVC service, mandatory if ILMI is active, otherwise optional)

ILMI Channel Pointer: This attributes identifies a VCC Termination Point managed entity used to support ILMI for the associated user. The default VPI/VCI for this termination point is 0/16. (R, W) (mandatory if ILMI is active)

ILMI Establishment Connectivity Poll Interval: This attribute defines the amount of time S seconds between successive transmissions of ILMI messages on this interface for the purpose of detecting establishment of ILMI connectivity. (R, W, Default=1) (optional)

ILMI Check Connectivity Poll Interval: This attribute defines the amount of time T seconds between successive transmissions of ILMI messages on this interface for the purpose of detecting loss of ILMI connectivity. The value zero disables ILMI connectivity procedures on this interface. (R, W, Default=5) (optional)

ILMI Connectivity Poll Factor: This attribute defines the number K of consecutive polls on this interface for which no ILMI response message is received before ILMI connectivity is declared lost. (R, W, Default=4) (optional)

ILMI Connectivity State: This attribute shows the connectivity state of ILMI. The value could be “up” or “down”. If ILMI is not defined, i.e., if the values of ILMI Channel Pointer is null, the value is “unknown”. (R) (optional)

Signaling Channel Pointer: This attributes identifies a Signaling VCC Termination Point managed entity for the associated user's signaling channel. The default VPI/VCI for this termination point is 0/5. (R, W) (mandatory with SVC service)

Charge Number: The subscriber address that will be billed for SVC services provided to the associated UNI. (R, W) (optional)

Originating Line Information: Information needed to process SVC charging information when interconnecting through an interexchange carrier in ANSI-based networks. (R, W) (optional)

Actions

No actions have been defined for this managed entity.

Notifications

Attribute Value Change: This notification is used to report changes to the attributes of this managed entity (except the Managed Entity ID attribute). The notification shall identify the attribute that changed, its old value, and its new value. (optional)

Managed Entity Creation: This notification is used to report the creation of an instance of this managed entity. (mandatory)

Managed Entity Deletion: This notification is used to report the deletion of an instance of this managed entity. (mandatory)

Relationships

Instances of this managed entity are contained in an ATM NE managed entity.

One instance of this managed entity shall exist for each remote user interface (multiple-user UNI case) and each local user interface (single-user UNI case) supported by the ATM NE. However, for a single-user UNI, if no attributes other than Managed Entity ID and ATM Termination Pointer are needed, this managed entity should not be instantiated.

Instances of this managed entity are associated with either (1) one or more VPL Termination Point managed entities that represent the ATM NE end of the remote UNI's VPs (multiple-user UNI case) or (2) one TC Adaptor managed entity (single-user UNI case) by the ATM Termination Pointer attribute.

If SVC service is supported, this managed entity is associated with a Signaling VCC Termination Point managed entity by the Signaling Channel Pointer attribute.

If ILMI is supported, this managed entity is associated with the VCC Termination Point representing the ILMI termination in the ATM NE by the ILMI Pointer attribute.

3.97.UPC/NPC Disagreement Monitoring Current Data

An instance of this managed entity is used to collect and report data associated with UPC/NPC Disagreement Monitoring functions performed by the ATM NE on individual VPL Termination Point and VCL Termination Point managed entities.

Instances of this managed entity are created and deleted by the ATM NE or by request of the managing system.

Attributes

Managed Entity ID: This attribute provides a unique name for the managed entity instance in the ATM NE. (R) (mandatory)

Administrative State: This attribute is used to activate (unlock) and deactivate (lock) the data collection function performed by this managed entity. (R, W) (mandatory)

Suspect Flag: This attribute indicates the reliability of the current UPC/NPC Disagreement data collected by the managed entity. This attribute may take on one of two possible values: reliable and unreliable (suspect). (R) (optional)

Elapsed Time: This attribute represents the difference between the current time and the start time of the present summary interval. (R) (mandatory)

Threshold Data ID: This attribute provides a pointer to an instance of the Threshold Data managed entity that contains the threshold values for the performance monitoring data collected by this managed entity. (R, W) (optional)

Number Of Suppressed Intervals: This attribute is present only if the ATM NE is suppressing UPC/NPC Disagreement Monitoring History Data creation when the current interval terminates with "all-zeroes" performance measurements. (R) (optional)

Discarded Cells due to UPC/NPC: This attribute provides a raw, thresholded count of the number of discarded cells due to combined CLP =0 and CLP =1 UPC/NPC policing. (R, S=D, D=0) (mandatory)

Discarded CLP =0 Cells due to UPC/NPC: This attribute provides a raw, thresholded count of the number of discarded CLP =0 cells due to CLP =0 only UPC/NPC policing. This counter is only present if CLP =0 traffic is separately policed. (R, S=D, D=0) (mandatory)

Successfully Passed Cells: This attribute provides a raw, unthresholded count of the number of cells that have been passed (i.e., not discarded) by the combined CLP =0 and CLP =1 UPC/NPC policing. (R, S=D, D=0) (mandatory)

Successfully Passed CLP =0 Cells: This attribute provides a raw, unthresholded count of the number of high priority cells that have been passed (i.e., not discarded) by the CLP =0 UPC/NPC policing. This counter is only present if CLP =0 traffic is separately policed. (R, S=D, D=0) (mandatory)

Tagged CLP=0 Cells: This attribute provides a count of the number of cells that have been a count of the cells which have been tagged. (R, S=D, D=0) (mandatory)

Actions

No actions have been defined for this managed entity.

Notifications

Threshold Crossing Alert: This message is used to notify the management system when the value of the above count exceeds a pre-set threshold. The following information shall be supplied with this notification: (optional)

- The ID of the Managed Entity Reporting the Threshold Crossing Alert
- The Type of Performance Parameter that Exceeded the Threshold

Relationships

One instance of this managed entity may exist for each instance of the VPL Termination Point and VCL Termination Point managed entities.

Each instance of this managed entity is associated with zero or one instance of the Threshold Data managed entity by the Threshold Data ID pointer attribute.

3.98.UPC/NPC Disagreement Monitoring History Data

This managed entity contains all the previous performance monitoring data collected as a result of performing UPC/NPC Disagreement Monitoring.

Measurement attributes in the History Data managed entity are an exact copy of the attributes in the corresponding Current Data managed entity at the end of the interval. The time at the end of the interval is indicated by the value of the attribute "Period End Time."

Instances of this managed entity are created automatically by the ATM NE. Instances of this managed entity are deleted by the ATM NE or by request of the managing system.

Attributes

Managed Entity ID: This attribute provides a unique name for the managed entity instance in the ATM NE. (R) (mandatory)

Period End Time: This attribute records the time at the end of the interval. (R) (mandatory)

Suspect Flag: This attribute indicates the reliability of the performance monitoring data collected by the managed entity. This attribute may take on one of two possible values: reliable and unreliable (suspect). (R) (optional)

Number Of Suppressed Intervals: This attribute is present only if the ATM NE is suppressing UPC/NPC Disagreement Monitoring History Data creation when the current interval terminates with "all-zeroes" performance measurements. (R) (optional)

Discarded Cells due to UPC/NPC: This attribute provides a count of the number of discarded cells due to combined CLP =0 and CLP =1 UPC/NPC policing. (R) (mandatory)

Discarded CLP =0 Cells due to UPC/NPC: This attribute provides a count of the number of discarded CLP =0 cells due to CLP =0 only UPC/NPC policing. This counter is only present if CLP =0 traffic is separately policed. (R) (mandatory)

Successfully Passed Cells: This attribute provides a count of the number of cells that have been passed (i.e., not discarded) by the combined CLP =0 and CLP =1 UPC/NPC policing function. (R) (mandatory)

Successfully Passed CLP =0 Cells: This attribute provides a count of the number of high priority cells that have been passed (i.e., not discarded) by the CLP =0 UPC/NPC policing function. This counter is only present if CLP =0 traffic is separately policed. (R) (mandatory)

Tagged CLP=0 Cells: This attribute provides a count of the number of cells that have been a count of the cells which have been tagged. (R, S=D, D=0) (mandatory)

Actions

No actions have been defined for this managed entity.

Notifications

No notifications have been defined for this managed entity.

Relationships

A new instance of this entity is created at the end of each 15 minute interval for each current data object. This managed entity will create a copy of the performance management attributes that are present in the associated current data managed entity at the end of the 15 minute interval. From zero to thirty-two instances of this managed entity shall be supported for each current data managed entity.

3.99.User Data

This managed entity describes the properties of a certain subscriber (user). The properties may be valid for the whole superior Customer Profile or for a certain directory number only, depending from the use of Customised Resource managed entity instances. At most one User Data managed entity instance with an empty Customised Resource Pointer List shall be contained in a Customer Profile managed entity instance.

Instances of this managed entity are created and deleted by request of the managing system.

