



**The ATM Forum  
Technical Committee**

**CMIP Specification  
for the  
M4 Interface**

**af-nm-0027.000**

**September, 1995**

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# 1. Introduction

This document specifies an ATM information model that provides a formal representation of the information exchanged between a managed system (e.g., an ATM NE) and a managing system using Guidelines for the Definition of Managed Objects (GDMO) templates, Abstract Syntax Notation One (ASN.1) syntax, and the Common Management Information Service Element (CMISE) services and protocol. This information model was specifically designed to meet the criteria defined in the ATM Forum's M4 Interface Specification<sup>[1]</sup>.

The model presented in this document reuses existing ITU-T Recommendations and other standards on information modeling where applicable. The ITU-T Recommendations referenced in this model are as follows:

- ITU-T Recommendation G.774 and G.774-01<sup>[2]</sup>
- ITU-T Recommendation M.3100<sup>[3]</sup>
- ITU-T Recommendation Q.822<sup>[4]</sup>
- ITU-T Recommendation X.721<sup>[5]</sup>
- ITU-T Recommendation X.739<sup>[6]</sup>

Other information modeling documents such as Bellcore's GR-836-IMD<sup>[7]</sup> and ANSI's T1.247<sup>[8]</sup> have been applied here for specific objects that have not yet been addressed in ITU-T.

The information model presented in this document was defined specifically to meet the functional requirements of the M4 Interface as set forth by the ATM Forum in 94-388R4<sup>[1]</sup>. When possible, the ATM Forum drew upon existing ATM CMIP modeling work in this area. Two models in particular that served as significant sources of input in the creation of this Information Model were ETSI's NA5-2210<sup>[9]</sup>, "B-ISDN Management Architecture and Management Information Model for the ATM cross-connect", and Bellcore's TA-NWT-001114 Issue 2<sup>[10]</sup>, "Generic Requirements for Operations Interfaces Using OSI Tools: ATM/Broadband Network Management".

The focus of this specification is on the definition of a Management Information Base (MIB) for CMIP implementations of the M4 Interface. See Annex A for recommended communication stacks to support the CMIP-based M4 Interface.





## 2. ATM NE Management Information Model

This document defines an information model that provides a formal representation of the information exchanged across the CMIP-based interface used to manage ATM Network Elements (NEs).

Note that the terminology used in the information modeling community to describe ATM/SDH based networks is not always the same as the terminology used by the broader range of ATM/SDH subject matter experts. Table 2-1 has been provided to assist the reader in understanding the mapping between these terms.

**Table 2-1:** Mapping of Equivalent Terms

<b>Information Modeling Term</b>	<b>Commonly Used Equivalent</b>
ATM Virtual Channel (VC) Connection	ATM Virtual Channel Link (VCL)
ATM Virtual Channel (VC) Trail	ATM Virtual Channel Connection (VCC)
ATM Virtual Path (VP) Connection	ATM Virtual Path Link (VPL)
ATM Virtual Path (VP) Trail	ATM Virtual Path Connection (VPC)
Inter-NNI	Broadband Inter Carrier Interface (BICI)
Intra-NNI	Broadband Inter Switching System Interface (BISSI)
SDH Administrative Unit Group (aug)	SONET STS-3 Group
SDH Administrative Unit 4 (au4) Connection	SONET STS-3c Channel
SDH Regenerator Section (rs) Connection	SONET Section
SDH Multiplex Section (ms) Connection	SONET Line
SDH Virtual Container 4 (vc4) Trail	SONET STS-3c Path

The similarity in the two sets of terminology can be a source of confusion for the first time reader, especially the terminology used to describe ATM VPs and VCs. The reader is urged to become familiar with the above mapping before delving into the details of the information model presented here.

Figures 2-1a, b, c and d illustrate the containment relationships between the managed object classes identified here for support of ATM NE management. Note that an arrow pointing from one object class to another object class represents the subordinate/superior relationship used as the basis for naming managed object classes.

Figures 2-2a, b, c, d, e, and f illustrate the inheritance relationships between these managed object classes.

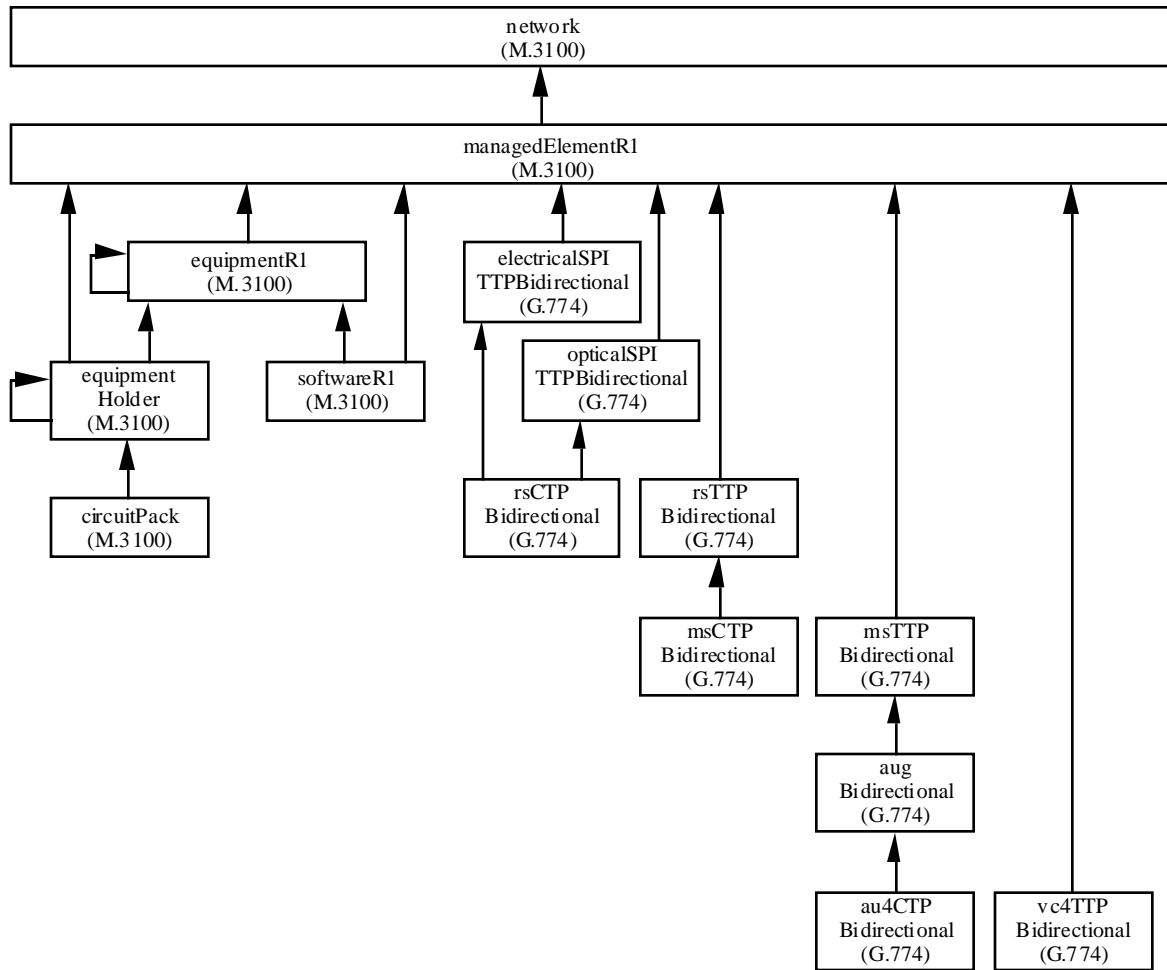


Figure 2-1a: Containment Tree Diagram (1 of 4)

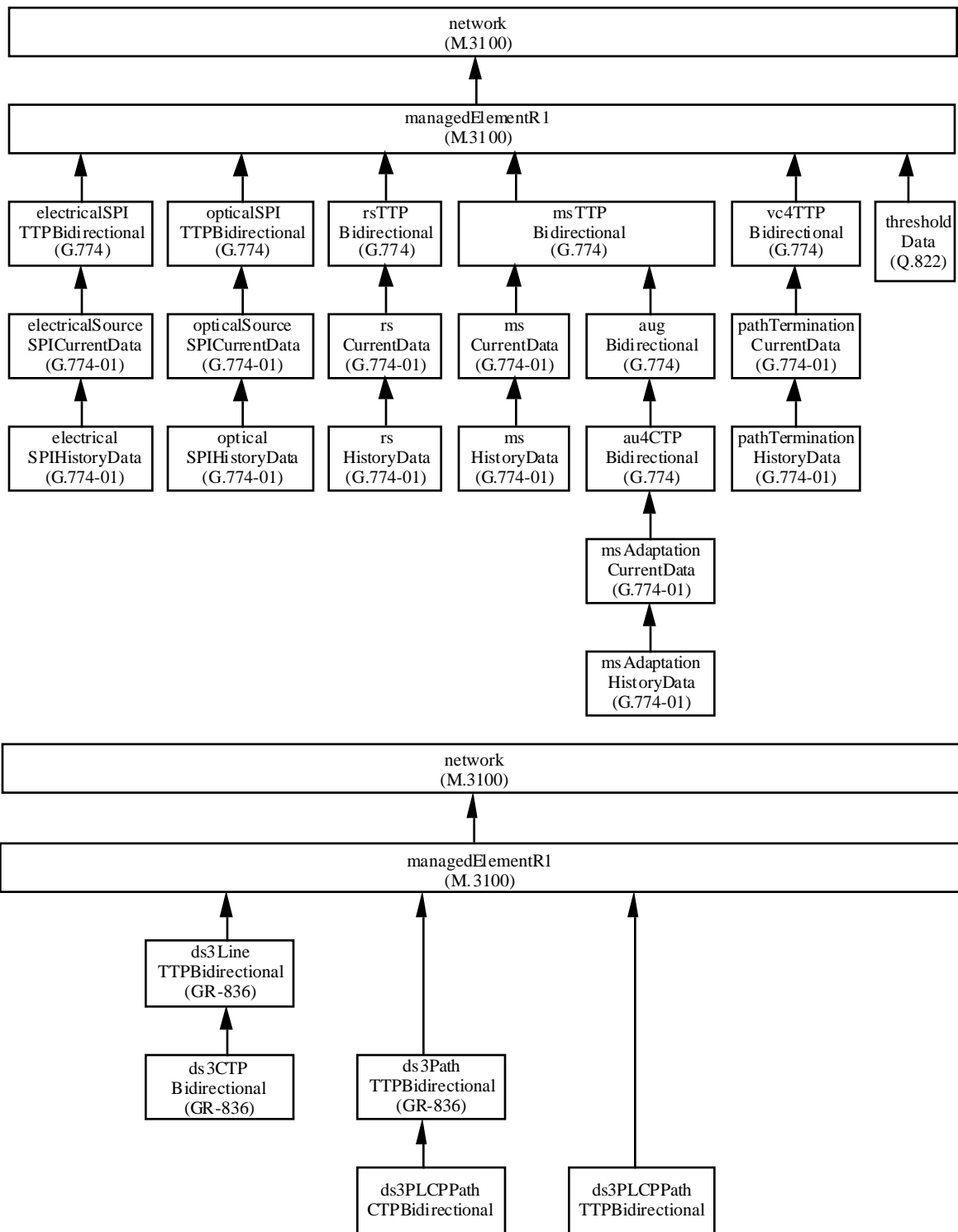


Figure 2-1b: Containment Tree Diagram (2 of 4)

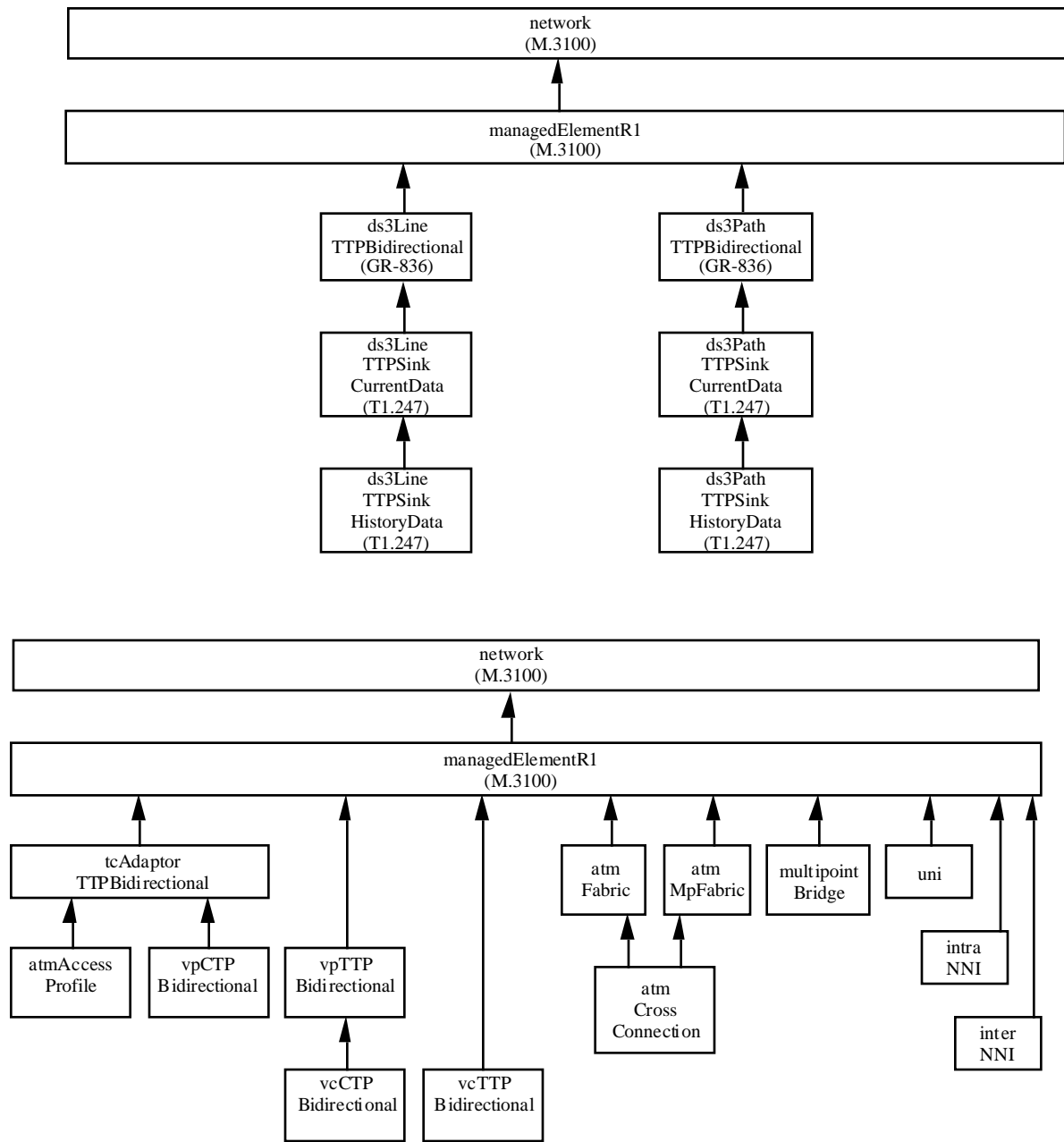


Figure 2-1c: Containment Tree Diagram (3 of 4)