Attributes

Managed Entity ID: This attribute provides a unique name for the managed entity instance in the ATM NE. (R, Set-by-Create) (mandatory)

Customised Resource Pointer List: This attribute points to instances of the Customised Resource managed entity. This attribute is synchronized with the User Data Pointer attribute in the Customised Resource managed entity: when User Data Pointer in the associated instance of the Customised Resource managed entity is updated, the Customised Resource Pointer List is updated accordingly.(R, Default = empty set) (mandatory)

Subscriber Category: This attribute determines the category of the calling subscriber according to ITU-T Recommendation Q.2763. Valid values are: operator (language French), operator (language English), operator (language German), operator (language Russian), operator (language Spanish), national operator, ordinary calling subscriber, calling subscriber with priority, data call, test call, pay phone. (R, W, Default = ordinary calling subscriber) (mandatory)

Origin Mark: This attribute assigns an origination to the (calling) subscriber. (R, W) (optional)

Preferred Carrier: This attribute identifies the default carrier to use when one is not explicitly identified in the call setup message received and processed by the managed system. (R, W) (optional)

Actions

No actions have been defined for this managed entity.

Notifications

Attribute Value Change: This notification is used to report changes to the attributes of this managed entity. The notification shall identify the attribute that changed, its old value, and its new value. (mandatory)

Managed Entity Creation: This notification is used to report the creation of an instance of this managed entity. (optional)

Managed Entity Deletion: This notification is used to report the deletion of an instance of this managed entity. (optional)

Relationships

Multiple instances of this managed entity may exist per instance of the ATM NE managed entity.

Each instance of this managed entity may be related to zero or more instances of Customised Resource managed entity through the pointer attribute Customised Resource Pointer List.

3.100. User to User Signaling Dependent

The User to User Signaling Dependent managed entity allows an ISDN subscriber to send/receive a limited amount of information to/from another ISDN subscriber over the signaling channel associated with their call according to ITU-T Recommendation Q.2957.

Instances of this managed entity are created and deleted by request of the managing system.

Attributes

Managed Entity ID: This attribute provides a unique name for the managed entity instance in the ATM NE. (R, Set-by-Create) (mandatory)

Administrative State: This attribute is used to activate (unlock) and deactivate (lock) user to user signaling function performed by this managed entity. (R, W) (mandatory)

Actions

No actions have been defined for this managed entity.

Notifications

State Change: This notification is used to report changes to the Administrative State attribute of this managed entity. The notification shall identify the state attribute that changed, its old value, and its new value. (mandatory)

Managed Entity Creation: This notification is used to report the creation of an instance of this managed entity. (mandatory)

Managed Entity Deletion: This notification is used to report the deletion of an instance of this managed entity. (mandatory)

Relationships

Zero or more instances of this managed entity may exist for each instance of the ABR, CBR, UBR or VBR managed entity.

3.101. VBR

The VBR managed entity represents the variable (statistical) bit rate bearer service according to ATM Forum TM 4.0.

Instances of this managed entity are created and deleted by request of the managing system.

Attributes

Managed Entity ID: This attribute provides a unique name for the managed entity instance in the ATM NE. (R, Set-by-Create) (mandatory)

Administrative State: This attribute is used to activate (unlock) and deactivate (lock) VBR service category performed by this managed entity. (R, W) (mandatory)

Customised Resource Pointer List: This is an attribute whose value(s) points to instances of the Customised Resource managed entity. This attribute is synchronised with the Bearer Service Pointer List attribute in the Customised Resource managed entity: when Bearer Service Pointer List in the associated instance of the Customised Resource managed entity is updated, the Customised Resource Pointer List is updated accordingly. (R, Default = empty set) (mandatory)

Timing Relation: This attribute indicates if rt-VBR (real-time) or nrt-VBR (non-real-time) is used. (R, W) (mandatory)

Actions

No actions have been defined for this managed entity.

Notifications

State Change: This notification is used to report changes to the Administrative State attribute of this managed entity. The notification shall identify the state attribute that changed, its old value, and its new value. (mandatory)

Attribute Value Change: This notification is used to report changes to the attributes of this managed entity. The notification shall identify the attribute that changed, its old value, and its new value. (mandatory)

Relationships

Zero or more instances of this managed entity may exist for each instance of the Customer Profile managed entity.

Zero or more instances of this managed entity are associated with zero or more instances of the Customised Resource managed entity by the Customised Resource Pointer List attribute.

This managed entity is related to CUG Independent managed entity through the Service Pointer List attribute of the CUG Independent managed entity.

3.102. VCC Termination Point

This managed entity represents the point in the ATM NE where the VCC and associated overhead (F5 OAM cells) are terminated/originated.

Instances of this managed entity are created and deleted by request of the managing system.

Attributes

Managed Entity ID: This attribute provides a unique name for the managed entity instance in the ATM NE. (R, Set-by-Create) (mandatory)

Operational State: This attribute identifies whether or not the managed entity is capable of performing its normal functions (i.e., in-service or out-of-service). (R) (mandatory)

Administrative State: This attribute is used to activate (unlock) and deactivate (lock) the functions performed by this managed entity. (R, W) (mandatory)

Connectivity Pointer: This attribute serves as a pointer to the VCL Termination Point managed entity instance (in the ATM NE) that supports the instance of this managed entity. (R, Set-by-Create) (mandatory)

Alarm Status: Indicates highest level outstanding alarm (or “cleared”) that applies to the entire link set. (R) (mandatory)

Current Problem List: The Current Problem List attribute type identifies the current existing problems, with severity, associated with the managed entity. (R) (mandatory)

Alarm Severity Assignment Profile Pointer: This attribute provides a pointer to the instance of the Alarm Severity Assignment Profile managed entity that contains the severity assignments for the alarms reported by this managed entity. When the value of this attribute is set to NULL, default severity assignments shall be used. (R, W) (optional)

Actions

Loopback OAM Cell: This operation is used to request the VCC Termination Point to insert a loopback OAM cell into the ATM cell stream, verify its return, and report the results of the loopback (i.e., passed or failed) back to the management system. Along with each request will be the location where the inserted OAM cell shall loop-back and an indication as to whether a *segment* or *end-to-end* OAM cell shall be used. The Loopback Location Code attribute value of the UNI, BICI, or BISSI where the loopback is to take place may be used to identify the loopback location. Additionally, a globally unique default value (e.g., "end-point") may also be used to perform a loopback at the other end of a VCC. (mandatory)

Notifications

Alarm: (mandatory) This message is used to notify the management system when a failure has been detected or cleared. The following parameters shall be supplied with this notification:

- The Nature of the Alarm (i.e., see generic trouble list) (mandatory)
- Specific Problems (optional)
- The ID of the Managed Entity Reporting the Alarm (mandatory)
- The Failed Switch Component or List of Failed (or Possibly Failed) Components (mandatory)
- Back-up Status (This is a Boolean indication as to whether or not the failed entity has been backed-up.) (optional)
- Back-up Entity (This is the ID of the managed entity providing back-up services to the failed entity. This parameter shall be NULL when the value of the "Back-up Status" parameter is *false*.) (optional)

- Severity of Failure (critical, major, minor, warning, indeterminate, and cleared) (mandatory)
- Additional Information (optional)
- Proposed Repair Actions (optional)
- Time and Date Failure was Detected (mandatory)

Attribute Value Change: This notification is used to report changes to the attributes of this managed entity (except the Managed Entity ID attribute). The notification shall identify the attribute that changed, its old value, and its new value. (optional)

Managed Entity Creation: This notification is used to report the creation of an instance of this managed entity. (mandatory)

Managed Entity Deletion: This notification is used to report the deletion of an instance of this managed entity. (mandatory)

State Change: This notification is used to report changes to the Operational State attribute of this managed entity. The notification shall identify the state attribute that changed, its old value, and its new value. (optional)

Relationships

Zero or more instances of the VCC Termination managed entity shall exist for each instance of the ATM NE managed entity.

Each instance of this managed entity is associated with one instances of the VCL Termination Point managed entity by the Connectivity Pointer attribute.

This managed entity is related to the UNI Info managed entity through the ILMI Channel Pointer attribute of the UNI Info managed entity.

This managed entity may have an association with a OAM Continuity Monitor and a OAM Performance Monitor.

3.103. VCL Termination Point

This managed element is used to represent the termination of VC links on an ATM NE. An instance of the ATM Cross Connection managed entity may be used to relate two instances of the VCL Termination Point managed entity (i.e., for point-to-point cross connection) or an instance of the VCL Termination Point managed entity to an instance of the Multipoint Bridge managed entity (i.e., for multipoint cross connection).

Instances of this managed entity are created and deleted by request of the managing system.

Attributes

Managed Entity ID: This attribute provides a unique name for the managed entity instance in the ATM NE. (R, Set-by-Create) (mandatory)

VCI Value: This attribute identifies the VCI value associated with the VC link being terminated. (R, Set-by-Create) (mandatory)

Traffic Descriptor Pointer: This attribute serves as a pointer to the instance of the Traffic Descriptor managed entity which contains the traffic parameters used for this VCL Termination Point. (R, W) (mandatory).