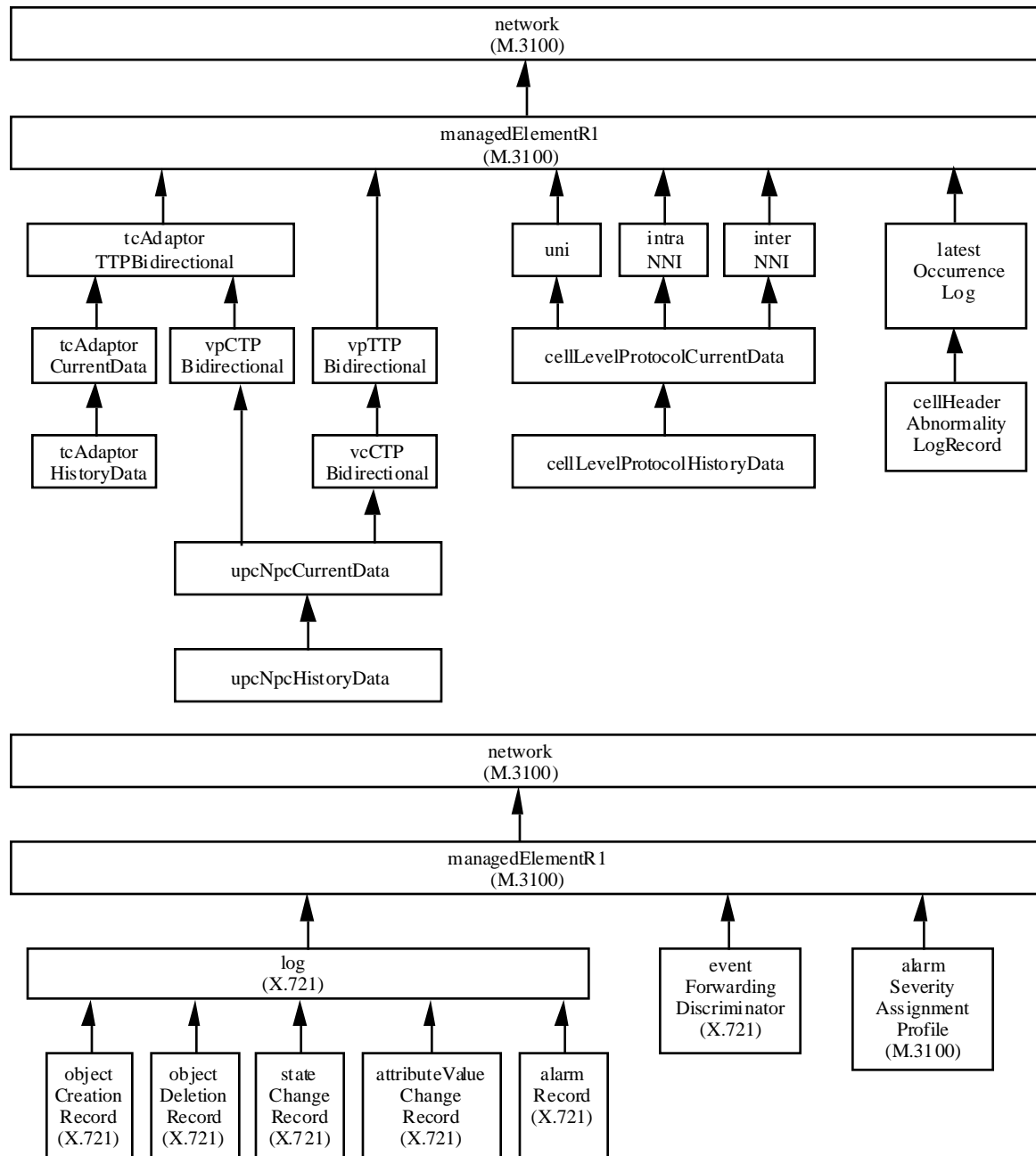


Figure 2-1d: Containment Tree Diagram (4 of 4)

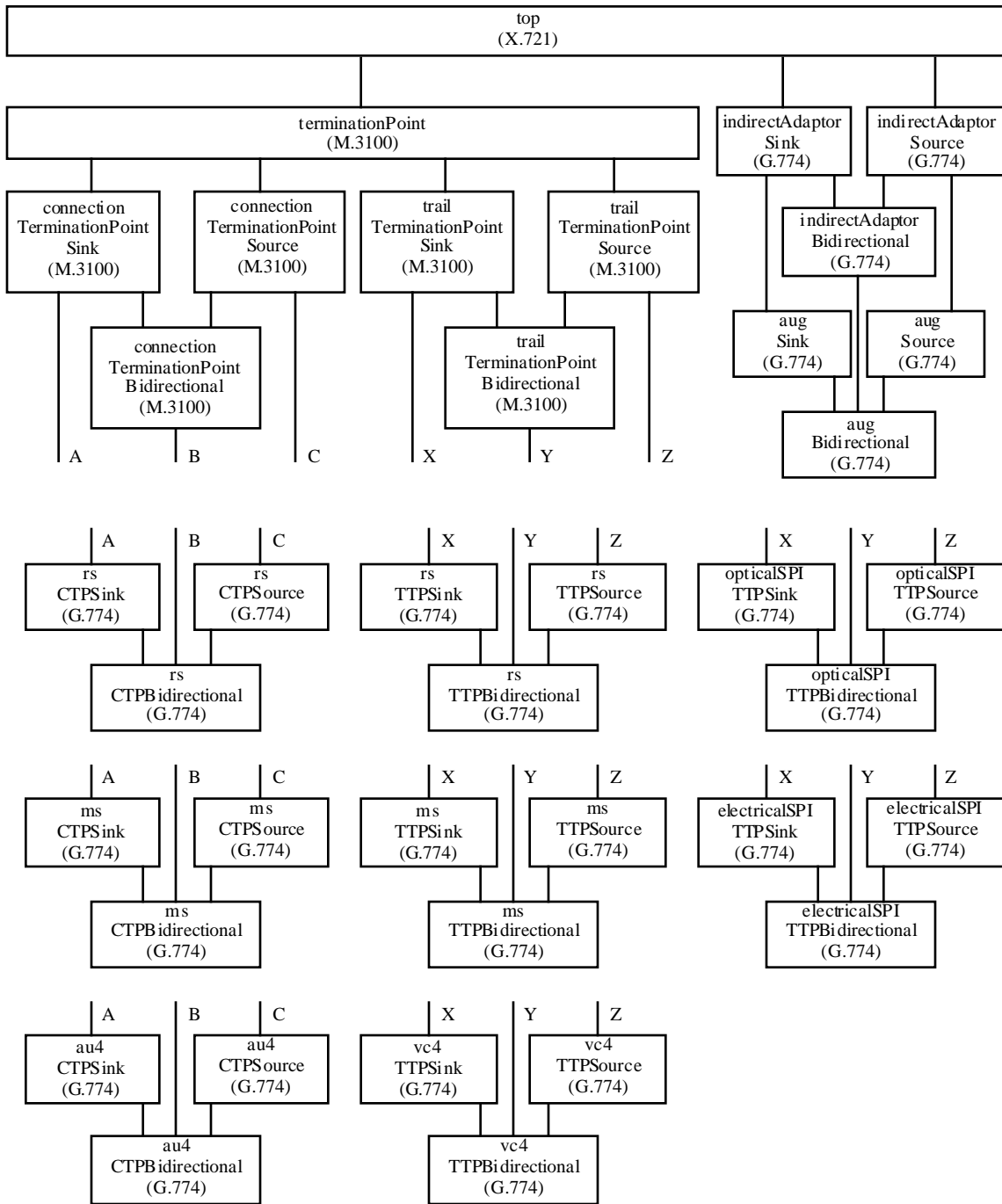


Figure 2-2a: Inheritance Tree Diagram (1 of 6)

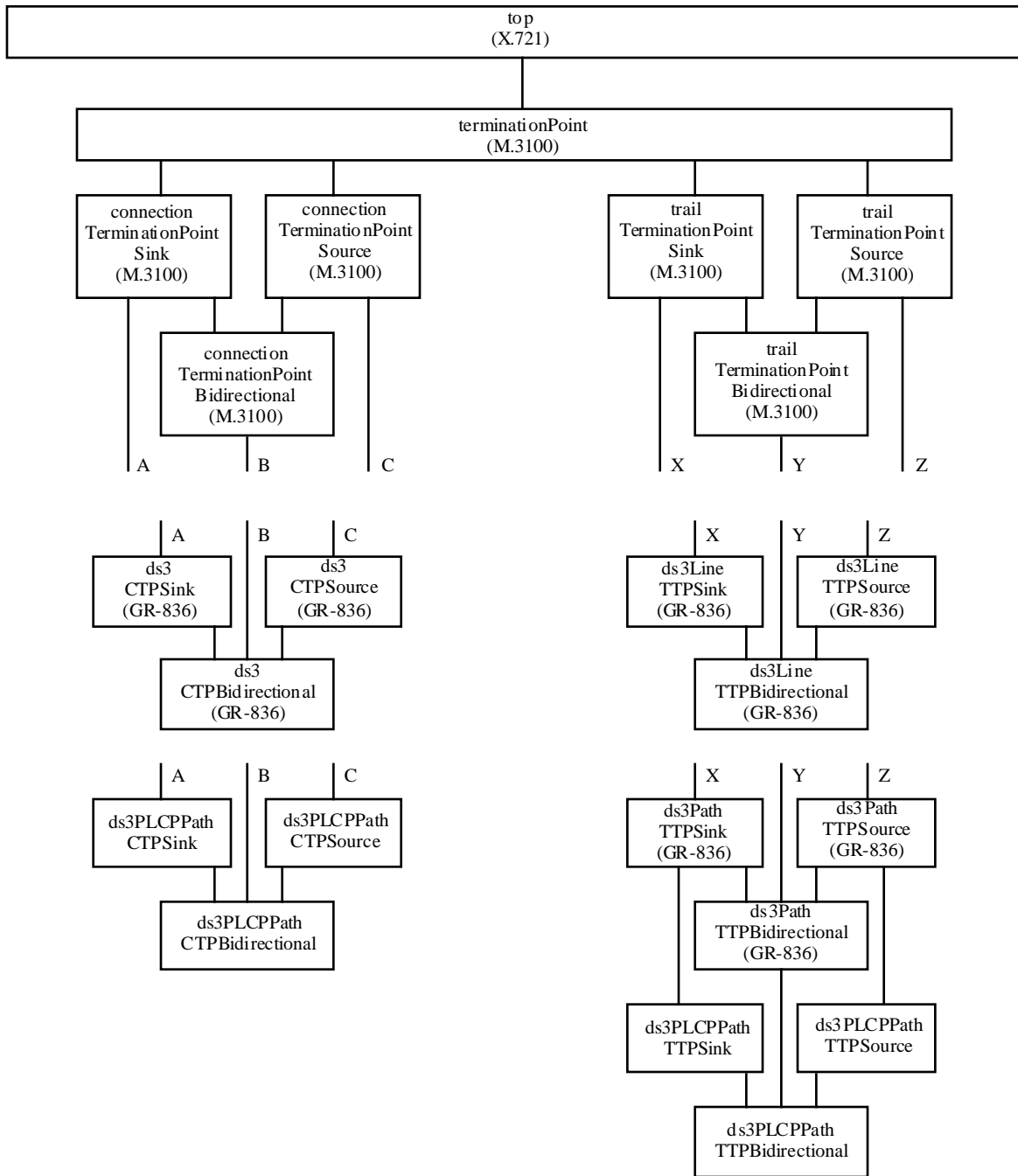


Figure 2-2b: Inheritance Tree Diagram (2 of 6)

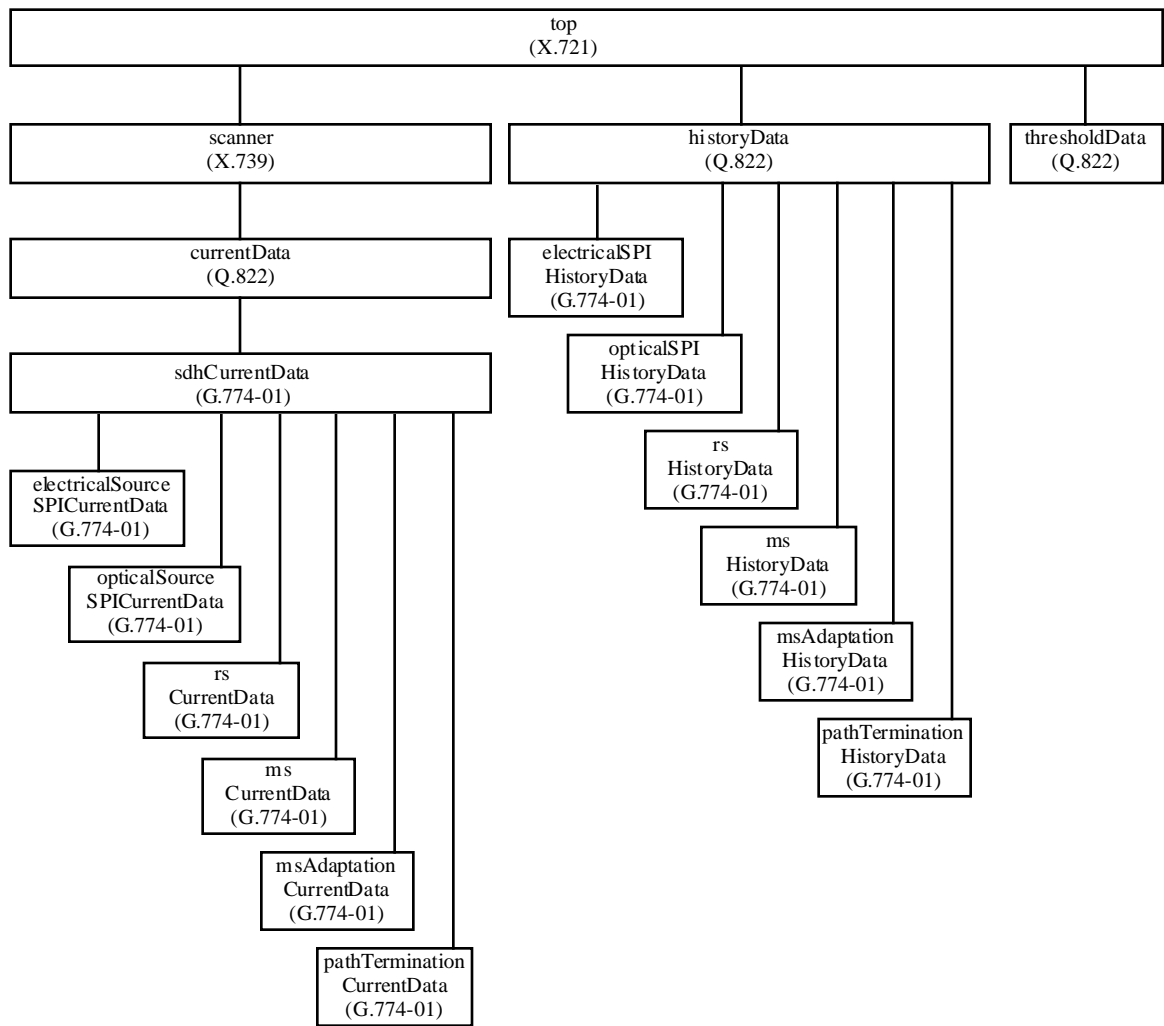
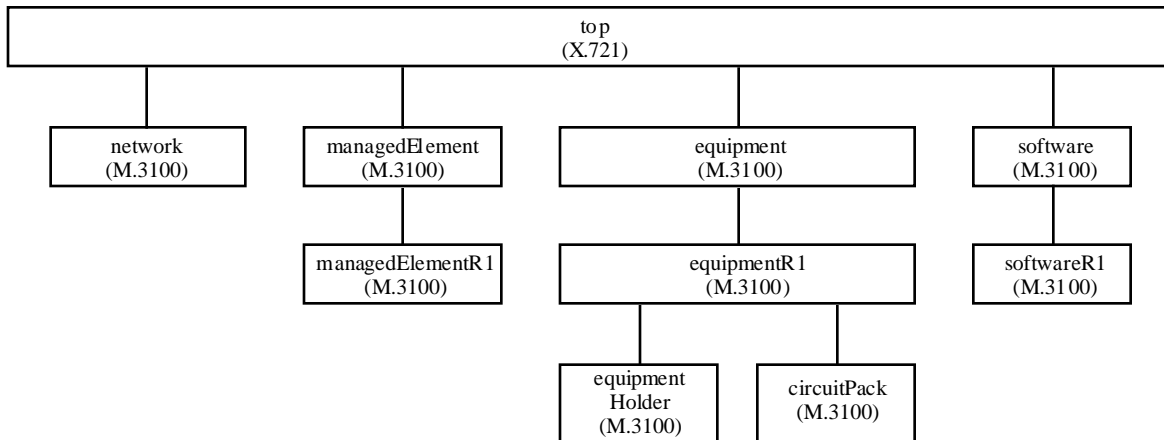