Operational State: This attribute identifies whether or not the VCL termination is capable of performing its normal functions (in-service or out-of-service). (R) (mandatory)

Segment End Point: This Boolean attribute indicates whether or not the VCL Termination Point managed entity instance has been configured to represent a VCC Segment End Point. (R, W) (mandatory)

Connectivity Pointer: This attribute serves as a pointer to the instance of the VCL Termination Point managed entity (in the ATM NE) to which it is cross-connected, or, if it represents the last virtual channel link termination in the VCC, it serves as a pointer to the corresponding VCC Termination Point managed entity instance in the ATM NE. (R, Set-by-Create) (mandatory)

Ingress and Egress Frame Discard Enabled/Disabled: 'Yes' means that the network element is allowed to treat data as frames and to apply frame discard. (R, W) (optional)

Alarm Status: Indicates highest level outstanding alarm (or "cleared") that applies to the entire link set. (R) (mandatory)

Current Problem List: The Current Problem List attribute type identifies the current existing problems, with severity, associated with the managed entity. (R) (mandatory)

Alarm Severity Assignment Profile Pointer: This attribute provides a pointer to the instance of the Alarm Severity Assignment Profile managed entity that contains the severity assignments for the alarms reported by this managed entity. When the value of this attribute is set to NULL, default severity assignments shall be used. (R, W) (optional)

Actions

Loopback OAM Cell: This operation is used to request the VCL Termination Point to insert a loopback OAM cell into the ATM cell stream, verify its return, and report the results of the loopback (i.e., passed or failed) back to the management system. Along with each request will be the location where the inserted OAM cell shall loop-back and an indication as to whether a *segment* or *end-to-end* OAM cell shall be used. The Loopback Location Code attribute value of the UNI, BICI, or BISSI where the loopback is to take place may be used to identify the loopback location. Additionally, a globally unique default value (e.g., "end-point") may also be used to perform a loopback at the end of a VCC. (mandatory)

Notifications

Alarm: (mandatory) This message is used to notify the management system when a failure has been detected or cleared. The following parameters shall be supplied with this notification:

- The Nature of the Alarm (i.e., see generic trouble list) (mandatory)
- Specific Problems (optional)
- The ID of the Managed Entity Reporting the Alarm (mandatory)
- The Failed Switch Component or List of Failed (or Possibly Failed) Components (mandatory)
- Back-up Status (This is a Boolean indication as to whether or not the failed entity has been backed-up.) (optional)
- Back-up Entity (This is the ID of the managed entity providing back-up services to the failed entity. This parameter shall be NULL when the value of the "Back-up Status" parameter is *false.*) (optional)
- Severity of Failure (critical, major, minor, warning, indeterminate, and cleared) (mandatory)
- Additional Information (optional)
- Proposed Repair Actions (optional)
- Time and Date Failure was Detected (mandatory)

Attribute Value Change: This notification is used to report changes to the Traffic Descriptor Pointer and Segment End-Point attributes of this managed entity . The notification shall identify the attribute that changed, its old value, and its new value. (optional)

Managed Entity Creation: This notification is used to report the creation of an instance of this managed entity. (mandatory)

Managed Entity Deletion: This notification is used to report the deletion of an instance of this managed entity. (mandatory)

State Change: This notification is used to report changes to the Operational State attribute of this managed entity. The notification shall identify the state attribute that changed (i.e., Operational State), its old value, and its new value. (optional)

Relationships

Zero or more instances of the VCL Termination Point managed entity shall exist for each instance of the VPC Termination Point managed entity.

Each instance of this managed entity may be associated with zero or one instance of the same managed entity by the Connectivity Pointer attribute.

Each instance of this managed entity is associated with zero or one instances of the VCC Termination Point managed entity by the Connectivity Pointer attribute.

Each instance of this managed entity is associated with zero or one instances of the Traffic Descriptor managed entity by the Traffic Descriptor Pointer attribute.

This managed entity is related to the ATM Cross Connection managed entity through the Termination Point A and Termination Point Z attributes of the ATM Cross Connection managed entity.

This managed entity is related to the Multipoint Bridge managed entity through the Primary VP/VC Link Termination Point and Common VP/VC Link Termination Point attributes of the Multipoint Bridge managed entity.

This managed entity may have an association with a OAM Continuity Monitor and a OAM Performance Monitor.

3.104. Virtual Path Group

Instances of this managed entity are used to group a set of VPCs with common characteristics. The VPCs of one Virtual Path Group can be distributed over one or more physical interfaces. For each VPC referenced, the related VPCI value is kept.

Instances of this managed entity are created and deleted by request of the managing system.

Attributes

Managed Entity ID: This attribute provides a unique name for the managed entity instance in the superior NNI Access instance. (R, Set-by-Create) (mandatory)

User Label: Assigns an user friendly name to the managed instance. (R, W) (mandatory)

Search Method: Identifies the algorithm to select one of the VPCs. (R, W) (optional)

Assign Non Assign: Indicates whether the exchange is for the VPCs of this instance the assigning or the non-assigning exchange. (R, Set-by-Create) (mandatory)

Assoc. vpTTP and VPCI List: Ordered list containing pointers to vpTTPBidirectional instances and containing the VPCI values associated to every pointer. The VPCI values have to be unique within the superior NNI Access instance. (R, W, A/R) (mandatory)

Actions

No actions have been defined for this managed entity.

Notifications

Attribute Value Change: This notification is used to report changes to the attributes of this managed entity. The notification shall identify the attribute that changed, its old value, and its new value. (optional)

Managed Entity Creation: This notification is used to report the creation of an instance of this managed entity. (mandatory)

Managed Entity Deletion: This notification is used to report the deletion of an instance of this managed entity. (mandatory)

Relationships

Instances of this managed entity are contained by instances of the managed entity NNI Access.

Each instances of this managed entity is associated with zero or more instances of the vpTTPBidirectional (VPC Termination Point) managed entity by the Assoc vpTTP and VPCI List pointer attribute.

This managed entity may be related to Route Data managed entity through the Assoc Group Comp or VPG pointer attribute of the Route Data managed entity.

3.105. VPC Termination Point

This managed entity represents the point in the switch where the VPC and associated overhead (F4 OAM cells) are terminated/originated.

Instances of this managed entity are created and deleted by request of the managing system.

Attributes

Managed Entity ID: This attribute provides a unique name for the managed entity instance in the ATM NE. (R, Set-by-Create) (mandatory)

Operational State: This attribute identifies whether or not the managed entity is capable of performing its normal functions (i.e., in-service or out-of-service). (R) (mandatory)

Administrative State: This attribute is used to activate (unlock) and deactivate (lock) the functions performed by this managed entity. (R, W) (mandatory)

Connectivity Pointer: This attribute serves as a pointer to the VPL Termination Point managed entity instance (in the ATM NE) that supports the instance of this managed entity. (R, Set-by-Create) (mandatory)

Supported Service Categories: This attribute specifies the set of service categories which are supported by the virtual path for virtual channel connections. (R, A/R) (mandatory)

Propagation Delay: This attributes indicates the expected propagation delay (in micro seconds). (R, W) (optional)

Actions

Loopback OAM Cell: This operation is used to request the VPC Termination Point to insert a loopback OAM cell into the ATM cell stream, verify its return, and report the results of the loopback (i.e., passed or failed) back to the management system. Along with each request will be the location where the inserted OAM cell shall loop-back and an indication as to whether a *segment* or *end-to-end* OAM cell shall be used. The Loopback Location Code attribute value of the UNI, BICI, or BISSI where the loopback is to take place may be used to identify the loopback location. Additionally, a globally unique default value (e.g., "end-point") may also be used to perform a loopback at the other end of the VPC. (mandatory)

Notifications

Alarm: (mandatory) This message is used to notify the management system when a failure has been detected or cleared. The following parameters shall be supplied with this notification:

- The Nature of the Alarm (i.e., see generic trouble list) (mandatory)
- Specific Problems (optional)
- The ID of the Managed Entity Reporting the Alarm (mandatory)
- The Failed Switch Component or List of Failed (or Possibly Failed) Components (mandatory)
- Back-up Status (This is a Boolean indication as to whether or not the failed entity has been backed-up.) (optional)
- Back-up Entity (This is the ID of the managed entity providing back-up services to the failed entity.

  This parameter shall be NULL when the value of the "Back-up Status" parameter is *false*.) (optional)
- Severity of Failure (critical, major, minor, warning, indeterminate, and cleared) (mandatory)
- Additional Information (optional)
- Proposed Repair Actions (optional)
- Time and Date Failure was Detected (mandatory)

Attribute Value Change: This notification is used to report changes to the attributes of this managed entity (except the Managed Entity ID attribute). The notification shall identify the attribute that changed, its old value, and its new value. (optional)

Managed Entity Creation: This notification is used to report the creation of an instance of this managed entity. (mandatory)

Managed Entity Deletion: This notification is used to report the deletion of an instance of this managed entity. (mandatory)

State Change: This notification is used to report changes to the Operational State attribute of this managed entity. The notification shall identify the state attribute that changed, its old value, and its new value. (optional)

Relationships

Zero or more instances of the VPC Termination managed entity shall exist for each instance of the ATM NE managed entity.

Each instance of this managed entity is associated with one instances of the VPL Termination Point managed entity by the Connectivity Pointer attribute.

This managed entity is related to the DSS2 Access Signaling Channel Termination Point managed entity through the VPCIs and VPs pointer attributes of the DSS2 Access Signaling Channel Termination Point managed entity.

This managed entity is related to the Virtual Path Group managed entity through the Assoc vpTTP and VPCI List pointer attributes of the Virtual Path Group managed entity.

This managed entity may have an association with a OAM Continuity Monitor and a OAM Performance Monitor.

Zero or one instance of the ATM Access Profile managed entity shall be contained in the VPC Termination Point managed entity.

3.106. VPCI Termination Point

Provides information on and management of an ATM VP connection that is used for SVC bearer channels. It will be identified by a Virtual Path Connection Identifier (VPCI) that is unique among the VPCIs controlled by their associated link sets. VPCI management is associated with the use of BISUP.

Instances of this managed entity are created and deleted by request of the managing system.

Attributes

Managed Entity ID: This attribute provides a unique name for the managed entity instance in the ATM NE. (R, Set-by-Create) (mandatory)

Configuration (mandatory)

> VPCI: identifier integer (mandatory) (R)
>
> Assigning Node: TRUE if the NE is the assigning node for this VPCI. If not specified, the ATM NE having the higher SPC value is the assigning node for all even numbered VPCI values, and is the non-assigning node for all odd numbered VPCI values. (R, Set-by-Create) (mandatory)

Administrative State: Allows the VPCI to be activated (unlocked) or deactivated (locked or shutting down). If locked, no connections, except test connections, may exist for the VPCI, if shutting down, the VPCI is not available for new SVC. The administrative state may be set to locked, shutting down, or unlocked either by a management system or automatically by the ATM NE. Unlocking requires confirmation from the remote signaling entity before it becomes locally effective. (R, W) (mandatory)

Remote Blocking Indication: This attribute indicates the remote blocking state of the virtual path. A blocked virtual path cannot be selected for new non-test traffic. However it can be used for test calls. The blocking of a virtual path has no influence on existing calls (non-test calls and test calls). (R) (optional)

Actions

No actions have been defined for this managed entity.

Notifications

Attribute Value Change: This notification is used to report changes to the attributes of this managed entity (except the Managed Entity ID attribute). The notification shall identify the attribute that changed, its old value, and its new value. (optional)

Managed Entity Creation: This notification is used to report the creation of an instance of this managed entity. (mandatory)

Managed Entity Deletion: This notification is used to report the deletion of an instance of this managed entity. (mandatory)

Remote Blocking Unconfirmed: Timer T12b expired after a request to initiate blocking on a VPCI was sent to a remote signaling entity. (optional)

Unblocking Failure: Timer T14b expired after a request to remove blocking on a VPCI was sent to a remote signaling entity. Local unlocking did not occur. (optional)

State Change: This notification is used to report changes to the Operational State attribute of this managed entity. The notification shall identify the state attribute that changed, its old value, and its new value. Sent when the managed system automatically initiates VPCI blocking. (mandatory)

Relationships

Instances of the VPCI Termination Point managed entity are contained by each VPC that may contain SVC bearer connections. These objects are required for all interoffice VPCs used to carry SVC bearer channels that are controlled by signaling links using BISUP managed entities.

3.107. VPL Termination Point

This managed entity is used to represent the termination of VP links on an ATM NE. An instance of the ATM Cross Connection managed entity may be used to relate two instances of the VPL Termination Point managed entity (i.e., for point-to-point cross connection) or an instance of the VPL Termination Point managed entity to an instance of the Multipoint Bridge managed entity (i.e., for multipoint cross connection).

Instances of this managed entity are created and deleted by request of the managing system.

Attributes

Managed Entity ID: This attribute provides a unique name for the managed entity instance in the ATM NE. (R, Set-by-Create) (mandatory)

VPI Value: This attribute identifies the VPI value associated with the VP link being terminated. (R) (mandatory)

VPL Service Type: Identifies the VPL as supporting PVC VP service, PVC VC service, or other. (R) (mandatory)

Traffic Descriptor Pointer: This attribute serves as a pointer to the instance of the Traffic Descriptor managed entity which contains the traffic parameters used for this VPL Termination Point, the value of this pointer may be null. (R, W) (mandatory).

Operational State: This attribute identifies whether or not the VPL termination is capable of performing its normal functions (in-service or out-of-service). (R) (mandatory)

Segment End Point: This Boolean attribute indicates whether or not the VPL Termination Point managed entity instance has been configured to represent a VPC Segment End Point. (R, W) (mandatory)

Connectivity Pointer: This attribute serves as a pointer to the instance of the VPL Termination Point managed entity (in the ATM NE) to which it is cross-connected, or, if it represents the last virtual path link termination in the VPC, it serves as a pointer to the corresponding instance of a VPC Termination Point managed entity in the ATM NE. (R, Set-by-Create) (mandatory)

Alarm Status: Indicates highest level outstanding alarm (or “cleared”) that applies to the entire link set. (R) (mandatory)

Current Problem List: The Current Problem List attribute type identifies the current existing problems, with severity, associated with the managed entity. (R) (mandatory)

Alarm Severity Assignment Profile Pointer: This attribute provides a pointer to the instance of the Alarm Severity Assignment Profile managed entity that contains the severity assignments for the alarms reported by this managed entity. When the value of this attribute is set to NULL, default severity assignments shall be used. (R, W) (optional)

Actions

Loopback OAM Cell: This operation is used to request the VPL Termination Point to insert a loopback OAM cell into the ATM cell stream, verify its return, and report the results of the loopback (i.e., passed or failed) back to the management system. Along with each request will be the location where the inserted OAM cell shall loop-back and an indication as to whether a *segment* or *end-to-end* OAM cell shall be used. The Loopback Location Code attribute value of the UNI, BICI, or BISSI where the loopback is to take place may be used to identify the loopback location. Additionally, a globally unique default value (e.g., "end-point") may also be used to perform a loopback at the end of the VPC. (mandatory)

Notifications

Alarm: (mandatory) This message is used to notify the management system when a failure has been detected or cleared. The following parameters shall be supplied with this notification:

- The Nature of the Alarm (i.e., see generic trouble list) (mandatory)

- Specific Problems (optional)
- The ID of the Managed Entity Reporting the Alarm (mandatory)
- The Failed Switch Component or List of Failed (or Possibly Failed) Components (mandatory)
- Back-up Status (This is a Boolean indication as to whether or not the failed entity has been backed-up.) (optional)
- Back-up Entity (This is the ID of the managed entity providing back-up services to the failed entity.

  This parameter shall be NULL when the value of the "Back-up Status" parameter is *false*.) (optional)
- Severity of Failure (critical, major, minor, warning, indeterminate, and cleared) (mandatory)
- Additional Information (optional)
- Proposed Repair Actions (optional)
- Time and Date Failure was Detected (mandatory)

Attribute Value Change: This notification is used to report changes to the Traffic Descriptor Pointer and Segment End-Point attributes of this managed entity . The notification shall identify the attribute that changed, its old value, and its new value. (optional)

Managed Entity Creation: This notification is used to report the creation of an instance of this managed entity. (mandatory)

Managed Entity Deletion: This notification is used to report the deletion of an instance of this managed entity. (mandatory)

State Change: This notification is used to report changes to the Operational State attribute of this managed entity. The notification shall identify the state attribute that changed (i.e., Operational State), its old value, and its new value. (optional)

Relationships

Zero or more instances of the VPL Termination Point managed entity shall exist for each instance of the TC Adaptor managed entity.

Each instance of this managed entity may be associated with zero or one instance of the same managed entity by the Connectivity Pointer attribute.

Each instance of this managed entity is associated with zero one instances of the VPC Termination Point managed entity by the Connectivity Pointer attribute.

Each instance of this managed entity is associated with zero or one instances of the Traffic Descriptor managed entity by the Traffic Descriptor Pointer attribute.

This managed entity is related to the ATM Cross Connection managed entity through the Termination Point A and Termination Point Z attributes of the ATM Cross Connection managed entity.

This managed entity is related to the Multipoint Bridge managed entity through the Primary VP/VC Link Termination Point and Common VP/VC Link Termination Point attributes of the Multipoint Bridge managed entity.

This managed entity may have an association with a OAM Continuity Monitor and a OAM Performance Monitor.