Figure 2-2c: Inheritance Tree Diagram (3 of 6)



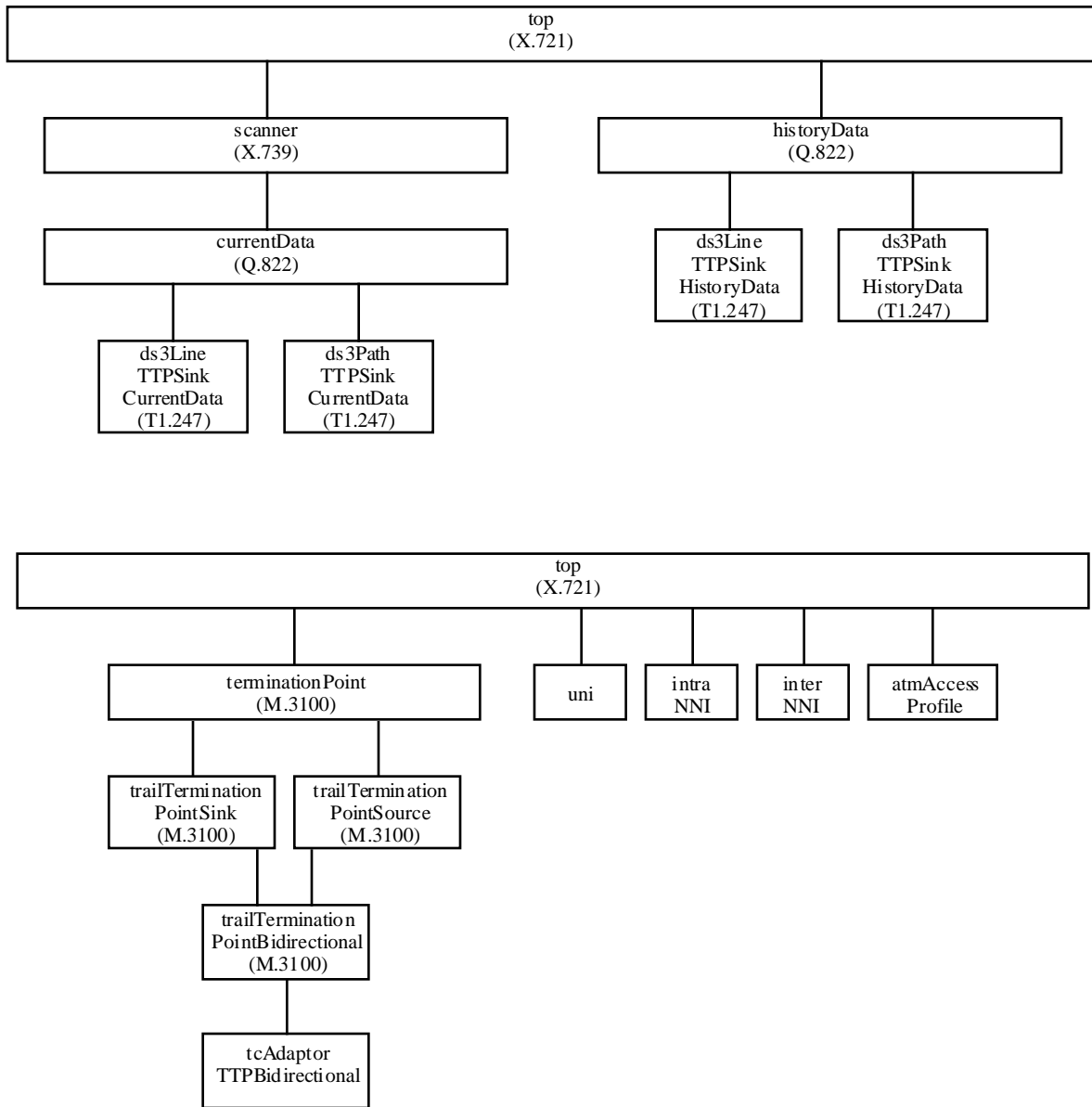


Figure 2-2d: Inheritance Tree Diagram (4 of 6)

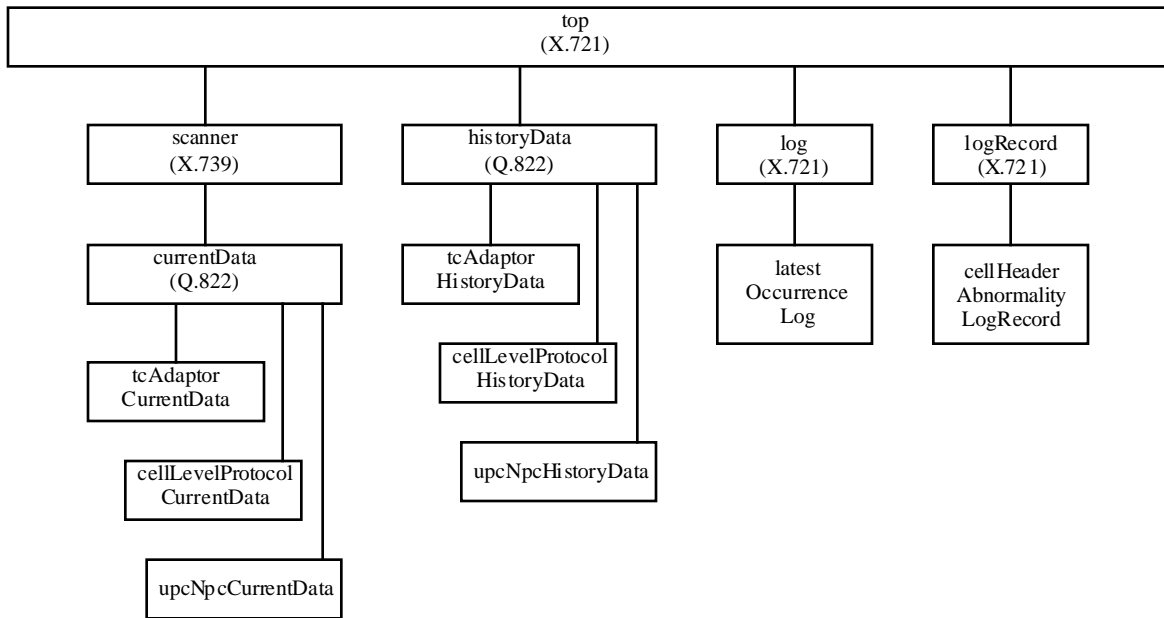
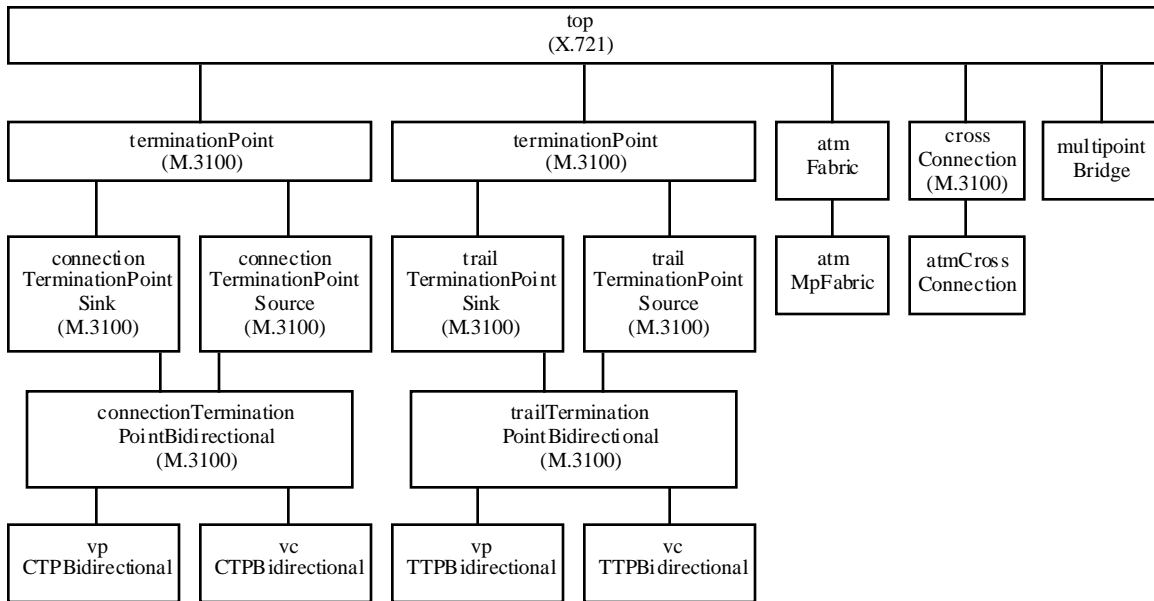


Figure 2-2e: Inheritance Tree Diagram (5 of 6)

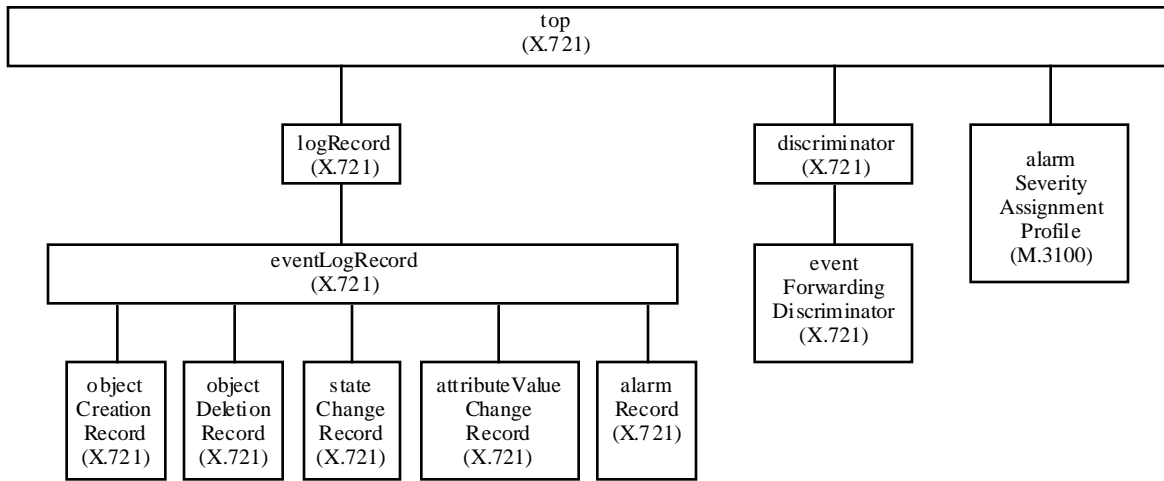


Figure 2-2f: Inheritance Tree Diagram (6 of 6)

## 2.1. Managed Objects

### 2.1.1. atmAccessProfile

atmAccessProfile MANAGED OBJECT CLASS  
 DERIVED FROM "Rec. X.721 | ISO/IEC 10165-2":top;  
 CHARACTERIZED BY  
 "ITU-T M.3100": attributeValueChangeNotificationPackage,  
 "ITU-T M.3100": createDeleteNotificationsPackage,  
 atmAccessProfilePkg PACKAGE  
 BEHAVIOUR atmAccessProfileBeh;  
 ATTRIBUTES  
 atmAccessProfileId  
 GET;;;  
 CONDITIONAL PACKAGES  
 vpLevelProfilePackage  
 PRESENT IF "profiling of the VP level at the ATM interface is supported",  
 vcLevelProfilePackage  
 PRESENT IF "profiling of the VC level at the ATM interface is supported";  
 REGISTERED AS {atmfM4ObjectClass 1};

atmAccessProfileBeh BEHAVIOUR  
 DEFINED AS  
 " The atmAccessProfile object class is a class of managed objects that characterize the client/server relationship at the VP and/or VC level.

Instances of this managed object class are explicitly created and deleted by the managing system using the CMIS M-CREATE and M-DELETE services, respectively. ";

### 2.1.2. atmCrossConnection

atmCrossConnection MANAGED OBJECT CLASS  
 DERIVED FROM "ITU-T M.3100": crossConnection;  
 CHARACTERIZED BY  
 "ITU-T M.3100": createDeleteNotificationsPackage,  
 atmCrossConnectionPkg PACKAGE  
 BEHAVIOUR atmCrossConnectionBeh;  
 ATTRIBUTES  
 recoveryType  
 GET-REPLACE;;;  
 REGISTERED AS {atmfM4ObjectClass 2};

atmCrossConnectionBeh BEHAVIOUR  
 DEFINED AS  
 "For point-to-point ATM VP and VC cross-connections, this managed object identifies the cross-connection relationship between two instances of the vpCTPBidirectional object class or vcCTPBidirectional object class, respectively. The vpCTPBidirectional or vcCTPBidirectional object instances being cross-connected

are identified by the fromTermination and toTermination attributes inherited from the crossConnection object class defined in ITU-T Recommendation M.3100.