Acronyms

AAL	ATM Adaptation Layer
ACR	Allowed Cell Rate
ADSL	Asymmetrical Digital Subscriber Loop
ADTF	Allowed cell rate Decrease Time Factor
ABR	Available Bit Rate
AIS	Alarm Indication Signal
AESA	ATM End System Address
APC	Adjacent Point Code
ATM	Asynchronous Transfer Mode
ATMF	ATM Forum
BGAK	Begin Acknowledge (PDU)
BGN	Begin (PDU)
BGREJ	Begin Rejected (PDU)
BHLI	Broadband High Layer Information
BICI	Broadband Inter Carrier Interface
BISDN	Broadband Integrated Services Digital Network
BISSI	Broadband Inter Switching System Interface
BISUP	Broadband ISDN User Part
BLLI	Broadband Low Layer Information
BOM	Beginning Of Message
BOMS	Beginning Of Message Segment
BT	Burst Tolerance
BTAG	Beginning TAG
CAC	Call Access Control
CBR	Constant Bit Rate
CDF	Cutoff Decrease Factor
CCITT	Consultative Committee on International Telephone & Telegraph
CDV	Cell Delay Variation
CDVT	Cell Delay Variation Tolerance
CES	Circuit Emulation Service
CIC	Carrier Identification Code
CIP	Carrier Identification Parameter
CgPN	Calling Party Number
CLEI	Common Language Equipment Identifier
CLIP	Calling Line Identification Present
CLIR	Calling Line Identification Restriction
CLP	Cell Loss Priority
CLR	Cell Loss Ratio
CM	Configuration Management
CMIP	Common Management Information Protocol
COLP	COnnected Line identification Present
COLR	COnnected Line identification Restriction
COM	Continuation of Message
COMS	Continuation of Message Segment
CP	Common Part
CPCS	Common Part Convergence Sublayer
CPCS-CI	Common Part Convergence Sublayer Congestion Indication
CPE	Customer Premises Equipment
CR	Conditional Requirement
CRC	Cyclic Redundancy Check

CS	Convergence Sublayer
CTD	Cell Transfer Delay
CV	Coding Violation
D	Default
DN	Directory Number
DPC	Destination Point Code
DS0	Digital Signal 0
DS1	Digital Signal 1
DS3	Digital Signal 3
DSS2	Digital Signaling System 2
E3	European 3
EFCI	Explicit Forward Congestion Indication
EFD	Event Forwarding Discriminator
EML	Element Management Layer
EL	Element Layer
EOM	End Of Message
EOMS	End Of Message Segment
ER	Error Recovery (PDU)
ERAK	Error Recovery Acknowledge (PDU)
ES	Errored Second
ETAG	Ending TAG
ETS	European Telecommunication Standard
FE	Far End
ETSI	European Telecommunication Standard Institute
FEC	Forward Error Correction
FFS	For Further Study
FM	Fault Management
FRTT	Fixed Round Trip Time
GCRA	Generic Cell Rate Algorithm
GR	Generic Requirement
HEC	Header Error Control
IAM	Initial Address Message
ICR	Initial Cell Rate
IETF	Internet Engineering Task Force
ILMI	Integrated Local Management Interface
IMD	Information Model Details
IME	ILMI Management Entity
ISC	International Switching Center
ISDN	Integrated Services Digital Network
ITU	International Telecommunications Union
ITU-T	International Telecommunications Union Technical Committee
IWF	Inter-Working Function
IWU	Inter-Working Unit
J2	Japan 2
LATA	Local Access and Transport Area
LCD	Loss of Cell Delineation
LOF	Loss Of Frame
LOP	Loss Of Pointer
LOS	Loss Of Signal
LP	Loss Priority
MAA	Management ATM Adaptation
MBS	Maximum Burst Size
MCR	Minimum Cell Rate
MIB	Management Information Base

MID	Message Identifier
MSU	Message Signal Unit
MTP	Message Transfer Part
NE	Network Element
NEL	Network Element Layer
NEML	Network Element Management Layer
NML	Network Management Layer
NMS	Network Management System
NNI	Network Network Interface
NPC	Network Parameter Control
NRP	Number of Retransmitted PDUs
nrt	Non-Real-Time
O	Optional requirement
OAM	Operations, Administration, and Maintenance
OAM&P	Operations, Administration, Maintenance, and Provisioning
OCD	Out of Cell Delineation
OLI	Originating Line Information
OLIP	Originating Line Information Parameter
OPC	Originating Point Code
OSI	Open Systems Interconnect
PCM	Pulse Code Modulation
PCR	Peak Cell Rate
PDH	Pliesieochronous Digital Hierarchy
PDU	Protocol Data Unit
PLCP	Physical Layer Convergence Protocol
PM	Performance Management
PMD	Physical Media Dependent
PNNI	Private Network to Network Interface
PTI	Payload Type Identifier
PVC	Permanent Virtual Circuit
QoS	Quality of Service
RRequirement or Readable only	
RAI	Remote Alarm Indication
RDF	Rate Decrease Factor
RDI	Remote Defect Indication
RIF	Rate Increase Factor
RS	ReSynchronization (PDU)
RSAK	Resynchronization Acknowledge (PDU)
rt	Real-Time
SAAL	Signaling AAL
SAR	Segment And Reassembly
SCR	Sustainable Cell Rate
SD	Sequenced Data (PDU)
SDH	Synchronous Digital Hierarchy
SDT	Structured Data Transfer
SDU	Service Data Unit
SEP	Signaling End Point
SES	Severely Errored Second
SLC	Signaling Link Code
SLS	Signaling Link Set
SM	Security Management or Streaming Mode
SMDS	Switched Megabit Data Service
SN	Sequence Number
SNMP	Simple Network Management Protocol

SONET	Synchronous Optical NETwork
SPC	Signaling Point Code
SREC	Synchronization Recovery (PDU)
SRTS	Synchronous Residual Time Stamp
SS7	Signaling System 7
SSCF	Service Specific Coordination Function
SSCOP	Service Specific Connection Oriented Protocol
SSCS	Service Specific Convergence Sublayer
SSM	Single Segment Message
STAT	Solicited Status Response (PDU)
STP	Signal Transfer Point
STS-3c	Synchronous Transport Signal 3c
SVC	Switched Virtual Circuit
SVCC	Switched Virtual Channel Connection
SVPC	Switched Virtual Path Circuit
Tnb	Timer #n
TAXI	Transparent Asynchronous Xmitter-receiver Interface
TBD	To Be Determined
TBE	Transient Buffer Exposure
TC	Transmission Convergence
TCA	Threshold Crossing Alert
TFP	TransFer Prohibited
TLA	Three Letter Anchronym
TMN	Telecommunications Management Network
TNS	Transit Network Selection
TP	Termination Point
TTP	Trail Termination Point
UAS	UnAvailable Second
UBR	Unspecified Bit Rate
UDT	Unstructured Data Transfer
UNI	User Network Interface
UPC	User Parameter Control
VBR	Variable Bit Rate
VC	Virtual Channel
VCC	Virtual Channel Connection
VCI	Virtual Channel Identifier
VCL	Virtual Channel Link
VP	Virtual Path
VPC	Virtual Path Connection
VPCI	VPC Identifier
VPG	Virtual Path Group
VPI	Virtual Path Identifier
VPL	Virtual Path Link
VR	Receiver State Variable
VS/VD	Virtual Source / Virtual Destination
WATM	Wireless ATM

Appendix A: PM calculations

This informative appendix demonstrates Relationships between certain performance related measurements specific to this document and certain cell transfer performance parameters and objectives of ITU-T Recommendation I.356.

The following relations assume that Peak Cell Rate (PCR) values are known in cells/second, and use the equivalence of 15 minutes to 900 seconds.

A.1 Utilization factor for the incoming direction on a designated ATM interface (i.e., a UNI, BICI or BISSI)

$$\text{Utilization Factor (Incoming)} = \frac{\text{15 minute count of cells received at the ATM interface}}{\text{PCR of the ATM interface} \times \text{900 seconds}}$$

This calculation can be performed for any ATM interface using the data specified by the items of **PM-1**, where the appropriate item is selected according to the appropriate interface type. Similarly, the utilization factor for the outgoing direction on any ATM interface can be found using this type of relation and the data specified by the items of **PM-1**.

Consider the accuracy of utilization factors estimated through this relation. For a DS3 that delineates cells by means of the Physical Layer Convergence Protocol (PLCP), the PCR of such an interface is 96,000 cells/second. Hence such an interface operating at the maximum possible utilization factor of 1.00 would pass 8.64×10^7 cells in 15 minutes, and therefore this relation permits the average utilization factor for a specified direction on such an interface during any 15 minute interval to be determined within better than the two significant figures usually needed for busy period determinations and other traffic engineering purposes.

Similarly for an STS-3c, the PCR of such an interface is 353,207.5 cells/second, and it would pass about 3.18×10^8 cells in 15 minutes when operating at a utilization factor of 1.00. Hence this relation also permits determination of the average utilization factor for a specified direction on an STS-3c based interface during any 15 minute interval to be determined well within an accuracy of two significant figures.

A.2 Utilization factor for the incoming direction on a designated VCL associated with a VCC that is a PVC

$$\text{Utilization Factor (Incoming)} = \frac{\text{15 minute count of cells received at the VCL}}{\text{PCR of the VCL} \times \text{900 seconds}}$$

This calculation can be performed for any such VCL using the data specified by the first item of **PM-57**. In the case of a non-symmetric VCC, the PCR of this VCL for its incoming direction would differ from the PCR for its outgoing direction, and the denominator of this relation would be correspondingly modified to indicate use of this VCL's PCR for the incoming direction. However, **PM-57** would remain unaffected by such non-symmetry.

Similarly, the utilization factor for the outgoing direction on a VCL associated with a VCC that is a PVC can be found using this type of relation and the second item of **PM-57**. And likewise, the respective utilization factors for the incoming and outgoing directions on a VPL associated with a VPC that is a PVC can be found using this type of relation and the data specified by the third and fourth items of **PM-57**.

Consider the accuracy of utilization factors estimated through this relation. A VCL having an available capacity for user information transfer of 1.544 Mbps would require a PCR[7] of close to 4,100 cells/second. Hence such a VCL

[7] For a VCL of this capacity, a PCR of 4,021 cells/second would be calculated if no provision is made for AAL and OAM cell overheads. Bellcore's [GR-1110] allows for such overheads, and specifies a corresponding PCR of 4,140 cells/second.

operating at the maximum utilization factor of 1.00 would pass about 3.7×10^6 cells in 15 minutes. Therefore this relation permits the average utilization factor for a specified direction on such a VCL during any 15 minute interval to be determined well within an accuracy of the two significant figures usually needed.