For multipoint ATM VP and VC cross-connections, this managed object identifies the cross-connect relationship between an instance of the vpCTPBidirectional object class or vcCTPBidirectional object class and an instance of the multipointBridge object class. For multipoint ATM VP and VC cross-connections, each vpCTPBidirectional or vcCTPBidirectional object instance connected to the multipointBridge object is identified by the fromTermination attribute of the atmCrossConnection object, while the instance of the multipointBridge object class is identified by the toTermination attribute. Note that multipoint ATM cross-connections are established by cross-connecting multiple instances of the vpCTPBidirectional or vcCTPBidirectional object class (each with its own atmCrossConnection object) to a single instance of the multipointBridge object class.

The administrativeState attribute inherited by this managed object may be used by the managing system to inhibit (lock) and allow (unlock) ATM cell flow through the ATM cross-connection being represented.

The recoveryType attribute identifies whether the ATM cross-connection is recoverable (default) or non-recoverable. Recoverable cross-connections remain intact regardless of the operational state of the cross-connection. Non-recoverable ATM cross-connections are cross-connections that are automatically released by the managed system upon detection of a service affecting failure.

Instances of this object class are automatically created and deleted by the managed system based on operations performed on the containing atmFabric or atmMpFabric object.

All ATM VP/VC cross-connections are, by definition, bi-directional; therefore, the directionality attribute, inherited from the crossConnection object class, shall be set to the fixed value of bidirectional.

The value of the signalType attribute is for further study. ";

### 2.1.3. atmFabric

```

atmFabric MANAGED OBJECT CLASS
  DERIVED FROM "Rec. X.721 | ISO/IEC 10165-2":top;
  CHARACTERIZED BY
    atmFabricPackage PACKAGE
      BEHAVIOUR atmFabricBeh;
    ATTRIBUTES
      atmFabricId
        GET,
      "Rec. X.721 | ISO/IEC 10165-2":administrativeState
        GET-REPLACE,
      "Rec. X.721 | ISO/IEC 10165-2":operationalState
        GET,
      "Rec. X.721 | ISO/IEC 10165-2":availabilityStatus
        GET;
    ACTIONS
      connect,
      disconnect;;;
REGISTERED AS {atmfM4ObjectClass 3};

atmFabricBeh BEHAVIOUR
  DEFINED AS

```

"This object class represents the function of managing the establishment and release of ATM cross-connections.

Administrative State:

- Unlocked: The atmFabric is allowed to perform its normal functions. ACTIONS will be accepted to setup or remove cross-connections.
- Locked: The atmFabric is not allowed to perform its normal functions. No ACTIONS will be accepted. No new cross-connection can be setup or removed.

Operational State:

- Enabled: When the atmFabric is in the enabled operational state, it may be fully operational or partially operational (partially operational is indicated by the availability status attribute).
- Disabled: The atmFabric is incapable of performing its normal function. For instance, the managing system will not be able to setup or remove any cross-connection.

Availability Status, the supported values are:

- Degraded: The atmFabric is degraded in some respect. For instance, the atmFabric cannot perform the function of establishing new cross-connections while it can still accept ACTIONS to tear down existing connections. The atmFabric remains available for service (i.e. its operational state is enabled) while it is degraded.
- Empty SET (none of the availableStatus conditions exist).

One instance of the atmFabric object class shall be automatically created by the managed system upon completion of system initialization. Further creation and deletion of such objects is not supported.";

#### 2.1.4. atmMpFabric

```
atmMpFabric MANAGED OBJECT CLASS
  DERIVED FROM atmFabric;
  CHARACTERIZED BY
    atmMpFabricPackage PACKAGE
    BEHAVIOUR atmMpFabricBeh;
    ACTIONS
      connectMultipointBridge,
      disconnectMultipointBridge,
      addTpsToMultipointBridge,
      removeTpsFromMultipointBridge;;;
REGISTERED AS {atmfM4ObjectClass 4};

atmMpFabricBeh BEHAVIOUR
```

## DEFINED AS

"This object class is derived from the atmFabric object class. In addition to all the functionality supported by the super classes, this object class manages the establishment and release of multipoint ATM cross connections.

## Administrative State:

- Unlocked: The atmMpFabric is allowed to perform its normal functions. ACTIONS will be accepted to setup or remove multipoint cross-connections, or to rearrange multipoint cross-connections.
- Locked: The atmMpFabric is not allowed to perform its normal functions. No ACTIONS will be accepted. No new multipoint cross-connection can be setup or removed and no multipoint connections may be rearranged.

## Operational State:

- Enabled: When the atmMpFabric is in the enabled operational state, it may be fully operational or partially operational (partially operational is indicated by the availability status attribute).
- Disabled: The atmMpFabric is incapable of performing its normal function. For instance, the managing system will not be able to setup or remove any multipoint cross-connection.

## Availability Status, the supported values for this attribute are:

- Degraded: The atmMpFabric is degraded in some respect. For instance, the atmMpFabric cannot perform the function of establishing new cross-connections while it can still accept ACTIONS to rearrange existing connections. The atmMpFabric remains available for service (i.e. its operational state is enabled) while it is degraded.
- Empty SET (none of the availableStatus conditions exist).";

**2.1.5. cellHeaderAbnormalityLogRecord**

cellHeaderAbnormalityLogRecord MANAGED OBJECT CLASS

DERIVED FROM "Rec. X.721 | ISO/IEC 10165-2":logRecord;

CHARACTERIZED BY

cellHeaderAbnormalityLogRecordPkg PACKAGE

BEHAVIOUR cellHeaderAbnormalityLogRecordBeh;

ATTRIBUTES

cellHeaderAbnormalityType

GET,

interfacePointer

GET,

vpiValue

GET,

```

    vciValue
    GET;;;
REGISTERED AS {atmfM4ObjectClass 5};

```

```

cellHeaderAbnormalityLogRecordBeh BEHAVIOUR
DEFINED AS

```

" The cellHeaderAbnormalityLogRecord object class is a class of managed support objects used to log information that describes ATM cell header protocol abnormality events detected by the managed system.

Attributes have been defined so that each record of the log conveys the following information:

- Abnormality Type (Unassigned VPI/VCI Value, or Out-of-Range VPI/VCI Value)
- VPI/VCI Value
- ATM Interface (i.e., pointer to the associated uni, interNNI, or intraNNI object)
- Date and Time of Log Entry

The latestOccurrenceLog containing this managed object class shall have the keyAttributeList attribute set to include cellHeaderAbnormalityType and interfacePointer.

Instances of this managed object class shall exist to record the latest occurrence of each abnormality type per UNI, Inter-NNI, and Intra-NNI. Therefore, the maximum number of instances of this object class that can exist in the managed system is equal to twice the number of interfaces supported by the managed system. As new instances of this managed object class are created by the managed system, previous instances with the same cellHeaderAbnormalityType and interfacePointer attribute values shall be automatically deleted.";

### 2.1.6. cellLevelProtocolCurrentData

```

cellLevelProtocolCurrentData MANAGED OBJECT CLASS
DERIVED FROM "ITU-T Q.822":currentData;
CHARACTERIZED BY
  "ITU-T M.3100": createDeleteNotificationsPackage,
  cellLevelProtocolCurrentDataPkg PACKAGE
  BEHAVIOUR cellLevelProtocolCurrentDataBeh;
  ATTRIBUTES
    discardedCellsInvalidHeader
      REPLACE-WITH-DEFAULT
      DEFAULT VALUE AtmMIBMod.integerZero
      GET,
    numReceivedOAMCells
      REPLACE-WITH-DEFAULT
      DEFAULT VALUE AtmMIBMod.integerZero
      GET;;;
REGISTERED AS {atmfM4ObjectClass 6};

```

```

cellLevelProtocolCurrentDataBeh BEHAVIOUR
DEFINED AS

```



" Instances of the cellLevelProtocolCurrentData object class are used to hold the current (15 minute) register counts reflecting the protocol monitoring functions performed per ATM UNI, Inter-NNI, and Intra-NNI.

Each instance of this managed object shall maintain a thresholded count of the number of cells discarded due to the detection of ATM Layer protocol violations (e.g., unassigned VPI/VCI value, out-of-range VPI/VCI value, or undefined Payload Type Indication value). In addition, an unthresholded count of the number of OAM cells received and processed (per ATM Interface) shall be maintained by this object.

Instances of this object class should be inherently created by the managed system whenever an instance of the uni, interNNI, or intraNNI object class is created.

This managed object class uses the cellLevelProtocolHistoryData managed object class for history retention. ";

### 2.1.7. cellLevelProtocolHistoryData

cellLevelProtocolHistoryData MANAGED OBJECT CLASS

DERIVED FROM "ITU-T Q.822":historyData;

CHARACTERIZED BY

cellLevelProtocolHistoryDataPkg PACKAGE

BEHAVIOUR cellLevelProtocolHistoryDataBeh;

ATTRIBUTES

discardedCellsInvalidHeader

GET,

numReceivedOAMCells

GET;;;

REGISTERED AS {atmfM4ObjectClass 7};

cellLevelProtocolHistoryDataBeh BEHAVIOUR

DEFINED AS

" Instances of the cellLevelProtocolHistoryData object class are used to store the observed events of a cellLevelProtocolCurrentData object at the end of the 15-minute granularity period. Instances of this managed object class are contained by an instance of the cellLevelProtocolCurrentData managed object class. ";

### 2.1.8. ds3PLCPPathCTPBidirectional

ds3PLCPPathCTPBidirectional MANAGED OBJECT CLASS

DERIVED FROM ds3PLCPPathCTPSink,

ds3PLCPPathCTPSource,

"ITU-T M.3100": connectionTerminationPointBidirectional;

CHARACTERIZED BY

ds3PLCPPathCTPBidirectionalPkg PACKAGE

BEHAVIOUR ds3PLCPPathCTPBidirectionalBeh;;;

REGISTERED AS {atmfM4ObjectClass 8};

ds3PLCPPathCTPBidirectionalBeh BEHAVIOUR

## DEFINED AS

"This object class represents a termination point where a DS3 PLCP link connection is both originated and terminated.

The downstreamConnectivityPointer and upstreamConnectivityPointer attributes point to an instance of the ds3PLCPPathTTPBidirectional object class.

The supportedByObjectList attribute, inherited from the terminationPoint object class, shall be set equal to the empty set.";

**2.1.9. ds3PLCPPathCTPSink**

ds3PLCPPathCTPSink MANAGED OBJECT CLASS

DERIVED FROM "ITU-T M.3100": connectionTerminationPointSink;

CHARACTERIZED BY

ds3PLCPPathCTPSinkPkg PACKAGE  
BEHAVIOUR ds3PLCPPathCTPSinkBeh;  
ATTRIBUTES

ds3PLCPPathCTPId

GET;;;

REGISTERED AS {atmfM4ObjectClass 9};

ds3PLCPPathCTPSinkBeh BEHAVIOUR

DEFINED AS

"This object class represents a termination point where a DS3 PLCP link connection is terminated.

This object class is used for inheritance purposes only.";

**2.1.10. ds3PLCPPathCTPSource**

ds3PLCPPathCTPSource MANAGED OBJECT CLASS

DERIVED FROM "ITU-T M.3100": connectionTerminationPointSource;

CHARACTERIZED BY

ds3PLCPPathCTPSourcePkg PACKAGE  
BEHAVIOUR ds3PLCPPathCTPSourceBeh;  
ATTRIBUTES

ds3PLCPPathCTPId

GET;;;

REGISTERED AS {atmfM4ObjectClass 10};

ds3PLCPPathCTPSourceBeh BEHAVIOUR

DEFINED AS

"This object class represents a termination point where a DS3 PLCP link connection is originated.

This object class is used for inheritance purposes only.";

**2.1.11. ds3PLCPPathTTPBidirectional**

ds3PLCPPathTTPBidirectional MANAGED OBJECT CLASS  
 DERIVED FROM ds3PLCPPathTTPSink,  
                   ds3PLCPPathTTPSource,  
                   "Bellcore GR-836": ds3PathTTPBidirectional;  
 CHARACTERIZED BY  
                   ds3PLCPPathTTPBidirectionalPkg PACKAGE  
                   BEHAVIOUR ds3PLCPPathTTPBidirectionalBeh;;;  
 REGISTERED AS {atmfM4ObjectClass 11};

ds3PLCPPathTTPBidirectionalBeh BEHAVIOUR  
 DEFINED AS

"This object class represents a termination point where a DS3 PLCP trail is both originated and terminated.

The downstreamConnectivityPointer and upstreamConnectivityPointer attributes point to an instance of the ds3PLCPPathCTPBidirectional object class.

The supportedByObjectList attribute, inherited from the terminationPoint object class, shall point to the supporting instance of the ds3PathTTPBidirectional object class. This attribute may also point to the equipment object that supports the DS3 PLCP trail termination point.

The tmnCommunicationsAlarmInformationPackage shall be used to report loss-of-frame events and the clearing of these events.";

#### 2.1.12. ds3PLCPPathTTPSink

ds3PLCPPathTTPSink MANAGED OBJECT CLASS  
 DERIVED FROM "Bellcore GR-836":ds3PathTTPSink;  
 CHARACTERIZED BY  
                   ds3PLCPPathTTPSinkPkg PACKAGE  
                   BEHAVIOUR ds3PLCPPathTTPSinkBeh;;;  
 REGISTERED AS {atmfM4ObjectClass 12};

ds3PLCPPathTTPSinkBeh BEHAVIOUR  
 DEFINED AS

"This object class represents a termination point where a DS3 PLCP trail is terminated.

This object class is used for inheritance purposes only.";

#### 2.1.13. ds3PLCPPathTTPSource

ds3PLCPPathTTPSource MANAGED OBJECT CLASS  
 DERIVED FROM "Bellcore GR-836":ds3PathTTPSource;  
 CHARACTERIZED BY  
                   ds3PLCPPathTTPSourcePkg PACKAGE  
                   BEHAVIOUR ds3PLCPPathTTPSourceBeh;;;  
 REGISTERED AS {atmfM4ObjectClass 13};

ds3PLCPPathTTPSourceBeh BEHAVIOUR  
 DEFINED AS

"This object class represents a termination point where a DS3 PLCP trail is originated.

This object class is used for inheritance purposes only.";

#### 2.1.14. interNNI

interNNI MANAGED OBJECT CLASS

DERIVED FROM "Rec. X.721 | ISO/IEC 10165-2":top;

CHARACTERIZED BY

interNNIPkg PACKAGE

BEHAVIOUR interNNIBeh;

ATTRIBUTES

interNNIId

GET,

underlyingTTPPointer

GET;;;

CONDITIONAL PACKAGES

"ITU-T M.3100: 1992": createDeleteNotificationsPackage

PRESENT IF "the objectCreation and objectDeletion notifications defined in Recommendation X.721 are supported by an instance of this class.",

farEndCarrierNetworkPkg

PRESENT IF "call processing functions supporting exchange access service over the Inter-NNI are performed in the managed system",

loopbackLocationIdentifierPkg

PRESENT IF "supplied by the managing system";

REGISTERED AS {atmM4ObjectClass 14};

interNNIBeh BEHAVIOUR

DEFINED AS

" This managed object is used to configure and identify an ATM Interface on the managed system as an Inter-NNI.

The underlyingTTPPointer attribute provides a pointer relationship to the tcAdaptorTTPBidirectional object that represents the location in the managed system where ATM is adapted to the physical transmission path.

The loopbackLocationIdentifierPkg provides a read/write code used for OAM cell loopback purposes. Incoming OAM Loopback cells with a Loopback Location field value that matches the value of the loopbackLocationIdentifier attribute shall be looped-back over the Inter-NNI.

An instance of this object class shall exist for each Inter-NNI on the managed system. Instances of this object class are explicitly created and deleted by the managing system using the CMIS M-CREATE and M-DELETE services, respectively. ";

#### 2.1.15. intraNNI

intraNNI MANAGED OBJECT CLASS

DERIVED FROM "Rec. X.721 | ISO/IEC 10165-2":top;

```

CHARACTERIZED BY
  intraNNIPkg PACKAGE
    BEHAVIOUR intraNNIBeh;
  ATTRIBUTES
    intraNNIId
    GET,
    underlyingTTPPointer
    GET;;;
CONDITIONAL PACKAGES
  "ITU-T M.3100: 1992": createDeleteNotificationsPackage
    PRESENT IF "the objectCreation and objectDeletion notifications
              defined in Recommendation X.721 are supported by an
              instance of this class.",
    loopbackLocationIdentifierPkg
    PRESENT IF "supplied by the managing system";
REGISTERED AS {atmfM4ObjectClass 15};

```

```

intraNNIBeh BEHAVIOUR
  DEFINED AS
    " This managed object is used to configure and identify an ATM Interface on the managed system
    as an Intra-NNI.

```

The underlyingTTPPointer attribute provides a pointer relationship to the tcAdaptorTTPBidirectional object that represents the location in the managed system where ATM is adapted to the physical transmission path.

The loopbackLocationIdentifierPkg provides a read/write code used for OAM cell loopback purposes. Incoming OAM Loopback cells with a Loopback Location field value that matches the value of the loopbackLocationIdentifier attribute shall be looped-back over the Intra-NNI.

An instance of this object class shall exist for each Intra-NNI on the managed system. Instances of this object class are explicitly created and deleted by the managing system using the CMIS M-CREATE and M-DELETE services, respectively. ";

### 2.1.16. latestOccurrenceLog

```

latestOccurrenceLog MANAGED OBJECT CLASS
  DERIVED FROM "Rec. X.721 | ISO/IEC 10165-2":log;
  CHARACTERIZED BY
    latestOccurrenceLogPkg PACKAGE
      BEHAVIOUR latestOccurrenceLogBeh;
    ATTRIBUTES
      keyAttributeList
      GET;;;
REGISTERED AS {atmfM4ObjectClass 16};

```

```

latestOccurrenceLogBeh BEHAVIOUR
  DEFINED AS
    "The latestOccurrenceLog object class is a specialization of the log object class. New behaviour introduced
    in this object class includes the ability to store log records based on the keyAttributeList attribute.
    Specifically, log records shall be automatically created and deleted such that for each keyAttributeList value,
    only the latest log record exists.

```

The inherited maxLogSize attribute of an instance of the latestOccurrenceLog object must be large enough to contain all possible combinations of values that can be placed on the attributes identified by the keyAttributeList attribute.";

### 2.1.17. multipointBridge

multipointBridge MANAGED OBJECT CLASS

DERIVED FROM "Rec. X.721 | ISO/IEC 10165-2":top;

CHARACTERIZED BY

"ITU-T M.3100": createDeleteNotificationsPackage,

"ITU-T M.3100": attributeValueChangeNotificationPackage,

"ITU-T M.3100": stateChangeNotificationPackage,

multipointBridgePkg PACKAGE

BEHAVIOUR multipointBridgeBeh;

ATTRIBUTES

multipointBridgeId

GET,

"Rec. X.721 | ISO/IEC 10165-2": administrativeState

GET-REPLACE,

primaryCTP

GET,

commonCTPs

GET,

multipointConnectionType

GET;;;

REGISTERED AS {atmfM4ObjectClass 17};

multipointBridgeBeh BEHAVIOUR

DEFINED AS

" The multipointBridge object class is a class of managed objects that represent the multipoint bridging function used to support multipoint VP/VC cross-connections. An instance of this object class shall exist for each multipoint VP/VC cross-connection supported by the managed system.

Instances of this object class shall be explicitly created and deleted by the managing system using the CMIS M-CREATE and M-DELETE services, respectively. Instances of this object class shall not be deleted until all associated instances of the atmCrossConnection object class are also deleted. When explicitly created by a managing system, the primaryCTP and multipointConnectionType attributes shall be set to NULL and the commonCTPs attribute shall be set to the EMPTY SET.

This object class is used to support four types of multipoint VP/VC connections. They are as follows:

- broadcast
- merge
- composite
- full multipoint

The primaryCTP attribute identifies the vpCTPBidirectional or vcCTPBidirectional object that generates traffic to broadcast and/or receives merged traffic for broadcast, merge, or composite multipoint cross-connection types. For full multipoint connections (i.e., all legs communicate with all other legs),

the value of this attribute shall be set to NULL. The primaryCTP attribute value shall remain fixed during the life of the multipoint cross-connection.

The commonCTPs attribute identifies all legs of the multipoint connection except the leg identified via the primaryCTP attribute. This attribute provides a pointer to one or more instances of the vpCTPBidirectional object class or vcCTPBidirectional object class. For full multipoint cross-connections, all the legs of the multipoint cross-connection shall be identified by this attribute. The legs represented by the commonCTPs attribute may be added or removed from an existing multipoint connection by performing the addTpsToMultipointBridge and removeTpsFromMultipointBridge operations, respectively, on the appropriate instance of the atmMpFabric object class.

The administrativeState attribute may be used by the management system to inhibit (lock) and allow (unlock) ATM cell flow through all multipoint cross-connections supported by the multipointBridge.";

### 2.1.18. tcAdaptorCurrentData

```
tcAdaptorCurrentData MANAGED OBJECT CLASS
  DERIVED FROM "ITU-T Q.822":currentData;
  CHARACTERIZED BY
    "ITU-T M.3100": createDeleteNotificationsPackage,
    tcAdaptorCurrentDataPkg PACKAGE
      BEHAVIOUR tcAdaptorCurrentDataBeh;
  ATTRIBUTES
    discardedCellsHECViolation
      REPLACE-WITH-DEFAULT
      DEFAULT VALUE AtmMIBMod.integerZero
      GET,
    erroredCellsHECViolation
      REPLACE-WITH-DEFAULT
      DEFAULT VALUE AtmMIBMod.integerZero
      GET;;;
REGISTERED AS {atmfM4ObjectClass 18};
```

```
tcAdaptorCurrentDataBeh BEHAVIOUR
  DEFINED AS
    "This managed object contains the current protocol monitoring data collected for its superior
    tcAdaptorTTPBidirectional object. Specifically, this managed object maintains a count of the number
    of received cells for which an HEC error was detected as well as a count of the number of received cells
    that were discarded due to an HEC error during the current 15-minute granularity period.
```

This object shall be automatically created whenever an instance of the tcAdaptorTTPBidirectional object class is created. ";

### 2.1.19. tcAdaptorHistoryData

```
tcAdaptorHistoryData MANAGED OBJECT CLASS
  DERIVED FROM "ITU-T Q.822":historyData;
  CHARACTERIZED BY
    tcAdaptorHistoryDataPkg PACKAGE
      BEHAVIOUR tcAdaptorHistoryDataBeh;
```

## ATTRIBUTES

discardedCellsHECViolation  
GET,  
erroredCellsHECViolation  
GET;;;

REGISTERED AS {atmfM4ObjectClass 19};

tcAdaptorHistoryDataBeh BEHAVIOUR

DEFINED AS

"Instances of the tcAdaptorHistoryData object class are used to store the observed events of a tcAdaptorCurrentData object at the end of the 15-minute granularity period. Instances of this managed object class are contained by an instance of the tcAdaptorCurrentData object class. ";

### 2.1.20. tcAdaptorTTPBidirectional

tcAdaptorTTPBidirectional MANAGED OBJECT CLASS

DERIVED FROM "ITU-T M.3100": trailTerminationPointBidirectional;

CHARACTERIZED BY

"ITU-T M.3100": tmnCommunicationsAlarmInformationPackage,  
"ITU-T M.3100": createDeleteNotificationsPackage,  
"ITU-T M.3100": stateChangeNotificationPackage,

tcAdaptorTTPBidirectionalPkg PACKAGE

BEHAVIOUR tcAdaptorTTPBidirectionalBeh;

ATTRIBUTES

tcTTPId  
GET;;;

CONDITIONAL PACKAGES

cellScramblingEnabledPkg

PRESENT IF "cell scrambling may be activated and deactivated for  
the supporting ATM interface.";

REGISTERED AS {atmfM4ObjectClass 20};

tcAdaptorTTPBidirectionalBeh BEHAVIOUR

DEFINED AS

" This managed object represents a point in the managed system 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[11] identifies this adaptation function as one of many functions performed at the Transmission Convergence (TC) Sublayer of the BISDN protocol stack.

This object is responsible for generating communicationsAlarm notifications that report the inability of the managed system to delineate ATM cells from the payload of a terminated digital transmission path.

The supportedByObjectList attribute inherited from the trailTerminationPoint managed object shall include a pointer to the underlying, path-level trail termination point managed object (e.g., vc4TTPBidirectional object).

Instances of this object class should be automatically created and deleted by the managed system.";



**2.1.21. uni**

uni MANAGED OBJECT CLASS

DERIVED FROM "Rec. X.721 | ISO/IEC 10165-2":top;

CHARACTERIZED BY

uniPkg PACKAGE

BEHAVIOUR uniBeh;

ATTRIBUTES

uniId

GET,

underlyingTTPPointer

GET;;;

CONDITIONAL PACKAGES

"ITU-T M.3100": createDeleteNotificationsPackage

PRESENT IF "the objectCreation and objectDeletion notifications defined in Recommendation X.721 are supported by an instance of this object class.",

atmSubscriberAddressPkg

PRESENT IF "an address or list of addresses are assigned to the UNI",

ilmiPkg

PRESENT IF "the ILMI capability is supported",

loopbackLocationIdentifierPkg

PRESENT IF "supplied by the managing system",

preferredCarrierPkg

PRESENT IF "call processing functions supporting exchange access service for the UNI subscriber are performed in the managed system";

REGISTERED AS {atmfM4ObjectClass 21};

uniBeh BEHAVIOUR

DEFINED AS

" This managed object is used to configure and identify an ATM interface on the managed system as a Public User Network Interface (UNI), embracing the physical characteristics corresponding to the UB reference point.

The underlyingTTPPointer attribute provides a pointer relationship to the tcAdaptorTTPBidirectional object that represents the location in the managed system where ATM is adapted to the physical transmission path.

The ilmiPkg shall be instantiated if the ILMI capability is supported by the UNI. This package identifies the VPI/VCI value used over the UNI to support ILMI.

The loopbackLocationIdentifierPkg provides a read/write code used for OAM cell loopback purposes. Incoming OAM Loopback cells with a Loopback Location field value that matches the value of the loopbackLocationIdentifier attribute shall be looped-back over the UNI.

An instance of this object class shall exist for each Public UNI on the managed system. Instances of this object class are explicitly created and deleted by the managing system using the CMIS M-CREATE and M-DELETE services, respectively. ";

**2.1.22. upcNpcCurrentData**

```

upcNpcCurrentData MANAGED OBJECT CLASS
DERIVED FROM "ITU-T Q.822":currentData;
CHARACTERIZED BY
  "ITU-T M.3100": createDeleteNotificationsPackage,
upcNpcCurrentDataPkg PACKAGE
  BEHAVIOUR upcNpcCurrentDataBeh;
  ATTRIBUTES
    discardedCells
      REPLACE-WITH-DEFAULT
      DEFAULT VALUE AtmMIBMod.integerZero
      GET,
    successfullyPassedCells
      REPLACE-WITH-DEFAULT
      DEFAULT VALUE AtmMIBMod.integerZero
      GET;;;
  CONDITIONAL PACKAGES
    discardedCLP0CellsPkg
      PRESENT IF "the managed system performs UPC/NPC functions
        separately for high Cell Loss Priority (CLP) cells (i.e.,
        cells with CLP=0)",
    successfullyPassedCLP0CellsPkg
      PRESENT IF " if the managed system supports high priority only
        policing and has the ability to count cells that are
        successfully passed by the CLP=0 UPC/NPC policing
        function",
    taggedCLP0CellsPkg
      PRESENT IF "the managed system supports Cell Loss Priority (CLP)
        tagging";
REGISTERED AS {atmfM4ObjectClass 22};

```

```

upcNpcCurrentDataBeh BEHAVIOUR
DEFINED AS

```

" An instance of this managed object class is used to collect 15-minute current data associated with UPC/NPC functions performed on its superior managed object.

All instances of this managed object are required to count and threshold the number of cells that were discarded due to UPC/NPC policing of the combined high and low cell loss priority traffic. In addition, all instances of this object class are required to maintain a count of the number of cells that were passed by the aggregate (i.e., CLP=0,1) UPC/NPC policing function.

If the managed system performs UPC/NPC separately for CLP=0 traffic, then an additional count shall be maintained and thresholded for discarded CLP=0 cells due to UPC/NPC policing of high priority (CLP=0) traffic only.

If Cell Loss Priority (CLP) tagging is performed by the managed system, the taggedCLP0CellsPkg conditional package should be present for maintaining a thresholded count of the number of CLP=0 cells that were tagged by the managed system.

This object also provides an optional attribute for counting the number of cells successfully passed by the high priority only policing functions of the UPC/NPC. This parameter, however, shall not be thresholded by the managed system.

Instances of this object class shall be automatically created by the managed system for each instance of the vpCTPBidirectional and vcCTPBidirectional object class where UPC/NPC functions take place (e.g., at UNI and Inter-NNI access points).

These objects shall be automatically deleted when the containing instance of the vpCTPBidirectional and vcCTPBidirectional object class is deleted.