A.3 Cell Loss Ratio (CLR) due to congestion at a designated ATM interface (i.e., a UNI, BICI or BISSI)

$$CLR = \frac{\text{15 minute count of (CLP =0+1) cells discarded due to congestion at the ATM interface}}{\text{15 minute count of cells transmitted at the ATM interface}}$$

This calculation can be performed for any ATM interface using the data specified by the appropriate item in **PM-1** (sub item 5 as the numerator and sub item 4 as the denominator). The resulting CLR applies to the combined (CLP =0+1) cell flow on an ATM interface. The CLR estimated in this manner is for the direction of transmission away from the ATM NE that had provided the data specified in **PM-1**.

Consider the accuracy of CLR values estimated through this relation. It was noted in Section A.1 that a DS3 using a PLCP and operating at a utilization factor of 1.00 would pass 8.64×10^7 cells in 15 minutes. If one postulates a utilization factor of 0.50 and a count of one cell lost in a 15 minute period, then the above relation yields a CLR estimate of about 2×10^{-8}.

It is useful to relate this CLR estimate with the CLR objectives contained in ITU-T Recommendation I.356 [I.356] . Recommendation I.356 indicates an end-to-end CLR objective over an international connection of 3×10^{-7} for Virtual Connections belonging to its QoS Class 1 (stringent class) and 1×10^{-5} for Virtual Connections belonging to its QoS Class 2 (tolerant class). It should be noted that only a fraction of such an end-to-end CLR objective would generally be allocated to a single ATM NE, and hence directly comparable to the CLR estimate given in the above paragraph. One may reasonably infer that the above relation and the relevant items in **PM-1** permit the determination, based upon the data from one 15 minute collection interval, of whether or not an ATM interface of DS3 capacity is operating in a manner that can support the CLR objective of Recommendation I.356's QoS Class 2. There may reasonably be less certainty about a similar determination for the CLR objective for QoS Class 1.

Consider next ATM interfaces of greater capacity. It was noted in Section A.1 that an STS-3c operating at a utilization factor of 1.00 would pass 3.18×10^8 cells in 15 minutes. If one postulates a utilization factor of 0.50 and a count of one cell lost in a 15 minute period, the above relation yields a CLR estimate of about 6×10^{-9}. One may infer with greater certainty that the above relation and the relevant items in **PM-1** permits the determination, based upon the data from one 15 minute collection interval, of whether on not an ATM interface of DS3 capacity is operating in a manner that can support the CLR objective of Recommendation I.356's QoS Class 1.

A.4 Cell Loss Ratio (CLR) across an ATM NE in a designated direction on a designated VCC that is a PVC

Identify for a point-to-point VCC under consideration its two Virtual Channel Links (VCLs) which appear at appropriate ATM interfaces of this ATM NE, as illustrated in Figure A-1. With respect to the designated direction of transmission, let VCLa denote the VCL supporting transmission for this VCC in the direction incoming to this ATM NE, and let VCLb denote the VCL supporting transmission for this VCC in the direction outgoing from this ATM NE.

Assume, as specified by items in PM-50, that counts of the cells received at the designated VCLa and counts of the cells transmitted at the designated VCLb are collected for one or more 15 minute periods. Then the following quantities can be determined:

cells lost count = count of cells received on VCLa - count of cells transmitted on VCLb

$$CLR = \frac{\text{cells lost count}}{}$$

count of cells received on VCLa

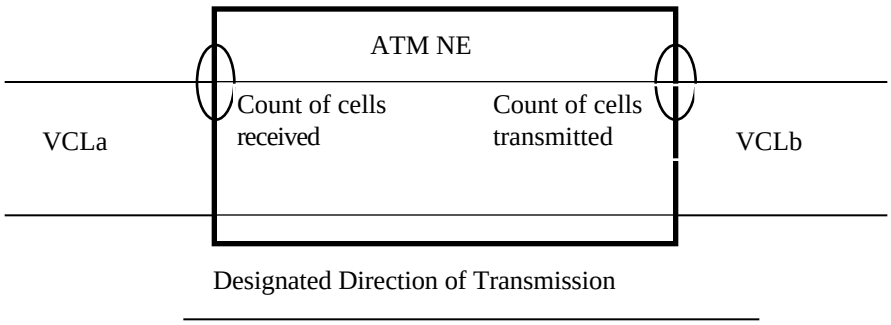

Figure A-1 Estimation of CLR for a VCC

The CLR estimated in this manner applies to the combined cell flow (CLP =0+1) on the designated VCC. Similar quantities can be obtained for the opposite direction of transmission on this VCC. Also, similar quantities can be obtained for each direction of transmission on a point-to-point VPC that is a PVC .

The cells lost count identified above includes cells lost on a designated VCC (or VPC) at an ATM NE due to all causes - the most significant of which is often congestion. Where necessary, it is possible to also investigate the relative numbers of cells lost due to congestion, cells lost due to discarding action by the UPC/NPC (via appropriate), and cells lost due to Header Error Check violations and ATM protocol errors. Note that **PM-1** provides data, but on an ATM interface basis only, concerning the number of cells lost due to Header Error Check violations and ATM protocol errors.

Consider the accuracy of CLR estimates obtained through these relations. It was noted in Section 3.2 that a VCL having an available capacity for user information transfer of 1.544 Mbps would require a PCR of close to 4,100 cells/second, and that such a VCL when operating at its maximum utilization factor of 1.00 would pass about 3.7 x 10^6 cells in 15 minutes. Postulating a VCL utilization factor of 0.50, a cells lost count of one, and a single 15 minute period, the above relation yields a CLR estimate of about 5 x 10^{-7}.

Comparing this CLR estimate with the end-to-end CLR objective of 1 x 10^{-5} for the QoS Class 2 of Recommendation I.356, and noting that further subdivision of this objective is needed to reflect its allocation to a single ATM NE, it appears that CLR estimates of this accuracy would be useful in determining whether or not a VCL is operating in a manner that can support the CLR objective of Recommendation I.356's QoS Class 2.

However, a similar comparison with the more stringent end-to-end CLR objective of 3 x 10^{-7} for the QoS Class 1 of Recommendation I.356, does not support a similar conclusion. It appears necessary to aggregate the relevant counts over multiple VCLs (or over multiple 15 minute periods within the same busy period) before making a like determination for the QoS Class 1 CLR objective.

Appendix B: BISSI, BICI, UNI, & UNI Info Summary

The similarity of attributes in the BISSI, BICI, UNI, UNI Info and the interface associated ATM Access Profile managed entities can make comparisons among these managed entities difficult. The following table is provided to help the reader make such comparisons. Attributes and notifications are listed in the left column. The remaining columns, one per managed entity, show which attributes and notifications are supported. VPCs, VCCs, VPI Bits and VCI Bits are provided for the interface entities by using the ATM Access Profile managed entity. The following notation is used:

M or M(n)	Mandatory or Mandatory, see note "n"
O	Optional
C(n)	Conditional, see note "n"
	Not supported
X	Supported, optional or mandatory not specified.

Attributes		BICI	BISSI	UNI	UNI Info
Managed Entity ID		M	M	M	M
TC Adaptor ID		M	M	M	–
ATM Termination Pointer		–	–	–	M
VPCs	Local Max	M	M	M(1)	C(2)
	Actual Max	M	M	M(1)	C(2)
VCCs	Local Max	M	M	M(1)	C(2)
	Actual Max	M	M	M(1)	C(2)
VPI Bits	Local Max	M	M	M(1)	–
	Network Max	–	–	–	C(2)
	Actual	M	M	M(1)	C(2)
VCI Bits	Local Max	M	M	M(1)	C(2)
	Actual	M	M	M(1)	C(2)
Far End Carrier Network		M	–	–	–
Loopback Location Code		M	M	M	–
SVCC VPI	Local Max				C(3)
	Actual Max				C(3)
SVCC VCI	Local Min				C(3)
	Actual Min				C(3)
ILMI Channel Pointer					C(4)
ILMI Establishment Connectivity Poll Interval					O
ILMI Check Connectivity Poll Interval					O
ILMI Connectivity Poll Factor					O
ILMI Connectivity State					O
Signaling Channel Pointer					C(5)
Charge Number					O
Originating Line Information					O
Notifications	Attr. Val. Chg	X	X	X	X
	Create/Del	X	X	X	X

(1) If single-user UNI, use for ILMI

(2) For multiple-user case only, mandatory if ILMI is active, otherwise optional

(3) Mandatory with ILMI active and SVC service, otherwise optional

(4) Mandatory with ILMI active, otherwise not used
(5) Mandatory for SVC Service in multi-user case, otherwise optional

Appendix C: Managed Entity Creation-Deletion Summary

This chart summarizes what can and cannot create or delete the managed entities. The options include the Network Element (NE) and the Managing System (MS). In the case of the MS, the MS makes the creation or deletion request to the NE which then performs the required function. A Yes indicates that the MS or NE can perform the function. A NO indicates that the MS or NE is not allowed to perform the function. Note that for a few managed entities, the NE can only create them at system initialization.