This managed object class uses the upcNpcHistoryData managed object class for history retention.";

### 2.1.23. upcNpcHistoryData

upcNpcHistoryData MANAGED OBJECT CLASS

DERIVED FROM "ITU-T Q.822":historyData;

CHARACTERIZED BY

upcNpcHistoryDataPkg PACKAGE

BEHAVIOUR upcNpcHistoryDataBeh;

ATTRIBUTES

discardedCells

GET,

successfullyPassedCells

GET;;;

CONDITIONAL PACKAGES

discardedCLP0CellsHistoryDataPkg

PRESENT IF "attribute value is supplied by upcNpcCurrentData",

successfullyPassedCLP0CellsHistoryDataPkg

PRESENT IF "attribute value is supplied by upcNpcCurrentData",

taggedCLP0CellsHistoryDataPkg

PRESENT IF "attribute value is supplied by upcNpcCurrentData";

REGISTERED AS {atmfM4ObjectClass 23};

upcNpcHistoryDataBeh BEHAVIOUR

DEFINED AS

" Instances of the upcNpcHistoryData object class are used to store the observed events of an upcNpcCurrentData object at the end of the 15-minute granularity period. A minimum of two instances of this managed object are needed to maintain the most recent past 30 minutes of history data.";

### 2.1.24. vcCTPBidirectional

vcCTPBidirectional MANAGED OBJECT CLASS

DERIVED FROM "ITU-T M.3100": connectionTerminationPointBidirectional;

CHARACTERIZED BY

"ITU-T M.3100": attributeValueChangeNotificationPackage,

"ITU-T M.3100": createDeleteNotificationsPackage,

"ITU-T M.3100": crossConnectionPointerPackage,

vcCTPBidirectionalPkg PACKAGE

BEHAVIOUR vcCTPBidirectionalBeh;

ATTRIBUTES

vcCTPId

```

    GET,
    segmentEndPoint
    DEFAULT VALUE AtmMIBMod.booleanFalseDefault
    GET-REPLACE;;;
CONDITIONAL PACKAGES
    egressTrafficDescriptorPkg
    PRESENT IF    "supplied by the managing system. This package must be
                  present at points where egress UPC/NPC functions are performed.",
    ingressTrafficDescriptorPkg
    PRESENT IF    "supplied by the managing system. This package must be
                  present at points where ingress UPC/NPC functions are performed.",
    oamCellLoopbackPkg
    PRESENT IF    "the termination point supports OAM cell Loopbacks",
    qosClassesPkg
    PRESENT IF    "QOS Class information is supplied by the managing
system";
REGISTERED AS {atmfM4ObjectClass 24};

```

vcCTPBidirectionalBeh BEHAVIOUR  
DEFINED AS

" The vcCTPBidirectional object class is a class of managed objects that delimit Virtual Channel (VC) links. From a configuration management perspective, instances of this object class represent VC link terminations that are either cross-connected to other VC link terminations or are available for such cross-connection.

Instances of this object class include attributes that describe the VCI value, traffic descriptor, and, optionally, the Quality of Service (QOS) class assigned to the VCL termination being represented. Note that the vcCTPId attribute value identifies the VCI value for the VCL being terminated and is also used as the RDN for naming instances of this object class. The vcCTPId attribute value may be provided by the managing system upon creation of this managed object instance or it may be absent in the M-CREATE message and thus selected by the managed system. When selected by the managed system, the value chosen shall be reported to the managing system as a parameter in the response to the successfully performed M-CREATE request.

From a performance and fault management perspective, instances of this object class represent logical points along VCCs at which various maintenance and network traffic management functions may be performed.

The conditional package oamCellLoopbackPkg provides the M-ACTION used to request the termination point to insert an OAM cell for downstream loopbacking and report whether or not the cell was returned within the required time.

When a VC-AIS or VC-RDI failure is detected, the vcCTPBidirectional object shall generate a communicationsAlarm notification (if the tmnCommunicationsAlarmInformationPackage is present) with the probableCause parameter value set equal to aIS or farEndReceiverFailure, respectively.

Instances of this object class may be explicitly created and deleted by the managing system using the CMIS M-CREATE and M-DELETE services, respectively. Instances of this managed object class may also be automatically created by the managed system in response to actions performed on instances of the atmFabric or atmMpFabric object class. ";

**2.1.25. vcTTPBidirectional**

vcTTPBidirectional MANAGED OBJECT CLASS

DERIVED FROM "ITU-T M.3100": trailTerminationPointBidirectional;

CHARACTERIZED BY

"Rec. X.721 | ISO/IEC 10165-2": administrativeStatePackage,

"ITU-T M.3100": attributeValueChangeNotificationPackage,

"ITU-T M.3100": createDeleteNotificationsPackage,

vcTTPBidirectionalPkg PACKAGE

BEHAVIOUR vcTTPBidirectionalBeh;

ATTRIBUTES

vcTTPId

GET;;;

CONDITIONAL PACKAGES

oamCellLoopbackPkg

PRESENT IF "the termination point supports OAM cell Loopbacks";

REGISTERED AS {atmfM4ObjectClass 25};

vcTTPBidirectionalBeh BEHAVIOUR

DEFINED AS

" The vcTTPBidirectional object class is a class of managed objects that delimit Virtual Channel Connections (VCCs).

An instance of this object class represents the logical point in the managed system where the end-to-end F5 flow (i.e., OAM cells with PT=5) terminates.

The conditional package oamCellLoopbackPkg provides the M-ACTION used to request the termination point to insert an OAM cell for downstream loopbacking and report whether or not the cell was returned within the required time.

An instance of this object class shall always point (via the upstreamConnectivityPointer and downstreamConnectivityPointer attributes) to a vcCTPBidirectional managed object.

Instances of this object class are explicitly created and deleted by the managing system using the CMIS M-CREATE and M-DELETE services, respectively. ";

**2.1.26. vpCTPBidirectional**

vpCTPBidirectional MANAGED OBJECT CLASS

DERIVED FROM "ITU-T M.3100": connectionTerminationPointBidirectional;

CHARACTERIZED BY

"ITU-T M.3100": attributeValueChangeNotificationPackage,

"ITU-T M.3100": createDeleteNotificationsPackage,

"ITU-T M.3100": crossConnectionPointerPackage,

vpCTPBidirectionalPkg PACKAGE

BEHAVIOUR vpCTPBidirectionalBeh;

ATTRIBUTES

vpCTPId

GET,

segmentEndPoint

DEFAULT VALUE AtmMIBMod.booleanFalseDefault

GET-REPLACE;;;

## CONDITIONAL PACKAGES

egressTrafficDescriptorPkg

PRESENT IF "supplied by the managing system. This package must be present at points where egress UPC/NPC functions are performed.",

ingressTrafficDescriptorPkg

PRESENT IF "supplied by the managing system. This package must be present at points where ingress UPC/NPC functions are performed.",

oamCellLoopbackPkg

PRESENT IF "the termination point supports OAM cell Loopbacks",

qosClassesPkg

PRESENT IF "QOS Class information is supplied by the managing system";

REGISTERED AS {atmfM4ObjectClass 26};

vpCTPBidirectionalBeh BEHAVIOUR

DEFINED AS

" The vpCTPBidirectional object class is a class of managed objects that delimit Virtual Path (VP) links. From a configuration management perspective, instances of this object class represent VP link terminations that are either cross-connected to other VP link terminations or are available for such cross-connection.

Instances of this object class include attributes that describe the VPI value, traffic descriptor, and, optionally, the Quality of Service (QOS) class assigned to the VPL termination being represented. Note that the vpCTPId attribute value identifies the VPI value of the VPL termination being represented and is also used as the RDN for naming instances of this object class. Note that the vpCTPId attribute may be provided by the managing system upon creation of this managed object instance or it may be absent in the M-CREATE message and thus selected by the managed system. When selected by the managed system, the value chosen shall be reported to the managing system as a parameter in the response to the successfully performed M-CREATE request.

From a performance and fault management perspective, instances of this object class represent logical points along VPCs at which various maintenance and network traffic management functions may be performed.

The conditional package oamCellLoopbackPkg provides the M-ACTION used to request the termination point to insert an OAM cell for downstream loopbacking and report whether or not the cell was returned within the required time.

When a VP-AIS or VP-RDI failure is detected, the vpCTPBidirectional object shall generate a communicationsAlarm notification (if the tmnCommunicationsAlarmInformationPackage is present) with the probableCause parameter value set equal to aIS or farEndReceiverFailure, respectively.

Instances of this object class may be explicitly created and deleted by the managing system using the CMIS M-CREATE and M-DELETE services, respectively. Instances of this managed object class may also be automatically created by the managed system in response to actions performed on instances of the atmFabric or atmMpFabric object class. ";

**2.1.27. vpTTPBidirectional**

vpTTPBidirectional MANAGED OBJECT CLASS

DERIVED FROM "ITU-T M.3100": trailTerminationPointBidirectional;

## CHARACTERIZED BY

"Rec. X.721 | ISO/IEC 10165-2": administrativeStatePackage,

"ITU-T M.3100": attributeValueChangeNotificationPackage,

"ITU-T M.3100": createDeleteNotificationsPackage,

vpTTPBidirectionalPkg PACKAGE

BEHAVIOUR vpTTPBidirectionalBeh;

ATTRIBUTES

vpTTPId

GET;;;

CONDITIONAL PACKAGES

oamCellLoopbackPkg

PRESENT IF "the termination point supports OAM cell Loopbacks";

REGISTERED AS {atmfM4ObjectClass 27};

vpTTPBidirectionalBeh BEHAVIOUR

DEFINED AS

" The vpTTPBidirectional object class is a class of managed objects that delimit Virtual Path Connections (VPCs).

An instances of this object class represents the logical point in the managed system where the end-to-end F4 flow (i.e., OAM cells with VCI=4) terminates.

The oamCellLoopbackPkg package provides the M-ACTION used to request the termination point to insert an OAM cell for downstream loopbacking and report whether or not the cell was returned within the required time.

An instance of this object class shall always point (via the upstreamConnectivityPointer and downstreamConnectivityPointer attributes) to a vpCTPBidirectional managed object.

Instances of this object class are explicitly created and deleted by the managing system using the CMIS M-CREATE and M-DELETE services, respectively. Instances of this object class may also be automatically created by the managed system in response to actions performed on instances of the atmFabric or atmMpFabric object class.";

## 2.2. Conditional Packages

### 2.2.1. atmSubscriberAddressPkg

atmSubscriberAddressPkg PACKAGE  
ATTRIBUTES  
    atmSubscriberAddress  
        GET-REPLACE  
        ADD-REMOVE;  
REGISTERED AS {atmfM4Package 1};

### 2.2.2. cellScramblingEnabledPkg

cellScramblingEnabledPkg PACKAGE  
ATTRIBUTES  
    cellScramblingEnabled  
        DEFAULT VALUE AtmMIBMod.booleanTrueDefault  
        GET-REPLACE;  
REGISTERED AS {atmfM4Package 2};

### 2.2.3. discardedCLP0CellsHistoryDataPkg

discardedCLP0CellsHistoryDataPkg PACKAGE  
ATTRIBUTES  
    discardedCLP0Cells  
        GET;  
REGISTERED AS {atmfM4Package 3};

### 2.2.4. discardedCLP0CellsPkg

discardedCLP0CellsPkg PACKAGE  
ATTRIBUTES  
    discardedCLP0Cells  
        REPLACE-WITH-DEFAULT  
        GET;  
REGISTERED AS {atmfM4Package 4};

### 2.2.5. egressTrafficDescriptorPkg



```
egressTrafficDescriptorPkg PACKAGE
  ATTRIBUTES
    egressPeakCellRate
      GET-REPLACE,
    egressCDVTolerance
      GET-REPLACE,
    egressSustainableCellRate
      GET-REPLACE,
    egressMaxBurstSize
      GET-REPLACE;
REGISTERED AS {atmfM4Package 5};
```

### 2.2.6. farEndCarrierNetworkPkg

```
farEndCarrierNetworkPkg PACKAGE
  ATTRIBUTES
    farEndCarrierNetwork
      GET-REPLACE;
REGISTERED AS {atmfM4Package 6};
```

### 2.2.7. ilmiPkg

```
ilmiPkg PACKAGE
  ATTRIBUTES
    ilmiChannelIdentifier
      GET-REPLACE;
REGISTERED AS {atmfM4Package 7};
```

### 2.2.8. ingressTrafficDescriptorPkg

```
ingressTrafficDescriptorPkg PACKAGE
  ATTRIBUTES
    ingressPeakCellRate
      GET-REPLACE,
    ingressCDVTolerance
      GET-REPLACE,
    ingressSustainableCellRate
      GET-REPLACE,
    ingressMaxBurstSize
      GET-REPLACE;
REGISTERED AS {atmfM4Package 8};
```

**2.2.9. loopbackLocationIdentifierPkg**

```
loopbackLocationIdentifierPkg PACKAGE
  ATTRIBUTES
    loopbackLocationIdentifier
      GET-REPLACE;
REGISTERED AS {atmfM4Package 9};
```

**2.2.10. oamCellLoopbackPkg**

```
oamCellLoopbackPkg PACKAGE
  ACTIONS
    loopbackOAMCell;
REGISTERED AS {atmfM4Package 10};
```

**2.2.11. preferredCarrierPkg**

```
preferredCarrierPkg PACKAGE
  ATTRIBUTES
    preferredCarrier
      GET-REPLACE
      ADD-REMOVE;
REGISTERED AS {atmfM4Package 11};
```

**2.2.12. qosClassesPkg**

```
qosClassesPkg PACKAGE
  ATTRIBUTES
    ingressQOSClass
      GET-REPLACE,
    egressQOSClass
      GET-REPLACE;
REGISTERED AS {atmfM4Package 12};
```

**2.2.13. successfullyPassedCLP0CellsHistoryDataPkg**

```
successfullyPassedCLP0CellsHistoryDataPkg PACKAGE
  ATTRIBUTES
    successfullyPassedCLP0Cells
      GET;
REGISTERED AS {atmfM4Package 13};
```

**2.2.14. successfullyPassedCLP0CellsPkg**

```
successfullyPassedCLP0CellsPkg PACKAGE
  ATTRIBUTES
    successfullyPassedCLP0Cells
      REPLACE-WITH-DEFAULT
      GET;
REGISTERED AS {atmfM4Package 14};
```

**2.2.15. taggedCLP0CellsHistoryDataPkg**

```
taggedCLP0CellsHistoryDataPkg PACKAGE
  ATTRIBUTES
    taggedCLP0Cells
      GET;
REGISTERED AS {atmfM4Package 15};
```

**2.2.16. taggedCLP0CellsPkg**

```
taggedCLP0CellsPkg PACKAGE
  ATTRIBUTES
    taggedCLP0Cells
      REPLACE-WITH-DEFAULT
      GET;
REGISTERED AS {atmfM4Package 16};
```

**2.2.17. vcLevelProfilePackage**

```
vcLevelProfilePackage PACKAGE
  ATTRIBUTES
    maxNumVCIBitsSupported
      GET-REPLACE,
    maxNumActiveVCCsAllowed
      GET-REPLACE;
REGISTERED AS {atmfM4Package 17};
```

**2.2.18. vpLevelProfilePackage**

```
vpLevelProfilePackage PACKAGE
```

ATTRIBUTES

maxNumVPIBitsSupported

GET-REPLACE,

maxNumActiveVPCsAllowed

GET-REPLACE,

maxEgressBandwidth

GET-REPLACE,

maxIngressBandwidth

GET-REPLACE;

REGISTERED AS {atmfM4Package 18};

## 2.3. Attributes

### 2.3.1. atmAccessProfileId

atmAccessProfileId ATTRIBUTE  
WITH ATTRIBUTE SYNTAX AtmMIBMod.NameType;  
MATCHES FOR EQUALITY;  
BEHAVIOUR atmAccessProfileIdBeh;  
REGISTERED AS {atmfM4Attribute 1};

atmAccessProfileIdBeh BEHAVIOUR  
DEFINED AS  
" This attribute is used to name instances of the atmAccessProfile managed object class.";

### 2.3.2. atmFabricId

atmFabricId ATTRIBUTE  
WITH ATTRIBUTE SYNTAX AtmMIBMod.NameType;  
MATCHES FOR EQUALITY;  
BEHAVIOUR atmFabricIdBeh;  
REGISTERED AS {atmfM4Attribute 2};

atmFabricIdBeh BEHAVIOUR  
DEFINED AS  
" This attribute is used to name instances of the atmFabric managed object class.";

### 2.3.3. atmSubscriberAddress

atmSubscriberAddress ATTRIBUTE  
WITH ATTRIBUTE SYNTAX AtmMIBMod.AtmSubscriberAddress;  
MATCHES FOR EQUALITY, SET-COMPARISON, SET-INTERSECTION;  
BEHAVIOUR atmSubscriberAddressBeh;  
REGISTERED AS {atmfM4Attribute 3};

atmSubscriberAddressBeh BEHAVIOUR  
DEFINED AS  
" This attribute identifies the ATM Subscriber address(es) associated with a particular UNI. The first address listed in this attribute is considered to be the primary address. ";

### 2.3.4. cellHeaderAbnormalityType

cellHeaderAbnormalityType ATTRIBUTE

WITH ATTRIBUTE SYNTAX AtmMIBMod.CellHeaderAbnormalityType;  
MATCHES FOR EQUALITY;  
BEHAVIOUR cellHeaderAbnormalityTypeBeh;  
REGISTERED AS {atmfM4Attribute 4};

cellHeaderAbnormalityTypeBeh BEHAVIOUR

DEFINED AS

" This attribute identifies the abnormality associated with the log record. Valid values for this attribute are: Unassigned VPI/VCI Value and Out-Of-Range VPI/VCI Value. This attribute type will be used as part of the keyAttributeList in the containing latestOccurrenceLog object.";

### 2.3.5. cellScramblingEnabled

cellScramblingEnabled ATTRIBUTE

WITH ATTRIBUTE SYNTAX AtmMIBMod.Boolean;  
MATCHES FOR EQUALITY;  
BEHAVIOUR cellScramblingEnabledBeh;  
REGISTERED AS {atmfM4Attribute 5};

cellScramblingEnabledBeh BEHAVIOUR

DEFINED AS

" This attribute identifies whether or not ATM cell scrambling is being performed over the ATM interface. A value of TRUE (default) is used to indicate that cell scrambling is being performed. ";

### 2.3.6. commonCTPs

commonCTPs ATTRIBUTE

WITH ATTRIBUTE SYNTAX AtmMIBMod.CommonCTPs;  
MATCHES FOR EQUALITY, SET-COMPARISON, SET-INTERSECTION;  
BEHAVIOUR commonCTPsBeh;  
REGISTERED AS {atmfM4Attribute 6};

commonCTPsBeh BEHAVIOUR

DEFINED AS

" This attribute identifies all legs of the multipoint connection except the leg identified via the primaryCTP attribute. This attribute provides a pointer to one or more instances of the vpCTPBidirectional object class or vcCTPBidirectional object class. For full multipoint cross-connections, all the legs of the multipoint cross-connection shall be identified by this attribute. ";

### 2.3.7. discardedCells

discardedCells ATTRIBUTE

DERIVED FROM "Rec. X.721 | ISO/IEC 10165-2":counter;  
BEHAVIOUR discardedCellsBeh;  
REGISTERED AS {atmfM4Attribute 7};

discardedCellsBeh BEHAVIOUR

DEFINED AS

" This attribute provides a count of the number of ATM cells that were discarded due to UPC/NPC policing of the combined high and low cell loss priority traffic. ";

### 2.3.8. discardedCellsHECViolation

discardedCellsHECViolation ATTRIBUTE

DERIVED FROM "Rec. X.721 | ISO/IEC 10165-2":counter;  
BEHAVIOUR discardedCellsHECViolationBeh;  
REGISTERED AS {atmfM4Attribute 8};

discardedCellsHECViolationBeh BEHAVIOUR

DEFINED AS

" This attribute provides a count of the number of cells discarded due to uncorrectable header bit errors. ";

### 2.3.9. discardedCLP0Cells

discardedCLP0Cells ATTRIBUTE

DERIVED FROM "Rec. X.721 | ISO/IEC 10165-2":counter;  
BEHAVIOUR discardedCLP0CellsBeh;  
REGISTERED AS {atmfM4Attribute 9};

discardedCLP0CellsBeh BEHAVIOUR

DEFINED AS

" This attribute provides a count of the number of cells with CLP=0 that were discarded due to UPC/NPC policing of high priority (CLP=0) only traffic. ";

### 2.3.10. discardedCellsInvalidHeader

discardedCellsInvalidHeader ATTRIBUTE

DERIVED FROM "Rec. X.721 | ISO/IEC 10165-2":counter;  
BEHAVIOUR discardedCellsInvalidHeaderBeh;  
REGISTERED AS {atmfM4Attribute 10};

discardedCellsInvalidHeaderBeh BEHAVIOUR

DEFINED AS

" This attribute identifies the number of ATM cells discarded due to header content errors. ";

**2.3.11. ds3PLCPPathCTPId**

ds3PLCPPathCTPId ATTRIBUTE  
WITH ATTRIBUTE SYNTAX AtmMIBMod.NameType;  
MATCHES FOR EQUALITY;  
BEHAVIOUR ds3PLCPPathCTPIdBeh;  
REGISTERED AS {atmfM4Attribute 11};

ds3PLCPPathCTPIdBeh BEHAVIOUR  
DEFINED AS

" This attribute is used to name instances of the ds3PLCPPathCTPBidirectional managed object class.";

**2.3.12. egressCDVTolerance**

egressCDVTolerance ATTRIBUTE  
WITH ATTRIBUTE SYNTAX AtmMIBMod.CDVTolerance;  
MATCHES FOR EQUALITY;  
BEHAVIOUR egressCDVToleranceBeh;  
REGISTERED AS {atmfM4Attribute 12};

egressCDVToleranceBeh BEHAVIOUR  
DEFINED AS

" This attribute represents the egress (with respect to the managed system) CDV Tolerance assigned to the VPL or VCL being terminated. ";

**2.3.13. egressMaxBurstSize**

egressMaxBurstSize ATTRIBUTE  
WITH ATTRIBUTE SYNTAX AtmMIBMod.MaxBurstSize;  
MATCHES FOR EQUALITY;  
BEHAVIOUR egressMaxBurstSizeBeh;  
REGISTERED AS {atmfM4Attribute 13};

egressMaxBurstSizeBeh BEHAVIOUR  
DEFINED AS

" This attribute represents the egress maximum burst size (in cells) that has been assigned to the VP or VC link being terminated. ";

**2.3.14. egressPeakCellRate**

egressPeakCellRate ATTRIBUTE  
WITH ATTRIBUTE SYNTAX AtmMIBMod.PeakCellRate;  
MATCHES FOR EQUALITY;  
BEHAVIOUR egressPeakCellRateBeh;  
REGISTERED AS {atmfM4Attribute 14};



egressPeakCellRateBeh BEHAVIOUR

DEFINED AS

" This attribute is used to indicate the peak cell rate assigned or reserved in the egress (with respect to the managed system) direction of transmission across the VP or VC link being terminated. ";

### 2.3.15. egressQOSClass

egressQOSClass ATTRIBUTE

WITH ATTRIBUTE SYNTAX AtmMIBMod.QosClass;

MATCHES FOR EQUALITY;

BEHAVIOUR egressQOSClassBeh;

REGISTERED AS {atmfM4Attribute 15};

egressQOSClassBeh BEHAVIOUR

DEFINED AS

" This attribute identifies the Quality Of Service (QOS) class assigned to the VPL or VCL in the egress (with respect to the managed system) direction of cell transmission. Valid values for this attribute are: Class 0, Class 1, Class 2, Class 3, and Class 4. ";

### 2.3.16. egressSustainableCellRate

egressSustainableCellRate ATTRIBUTE

WITH ATTRIBUTE SYNTAX AtmMIBMod.SustainableCellRate;

MATCHES FOR EQUALITY;

BEHAVIOUR egressSustainableCellRateBeh;

REGISTERED AS {atmfM4Attribute 16};

egressSustainableCellRateBeh BEHAVIOUR

DEFINED AS

" This traffic descriptor represents the egress (with respect to the managed system) sustainable cell rate (in cells/second) assigned to the link being terminated ";

### 2.3.17. erroredCellsHECViolation

erroredCellsHECViolation ATTRIBUTE

DERIVED FROM "Rec. X.721 | ISO/IEC 10165-2":counter;

BEHAVIOUR erroredCellsHECViolationBeh;

REGISTERED AS {atmfM4Attribute 17};

erroredCellsHECViolationBeh BEHAVIOUR

DEFINED AS

" This attribute provides a count of the number of cells detected with an HEC error. ";

**2.3.18. farEndCarrierNetwork**

farEndCarrierNetwork ATTRIBUTE

WITH ATTRIBUTE SYNTAX AtmMIBMod.FarEndCarrierNetwork;  
MATCHES FOR EQUALITY;  
BEHAVIOUR farEndCarrierNetworkBeh;  
REGISTERED AS {atmfM4Attribute 18};

farEndCarrierNetworkBeh BEHAVIOUR

DEFINED AS

" This attribute identifies the adjacent (far-end) carrier to which the Inter-NNI is connected. ";

**2.3.19. ilmiChannelIdentifier**

ilmiChannelIdentifier ATTRIBUTE

WITH ATTRIBUTE SYNTAX AtmMIBMod.IlmiChannelIdentifier;  
MATCHES FOR EQUALITY;  
BEHAVIOUR ilmiChannelIdentifierBeh;  
REGISTERED AS {atmfM4Attribute 19};

ilmiChannelIdentifierBeh BEHAVIOUR

DEFINED AS

" This attribute identifies the VPI/VCI pair that is used to provide the user connectivity to the Interim Local Management Interface (ILMI) Server in the managed system. The default value for this attribute is VPI=0 and VCI=16. ";

**2.3.20. ingressCDVTolerance**

ingressCDVTolerance ATTRIBUTE

WITH ATTRIBUTE SYNTAX AtmMIBMod.CDVTolerance;  
MATCHES FOR EQUALITY;  
BEHAVIOUR ingressCDVToleranceBeh;  
REGISTERED AS {atmfM4Attribute 20};

ingressCDVToleranceBeh BEHAVIOUR

DEFINED AS

" This attribute represents the ingress (with respect to the managed system) CDV Tolerance assigned to the VPL or VCL being terminated.";

**2.3.21. ingressMaxBurstSize**

ingressMaxBurstSize ATTRIBUTE

WITH ATTRIBUTE SYNTAX AtmMIBMod.MaxBurstSize;

MATCHES FOR EQUALITY;  
BEHAVIOUR ingressMaxBurstSizeBeh;  
REGISTERED AS {atmfM4Attribute 21};

ingressMaxBurstSizeBeh BEHAVIOUR  
DEFINED AS

" This attribute represents the ingress (with respect to the managed system) maximum burst size (in cells) that has been assigned to the VP or VC link being terminated. ";

### 2.3.22. ingressPeakCellRate

ingressPeakCellRate ATTRIBUTE  
WITH ATTRIBUTE SYNTAX AtmMIBMod.PeakCellRate;  
MATCHES FOR EQUALITY;  
BEHAVIOUR ingressPeakCellRateBeh;  
REGISTERED AS {atmfM4Attribute 22};

ingressPeakCellRateBeh BEHAVIOUR  
DEFINED AS

" This attribute is used to indicate the peak cell rate assigned or reserved in the ingress (with respect to the managed system) direction of transmission across the VP or VC link being terminated. ";

### 2.3.23. ingressQOSClass

ingressQOSClass ATTRIBUTE  
WITH ATTRIBUTE SYNTAX AtmMIBMod.QosClass;  
MATCHES FOR EQUALITY;  
BEHAVIOUR ingressQOSClassBeh;  
REGISTERED AS {atmfM4Attribute 23};

ingressQOSClassBeh BEHAVIOUR  
DEFINED AS

" This attribute identifies the Quality Of Service (QOS) class assigned to the VPL or VCL in the ingress (with respect to the managed system) direction of cell transmission. Valid values for this attribute are: Class 0, Class 1, Class 2, Class 3, and Class 4. ";

### 2.3.24. ingressSustainableCellRate

ingressSustainableCellRate ATTRIBUTE  
WITH ATTRIBUTE SYNTAX AtmMIBMod.SustainableCellRate;  
MATCHES FOR EQUALITY;  
BEHAVIOUR ingressSustainableCellRateBeh;  
REGISTERED AS {atmfM4Attribute 24};

ingressSustainableCellRateBeh BEHAVIOUR

DEFINED AS

" This traffic descriptor represents the ingress (with respect to the managed system) sustainable cell rate (in cells/second) assigned to the link being terminated. ";

### 2.3.25. interfacePointer

interfacePointer ATTRIBUTE

WITH ATTRIBUTE SYNTAX AtmMIBMod.InterfacePointer;

MATCHES FOR EQUALITY;

BEHAVIOUR interfacePointerBeh;

REGISTERED AS {atmfM4Attribute 25};

interfacePointerBeh BEHAVIOUR

DEFINED AS

" This attribute identifies the object instance Id of the uni, interNNI, or intraNNI object with which the cell header abnormality is associated. This attribute type will be used as part of the keyAttributeList in the containing latestOccurrenceLog object. ";

### 2.3.26. interNNIId

interNNIId ATTRIBUTE

WITH ATTRIBUTE SYNTAX AtmMIBMod.NameType;

MATCHES FOR EQUALITY;

BEHAVIOUR interNNIIdBeh;

REGISTERED AS {atmfM4Attribute 26};

interNNIIdBeh BEHAVIOUR

DEFINED AS

" This attribute is used to name instances of the interNNI managed object class. ";

### 2.3.27. intraNNIId

intraNNIId ATTRIBUTE

WITH ATTRIBUTE SYNTAX AtmMIBMod.NameType;

MATCHES FOR EQUALITY;

BEHAVIOUR intraNNIIdBeh;

REGISTERED AS {atmfM4Attribute 27};

intraNNIIdBeh BEHAVIOUR

DEFINED AS

" This attribute is used to name instances of the intraNNI managed object class. ";

### 2.3.28. keyAttributeList

keyAttributeList ATTRIBUTE  
 WITH ATTRIBUTE SYNTAX AtmMIBMod.AttributeList;  
 MATCHES FOR EQUALITY;  
 BEHAVIOUR keyAttributeListBeh;  
 REGISTERED AS {atmfM4Attribute 28};

keyAttributeListBeh BEHAVIOUR  
 DEFINED AS  
 " This attribute indicates the list of attribute types to be used as keys to uniquely identify the entries in a latestOccurrenceLog.";