Managed Entity	MS Create	MS Delete	NE Create	NE Delete
AA1 Profile	Yes	Yes	No	No
AA1 Protocol Current Data	No	No	Yes	Yes
AAL1 Protocol History Data	No	Yes	Yes	Yes
AAL3/4 Profile	Yes	Yes	No	No
AAL3/4 Protocol Current Data	No	No	Yes	Yes
AAL3/4 Protocol History Data	No	Yes	Yes	Yes
AAL5 Profile	Yes	Yes	No	No
AAL5 Protocol Current Data	No	No	Yes	Yes
AAL5 Protocol History Data	No	Yes	Yes	Yes
ABR	Yes	Yes	No	No
ABR Feedback Control	No	No	Yes	Yes
Abstract Destination	Yes	Yes	No	No
Alarm Record	No	Yes	Yes	Yes
Alarm Severity Assignment Profile	Yes	Yes	Yes[1]	No
Analysis Criteria	Yes	Yes	No	No
ATM Access Profile	Yes	Yes	Yes[1]	No
ATM Cell Protocol Monitoring Current Data	No	No	Yes	Yes
ATM Cell Protocol Monitoring History Data	No	Yes	Yes	Yes
ATM Cell Protocol Monitoring Log Record	No	Yes	Yes	Yes
ATM Cross Connection	Yes	Yes	No	Yes
ATM Cross Connection Control	No	No	Yes[1]	No
ATM MTP Signaling Point	Yes	Yes	No	No
ATM NE	No	No	Yes[1]	No
ATM Signaling Link Set Termination Point	Yes	Yes	No	No
ATM Signaling Link Termination Point	Yes	Yes	No	No

Managed Entity	MS Create	MS Delete	NE Create	NE Delete
ATM Traffic Load Current Data	Yes	Yes	Yes	Yes
ATM Traffic Load History Data	No	Yes	Yes	Yes
Attribute Value Change Record	No	Yes	Yes	Yes
BICI	Yes	Yes	No	No
BISSI	Yes	Yes	No	No
BISUP Access Point	Yes	Yes	No	No
BISUP Signaling Point	Yes	Yes	No	No
BISUP Timers Profile	Yes	Yes	Yes[1]	No
Calling Line Identification Presentation Dependent	Yes	Yes	No	No
Calling Line Identification Restriction Dependent	Yes	Yes	No	No
Calling Number Screening	Yes	Yes	No	No
Call Routing Office Data	No	Yes	Yes[1]	No
Carrier Data	Yes	Yes	No	No
CBR	Yes	Yes	No	No
CES Service Profile	Yes	Yes	No	No
Congestion Discard Current Data	No	No	Yes	Yes
Congestion Discard History Data	No	Yes	Yes	Yes
Connected Line Identification Presentation Dependent	Yes	Yes	No	No
Connected Line Identification Restriction Dependent	Yes	Yes	No	No
Connected Number Screening	Yes	Yes	No	No
CUG Independent	Yes	Yes	No	No
CUG Subscription Option Dependent	Yes	Yes	No	No
Customer Profile	Yes	Yes	No	No
Customized Resource	Yes	Yes	No	No
Diagnostic Control	Yes	Yes	No	No
Digit Manipulation	Yes	Yes	No	No
Direct Dialing In Independent	Yes	Yes	No	No
Directory Number AESA	Yes	Yes	No	No
Directory Number E.164	Yes	Yes	No	No
DSS2 Access Signaling Channel Termination Point	Yes	Yes	No	No
Equipment	Yes	Yes	Yes	No
Equipment Holder	Yes	No	Yes	No
Event Forwarding Discriminator	Yes	Yes	Yes[1]	No

Managed Entity	MS Create	MS Delete	NE Create	NE Delete
Group Combination	Yes	Yes	No	No
Interworking VCC Termination Point	Yes	Yes	Yes	Yes
Latest Occurrence Log	No	No	Yes	No
List of Route TPs	Yes	Yes	No	No
Local Destination	Yes	Yes	No	No
Log	No	No	Yes	No
Managed Entity Creation Log Record	No	Yes	Yes	Yes
Managed Entity Deletion Log Record	No	Yes	Yes	Yes
MTP3b Access Point	Yes	Yes	No	No
Multiple Subscriber Number Independent	Yes	Yes	No	No
Multipoint Bridge	Yes	Yes	Yes	Yes
NNI Access	Yes	Yes	No	No
OAM Continuity Monitor	Yes	Yes	Yes	Yes
OAM Performance Monitor	Yes	Yes	Yes	Yes
OAM VP-VC Current Data	No	Yes	Yes	Yes
OAM VP-VC History Data	No	Yes	Yes	Yes
Physical Path Termination Point	Yes	Yes	Yes	No
Plug-in Units	Yes	Yes	Yes	No
Post Analysis Evaluation	Yes	Yes	No	No
Route Data	Yes	Yes	No	No
SAAL NNI Protocol Profile	Yes	Yes	Yes	No
SAAL UNI Protocol Profile	Yes	Yes	Yes	No
Signaling Route Set NE Part	Yes	Yes	No	No
Signaling Route NE Part	Yes	Yes	No	No
Signaling VCC Termination Point	Yes	Yes	No	No
Software	Yes	Yes	Yes	Yes
SSCOP Current Data	Yes	Yes	Yes	Yes
SSCOP History Data	No	Yes	Yes	Yes
State Change Record	No	Yes	Yes	Yes
Sub Addressing Dependent	Yes	Yes	No	No
TC Adaptor	Yes	Yes	Yes	No
TC Adaptor Protocol Monitoring Current Data	No	Yes	Yes	Yes
TC Adaptor Protocol Monitoring History Data	No	Yes	Yes	Yes

Managed Entity	MS Create	MS Delete	NE Create	NE Delete
Threshold Data	Yes	Yes	Yes[1]	No
Traffic Descriptor	Yes	Yes	Yes[1]	No
UBR	Yes	Yes	No	No
UNI	Yes	Yes	No	No
UNI Info	Yes	Yes	No	No
UPC/NPC Disagreement Monitoring Current Data	Yes	Yes	Yes	Yes
UPC/NPC Disagreement Monitoring History Data	No	Yes	Yes	Yes
User Data	Yes	Yes	No	No
User To User Signaling Dependent	Yes	Yes	No	No
VBR	Yes	Yes	No	No
VCC Termination Point	Yes	Yes	No	No
VCL Termination Point	Yes	Yes	No	No
Virtual Path Group	Yes	Yes	No	No
VPC Termination Point	Yes	Yes	No	No
VPCI Termination Point	Yes	Yes	No	No
VPL Termination Point	Yes	Yes	No	No

Note 1: The ATM NE can only create these managed entities at ATM NE initialization.

Appendix D: References

1. [af-bici-0013.001] ATM Forum, BISDN Inter-Carrier Interface (BICI) Specification, Version 1.0, August 1993, plus Supplement 1.1, August 1994.
2. [af-bici-0013.002] ATM Forum, Broadband Inter-Carrier Interface Specification, Version 2.0, December 1995.
3. [af-ilmi-0065.000] ATM Forum, Integrated Local Management Interface (ILMI) Specification, Version 4.0, July 1996.
4. [af-nm-0058.000] ATM Forum, M4 Network View Interface Requirements and Logical MIB.
5. [af-nm-0071.000] ATM Forum, ATM Adaptation Layer (AAL) Requirements and Logical MIB, Version 1.0, December 1996.
6. [af-nm-0072.000] ATM Forum, Circuit Emulation Service Requirements and Logical MIB, Version 1.0, December 1996.
7. [af-nm-0074.000] ATM Forum, M4 Network View Requirements and Logical MIB addendum, January 1977.
8. [af-phy-029.000] ATM Forum, ATM Forum 6,312 KBPS UNI Specification, June 1995.
9. [af-sig-0061.000] ATM Forum, ATM UNI Signaling Specification 4.0, July 1996.
10. [af-test-nm-0094.000] ATM Test Access Function (ATAF) Specification Version 1.0, February 1998.
11. [af-tm-0056.000] ATM Forum, Traffic Management Specification 4.0, April 1996.
12. [af-vtoa-0078.000] ATM Forum, Circuit Emulation Service Interoperability, Version 1.0, January 1997.
13. [af-uni-0010.002] ATM Forum, ATM User-Network Interface Specification, Version 3.1, 1994.
14. [af-uni-0010.003] ATM Forum, ATM User-Network Interface Specification, Version 4.0.
15. [E.164] ITU-T Recommendation E.164, Numbering plan for the ISDN era, August 1991.
16. [G.703] ITU-T Recommendation G.703, General Aspect of Digital Transmission Systems: Terminal Equipment, Physical/Electrical Characteristics of Hierarchical Digital Interfaces, Geneva, 1991.
17. [G.704] ITU-T Recommendation G.704, General Aspect of Digital Transmission Systems: Terminal Equipment, Synchronous Frame Structures used at Primary and Secondary Hierarchical Levels, Geneva, 1991.
18. [G.706] ITU-T Recommendation G.706, General Aspect of Digital Transmission Systems: Terminal Equipment, Frame Alignment and Cycle Redundancy Check (CRC) Procedures relating to Basic Frame Structure Defined in Recommendation G.704, Geneva, 1991.
19. [G.732] ITU-T Recommendation G.732, Characteristics of Primary PCM Multiplexing Equipment Operating at 2048 KBPS, Blue Book Fascicle III.4, Geneva, 1989.
20. [G.774-01] ITU-T Recommendation G.774-01, Synchronous Digital Hierarchy (SDH) Performance Monitoring for the Network Element View, January 1994.
21. [G.804] ITU-T Recommendation G.804, Digital Networks, Transport of SDH Elements on PDH Network: Frame and Multiplexing Structures, November 1993.
22. [G.823] ITU-T Recommendation G.823, The Control of Jitter and Wander within Digital Networks which are based on the 2048 KBPS Hierarchy, Blue Book Fascicle III.5, Geneva, 1989.
23. [G.826] ITU-T Recommendation G.826, Digital Networks, Error Performance Parameters and Objectives for International, Constant Bit Rate Digital Paths at or above the Primary Rate, November 1993.
24. [G.832] ITU-T Recommendation G.832, Digital Networks, Transport of SDH Elements on PDH Networks: Frame and Multiplexing Structures, November 1993.
25. [I.210] ITU-T Recommendation I.210, Principles of telecommunication services supported by an ISDN and the means to describe them, March 1993.
26. [I.321] ITU-T Recommendation I.321, B-ISDN Protocol Reference Model and its Application, February 1990.
27. [I.356] ITU-T Recommendation I.356, B-ISDN ATM Layer Cell Transfer Performance, 1996.
28. [I.371] ITU-T Recommendation I.371 Traffic control and congestion control in B-ISDN, August 1996
29. [I.610] ITU-T Recommendation I.610 B-ISDN OAM Principles and Functions Draft Recommendation, June 1998.

30. [I.751] ITU-T Recommendation I.751 B-ISDN Equipment Aspects – Asynchronous Transfer Mode (ATM) Management of the Network Element View, March 1996.
31. [I.751.1] ITU-T Recommendation I.751.1 B-ISDN Equipment Aspects – NE Management Information Model for the Message Transfer Part (MTP), October 1995.
32. [M.3100] ITU-T Recommendation M.3100, Generic Network Information Model, Version 2, March 1995.
33. [M.3010] ITU-T Recommendation M.3010, Principles of Telecommunications Management Network (TMN), December 1991.
34. [M.3400] ITU-T Recommendation M.3400, TMN Management Functions, December 1991.
35. [Q.2110] ITU-T Recommendation Q.2110, Service Specific Connection Oriented Protocol (SSCOP) Specification, January 1994.
36. [Q.2130] ITU-T Recommendation Q.2130, B-ISDN Signaling Adaptation Layer - Service Specific Coordination Function for Support of Signaling at the User to Network Interface (SSCF at UNI), 1993.
37. [Q.2140] ITU-T Recommendation Q.2140, B-ISDN Signaling Adaptation Layer - Service Specific Coordination Function for Support of Signaling at the Network Node Interface (SSCF at NNI), 1994.
38. [Q.2144] ITU-T Recommendation Q.2144, B-ISDN Signaling Adaptation Layer - Layer Management for the SAAL at the Network Node Interface (SSCF at NNI), May 1995.
39. [Q.2751.1] ITU-T Recommendation Q.2751.1, Extension of Q.751.1 for SAAL Signaling, January 1997.
40. [Q.2763] ITU-T Recommendation Q.2763, Broadband integrated services digital network (B-ISDN). Signaling System No.7 B-ISDN user part (B-ISUP). Formats and codes, February 1995.
41. [Q.2764] ITU-T Recommendation Q.2764, B-ISDN User Part - Basic Call Procedures, October 1994.
42. [Q.2931] ITU-T Recommendation Q.2931, B-ISDN Digital Subscriber Signaling System No. 2 (DSS 2) – User-Network Interface (UNI), Layer 3 Specification for Basic Call/Connection Control, February 1995.
43. [Q.2951] ITU-T Recommendation Q.2951, Stage 3 description for number identification supplementary services using B-ISDN Digital Subscriber Signaling System No. 2 (DSS 2) - basic call; Clauses 1-6 and 8 (DDI, MSN, CLIP, CLIR, COLP, COLR, SUB), February 1995.
44. [Q.2955] ITU-T Recommendation Q.2955, Closed User Group, 06/97 *to be published*
45. [Q.704] ITU-T Recommendation Q.704, Signaling network functions and messages, July 1996.
46. [Q.707] ITU-T Recommendation Q.707, Testing and maintenance Blue Book Fasc. VI.7, November 1988.
47. [Q.751.1] ITU-T Recommendation Q.751.1, Network Element Management Information Model for the Message Transfer Part (MTP), April 28, 1995.
48. [Q.824] ITU-T Recommendation Q.824, Stages 2 and 3 description for the Q3 interface - Customer administration. Common information, October 1995.
49. [Q.824.1] ITU-T Recommendation Q.824.1, Stages 2 and 3 description for the Q3 interface - Customer administration. Integrated Services Digital Network (ISDN) basic and primary rate access, October 1995.
50. [Q.824.2] ITU-T Recommendation Q.824.2, Stages 2 and 3 description for the Q3 interface - Customer administration. Integrated Services Digital Network (ISDN) supplementary services, October 1995.
51. [Q.824.6] ITU-T Recommendation Q.824.6, Stages 2 and 3 description for the Q3 interface - Customer administration, June 1998.
52. [X.721] ITU-T Recommendation X.721, Information Technology - Open Systems Interconnection - Systems Management - Part 2: State Management Function, 1992.
53. [T1.119] ANSI T1.119-1994, Synchronous Optical Network (SONET) Operations, Administration, Maintenance, and Provisioning (OAM&P) - Communication.
54. [T1.119-01] ANSI T1.119-01-1995, Synchronous Optical Network (SONET) Operations, Administration, Maintenance, and Provisioning (OAM&P) - Protection Fragment.
55. [T1.119-02] ANSI T1.119-02-1997, Synchronous Optical Network (SONET) Operations, Administration, Maintenance, and Provisioning (OAM&P) - Performance Management Fragment.
56. [T1.231] ANSI T1.231-1997, Layer 1 In-Service Digital Transmission Performance Monitoring.
57. [T1.240] ANSI T1.240-1997, Operations, Administration, Maintenance, and Provisioning (OAM&P) - Generic Network Information Model for Interfaces between Operation Systems & Network Elements

58. [T1.247] ANSI T1.247-1997, Operations, Administration, Maintenance, and Provisioning (OAM&P) - Performance Management Functional Area: Services and Information Model for Interfaces Between Operations Systems and Network Elements.
59. [ETS 300 213] ETSI Specification "Metropolitan Area Network (MAN) Physical Layer Convergence Procedure for 2048 KBPS," February 1995.
60. [ETS 300 214] ETSI Specification "Metropolitan Area Network (MAN) Physical Layer Convergence Procedure for 34368 KBPS," February 1995.
61. [ETS 300 337] ETSI Specification "Transmission and Multiplexing(TM): Generic Frame Structure for the Transport of Various Signals (including ATM Cells and SDH Elements) at the CCITT Recommendation G.702 Hierarchical Rates of 2048 KBPS, 34368 KBPS and 139264 KBPS," February 1995.
62. [ETS 300 371] ETSI Specification "Transmission and Multiplexing (TM): Plesiochronous Digital Hierarchy (PDH) Information Model for the Network Element (NE) View," November 1994.
63. [ETS 300 417] ETSI Specification "Transmission and Multiplexing(TM): General Requirement for Synchronous Digital Hierarchy (SDH) Equipment,
    Part 1: Generic Process and Performance," February 1995.
    Part 2-1: Physical Layer Functions," March 1995.
    Part 5-1: PDH Path Layer Functions," January 1996.
64. [DTR 043208] European Technical Report (ETR) DTR/NA-043208 Telecommunication Management Network (TMN); Introduction to Standardizing Security for TMN1.
65. [GR-836] Bell Communications Research GR-836-CORE Issue 2 September 1996, Generic Operations Interfaces using OSI Tools- Information Model Overview: Transport Configuration and Surveillance for Network Elements.
66. [GR-836-IMD] Bell Communications Research GR-836-IMD Issue 2 September 1996, Generic Operations Interfaces using OSI Tools- Information Model Details: Transport Configuration and Surveillance for Network Elements.
67. [GR-1042] Bell Communications Research GR-1042-CORE Issue 2 September 1996, Generic Operations Interfaces using OSI Tools- Information Model Overview: Synchronous Optical Network (SONET) Transport Information Model.
68. [GR-1042-IMD] Bell Communications Research GR-1042-IMD Issue 1 Revision 1, August 1995, Generic Operations Interfaces using OSI Tools- Information Model Details: Synchronous Optical Network (SONET) Transport Information Model.
69. [GR-1110] Bell Communications Research GR-1110-CORE Issue 1, Revision 5, Broadband Switching Systems (BSS) Generic Requirements.
70. [GR-1248] Bell Communications Research GR-1248-CORE Issue 3, August 1996, Generic Requirements for Operations of ATM Network Elements (NEs).