### 2.3.29. loopbackLocationIdentifier

loopbackLocationIdentifier ATTRIBUTE  
 WITH ATTRIBUTE SYNTAX AtmMIBMod.OctetString;  
 MATCHES FOR EQUALITY;  
 BEHAVIOUR loopbackLocationIdentifierBeh;  
 REGISTERED AS {atmfM4Attribute 29};

loopbackLocationIdentifierBeh BEHAVIOUR  
 DEFINED AS  
 " This attribute provides a read/write code used for OAM cell loopback purposes. Incoming OAM Loopback cells with a Loopback Location field value that matches the value of the loopbackLocationIdentifier attribute shall be looped-back over the ATM interface.";

### 2.3.30. maxEgressBandwidth

maxEgressBandwidth ATTRIBUTE  
 WITH ATTRIBUTE SYNTAX AtmMIBMod.Integer;  
 MATCHES FOR EQUALITY, ORDERING;  
 BEHAVIOUR maxEgressBandwidthBeh;  
 REGISTERED AS {atmfM4Attribute 30};

maxEgressBandwidthBeh BEHAVIOUR  
 DEFINED AS  
 "This attribute identifies the maximum egress bandwidth for the ATM Interface that is managed exclusively by the NE. Further behaviour for this attribute is the subject of further study.";

### 2.3.31. maxIngressBandwidth

maxIngressBandwidth ATTRIBUTE  
 WITH ATTRIBUTE SYNTAX AtmMIBMod.Integer;  
 MATCHES FOR EQUALITY, ORDERING;  
 BEHAVIOUR maxIngressBandwidthBeh;  
 REGISTERED AS {atmfM4Attribute 31};

maxIngressBandwidthBeh BEHAVIOUR

DEFINED AS

"This attribute identifies the maximum ingress bandwidth for the ATM Interface that is managed exclusively by the NE. *Further behaviour for this attribute is the subject of further study.*";

### 2.3.32. **maxNumActiveVCCsAllowed**

maxNumActiveVCCsAllowed ATTRIBUTE  
 WITH ATTRIBUTE SYNTAX AtmMIBMod.Integer;  
 MATCHES FOR EQUALITY, ORDERING;  
 BEHAVIOUR maxNumActiveVCCsAllowedBeh;  
 REGISTERED AS {atmfM4Attribute 32};

maxNumActiveVCCsAllowedBeh BEHAVIOUR  
 DEFINED AS

" This attribute identifies the maximum number of concurrently active Virtual Channel Connections (VCCs) that the interface has been configured to support. ";

### 2.3.33. **maxNumActiveVPCsAllowed**

maxNumActiveVPCsAllowed ATTRIBUTE  
 WITH ATTRIBUTE SYNTAX AtmMIBMod.Integer;  
 MATCHES FOR EQUALITY, ORDERING;  
 BEHAVIOUR maxNumActiveVPCsAllowedBeh;  
 REGISTERED AS {atmfM4Attribute 33};

maxNumActiveVPCsAllowedBeh BEHAVIOUR  
 DEFINED AS

" This attribute identifies the maximum number of concurrently active Virtual Path Connections (VPCs) that the interface has been configured to support. ";

### 2.3.34. **maxNumVCIBitsSupported**

maxNumVCIBitsSupported ATTRIBUTE  
 WITH ATTRIBUTE SYNTAX AtmMIBMod.Integer;  
 MATCHES FOR EQUALITY, ORDERING;  
 BEHAVIOUR maxNumVCIBitsSupportedBeh;  
 REGISTERED AS {atmfM4Attribute 34};

maxNumVCIBitsSupportedBeh BEHAVIOUR  
 DEFINED AS

" This attribute identifies the maximum number of contiguous VCI bits, starting from the least significant bit, that may be used over the UNI, Inter-NNI, or Intra-NNI. The value of this parameter represents the lower supported value of the equipment on each end of the UNI, Inter-NNI, or Intra-NNI. Note that a value of N for this attribute implies that VCI values in the range of 0 to  $(2^N)-1$  are possible.";

**2.3.35. maxNumVPIBitsSupported**

maxNumVPIBitsSupported ATTRIBUTE  
WITH ATTRIBUTE SYNTAX AtmMIBMod.Integer;  
MATCHES FOR EQUALITY, ORDERING;  
BEHAVIOUR maxNumVPIBitsSupportedBeh;  
REGISTERED AS {atmfM4Attribute 35};

maxNumVPIBitsSupportedBeh BEHAVIOUR  
DEFINED AS

" This attribute identifies the maximum number of contiguous VPI bits, starting from the least significant bit, that may be used over the UNI, Inter-NNI, or Intra-NNI. The value of this parameter represents the lower supported value of the equipment on each end of the UNI, Inter-NNI, or Intra-NNI. Note that a value of N for this attribute implies that VPI values in the range of 0 to  $(2^N)-1$  are possible. ";

**2.3.36. multipointBridgeId**

multipointBridgeId ATTRIBUTE  
WITH ATTRIBUTE SYNTAX AtmMIBMod.NameType;  
MATCHES FOR EQUALITY;  
BEHAVIOUR multipointBridgeIdBeh;  
REGISTERED AS {atmfM4Attribute 36};

multipointBridgeIdBeh BEHAVIOUR  
DEFINED AS

" This attribute is used to name instances of the multipointBridge managed object class. ";

**2.3.37. multipointConnectionType**

multipointConnectionType ATTRIBUTE  
WITH ATTRIBUTE SYNTAX AtmMIBMod.MultipointConnectionType;  
MATCHES FOR EQUALITY;  
BEHAVIOUR multipointConnectionTypeBeh;  
REGISTERED AS {atmfM4Attribute 37};

multipointConnectionTypeBeh BEHAVIOUR  
DEFINED AS

" This attribute represents the type of cross-connection established by the multipoint bridge. Valid values are broadcast, merge, composite, and full multipoint. ";

**2.3.38. numReceivedOAMCells**

numReceivedOAMCells ATTRIBUTE  
DERIVED FROM "Rec. X.721 | ISO/IEC 10165-2":counter;  
BEHAVIOUR numReceivedOAMCellsBeh;  
REGISTERED AS {atmfM4Attribute 38};

numReceivedOAMCellsBeh BEHAVIOUR  
DEFINED AS  
" This attribute provides a count of the number of OAM cells received by the ATM Layer for the supporting UNI, Inter-NNI, or Intra-NNI. ";

### 2.3.39. preferredCarrier

preferredCarrier ATTRIBUTE  
WITH ATTRIBUTE SYNTAX AtmMIBMod.PreferredCarrier;  
MATCHES FOR EQUALITY, SET-COMPARISON, SET-INTERSECTION;  
BEHAVIOUR preferredCarrierBeh;  
REGISTERED AS {atmfM4Attribute 39};

preferredCarrierBeh BEHAVIOUR  
DEFINED AS  
" 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. ";

### 2.3.40. primaryCTP

primaryCTP ATTRIBUTE  
WITH ATTRIBUTE SYNTAX AtmMIBMod.PointerOrNull;  
MATCHES FOR EQUALITY;  
BEHAVIOUR primaryCTPBeh;  
REGISTERED AS {atmfM4Attribute 40};

primaryCTPBeh BEHAVIOUR  
DEFINED AS  
"The primaryCTP attribute identifies the vpCTPBidirectional or vcCTPBidirectional object that generates traffic to broadcast and/or receives merged traffic for broadcast, merge, or composite multipoint cross-connection types. For full multipoint connections (i.e., all legs communicate with all other legs), the value of this attribute shall be set to NULL. The primaryCTP attribute value shall remain fixed during the life of the associated multipoint cross-connection. ";

### 2.3.41. recoveryType

recoveryType ATTRIBUTE  
WITH ATTRIBUTE SYNTAX AtmMIBMod.RecoveryType;  
MATCHES FOR EQUALITY;  
BEHAVIOUR recoveryTypeBeh;



REGISTERED AS {atmfM4Attribute 41};

recoveryTypeBeh BEHAVIOUR

DEFINED AS

"The recoveryType attribute identifies whether the ATM cross-connection is recoverable (default) or non-recoverable. Recoverable cross-connections remain intact regardless of the operational state of the cross-connection. Non-recoverable ATM cross-connections are cross-connections that are automatically released by the managed system upon detection of a service affecting failure.";

#### 2.3.42. segmentEndPoint

segmentEndPoint ATTRIBUTE

WITH ATTRIBUTE SYNTAX AtmMIBMod.Boolean;

MATCHES FOR EQUALITY;

BEHAVIOUR segmentEndPointBeh;

REGISTERED AS {atmfM4Attribute 42};

segmentEndPointBeh BEHAVIOUR

DEFINED AS

" This boolean attribute indicates whether the vpCTPBidirectional object instance or vcCTPBidirectional object instance has been configured to represent an end-point of a VPC or VCC Segment, respectively. ";

#### 2.3.43. successfullyPassedCells

successfullyPassedCells ATTRIBUTE

DERIVED FROM "Rec. X.721 | ISO/IEC 10165-2":counter;

BEHAVIOUR successfullyPassedCellsBeh;

REGISTERED AS {atmfM4Attribute 43};

successfullyPassedCellsBeh BEHAVIOUR

DEFINED AS

" This attribute represents the number of ATM cells that were received and successfully passed (i.e., not discarded) by the UPC/NPC function after performing policing functions on the combined high and low cell loss priority traffic. ";

#### 2.3.44. successfullyPassedCLP0Cells

successfullyPassedCLP0Cells ATTRIBUTE

DERIVED FROM "Rec. X.721 | ISO/IEC 10165-2":counter;

BEHAVIOUR successfullyPassedCLP0CellsBeh;

REGISTERED AS {atmfM4Attribute 44};

successfullyPassedCLP0CellsBeh BEHAVIOUR

DEFINED AS

" This attribute represents the number of ATM cells that were received and successfully passed (i.e., not discarded) by the UPC/NPC function after performing policing functions on the high priority (CLP=0) traffic. ";

### 2.3.45. taggedCLP0Cells

taggedCLP0Cells ATTRIBUTE  
 DERIVED FROM "Rec. X.721 | ISO/IEC 10165-2":counter;  
 BEHAVIOUR taggedCLP0CellsBeh;  
 REGISTERED AS {atmfM4Attribute 45};

taggedCLP0CellsBeh BEHAVIOUR  
 DEFINED AS

" This attribute provides a count of the number of cells with CLP=0 that were tagged (i.e., CLP reset to 1) by the UPC or NPC function. ";

### 2.3.46. tcTTPId

tcTTPId ATTRIBUTE  
 WITH ATTRIBUTE SYNTAX AtmMIBMod.NameType;  
 MATCHES FOR EQUALITY;  
 BEHAVIOUR tcTTPIdBeh;  
 REGISTERED AS {atmfM4Attribute 46};

tcTTPIdBeh BEHAVIOUR  
 DEFINED AS

" This attribute is used for naming instances of the tcAdaptorTTPBidirectional managed object class. ";

### 2.3.47. underlyingTTPPointer

underlyingTTPPointer ATTRIBUTE  
 WITH ATTRIBUTE SYNTAX AtmMIBMod.PointerOrNull;  
 MATCHES FOR EQUALITY;  
 BEHAVIOUR underlyingTTPPointerBeh;  
 REGISTERED AS {atmfM4Attribute 47};

underlyingTTPPointerBeh BEHAVIOUR  
 DEFINED AS

" This attribute provides a pointer relationship to the tcAdaptorTTPBidirectional object that provides the underlying ATM transport for the interface. ";

### 2.3.48. uniId

**uniId ATTRIBUTE**

WITH ATTRIBUTE SYNTAX AtmMIBMod.NameType;  
MATCHES FOR EQUALITY;  
BEHAVIOUR uniIdBeh;  
REGISTERED AS {atmfM4Attribute 48};

**uniIdBeh BEHAVIOUR**

DEFINED AS  
" This attribute is used for naming instances of the uni managed object class. ";

**2.3.49. vcCTPId****vcCTPId ATTRIBUTE**

WITH ATTRIBUTE SYNTAX AtmMIBMod.SimpleNameType;  
MATCHES FOR EQUALITY, ORDERING;  
BEHAVIOUR vcCTPIdBah;  
REGISTERED AS {atmfM4Attribute 49};

**vcCTPIdBah BEHAVIOUR**

DEFINED AS  
" This attribute is used for naming instances of the vcCTPBidirectional managed object class. The value of this attribute shall be set equal to the VCI value of the Virtual Channel Link (VCL) being terminated. ";

**2.3.50. vciValue****vciValue ATTRIBUTE**

WITH ATTRIBUTE SYNTAX AtmMIBMod.Integer;  
MATCHES FOR EQUALITY, ORDERING;  
BEHAVIOUR vciValueBeh;  
REGISTERED AS {atmfM4Attribute 50};

**vciValueBeh BEHAVIOUR**

DEFINED AS  
" This attribute represents the VCI Value in the header of the discarded ATM cell. ";

**2.3.51. vcTTPId****vcTTPId ATTRIBUTE**

WITH ATTRIBUTE SYNTAX AtmMIBMod.NameType;  
MATCHES FOR EQUALITY;  
BEHAVIOUR vcTTPIdBah;  
REGISTERED AS {atmfM4Attribute 51};

**vcTTPIdBah BEHAVIOUR**

DEFINED AS

" This attribute is used for naming instances of the vcTTPBidirectional managed object class. ";

### 2.3.52. vpCTPId

vpCTPId ATTRIBUTE  
WITH ATTRIBUTE SYNTAX AtmMIBMod.SimpleNameType;  
MATCHES FOR EQUALITY, ORDERING;  
BEHAVIOUR vpCTPIdBeh;  
REGISTERED AS {atmfM4Attribute 52};

vpCTPIdBeh BEHAVIOUR  
DEFINED AS

" This attribute is used for naming instances of the vpCTPBidirectional managed object class. This attribute shall be set equal to the VPI value of the Virtual Path Link (VPL) being terminated. ";

### 2.3.53. vpiValue

vpiValue ATTRIBUTE  
WITH ATTRIBUTE SYNTAX AtmMIBMod.Integer;  
MATCHES FOR EQUALITY, ORDERING;  
BEHAVIOUR vpiValueBeh;  
REGISTERED AS {atmfM4Attribute 53};

vpiValueBeh BEHAVIOUR  
DEFINED AS

" This attribute represents the VPI value in the header of the discarded ATM cell. ";

### 2.3.54. vpTTPId

vpTTPId ATTRIBUTE  
WITH ATTRIBUTE SYNTAX AtmMIBMod.NameType;  
MATCHES FOR EQUALITY;  
BEHAVIOUR vpTTPIdBeh;  
REGISTERED AS {atmfM4Attribute 54};

vpTTPIdBeh BEHAVIOUR  
DEFINED AS

" This attribute is used for naming instances of the vpTTPBidirectional managed object class. ";

## 2.4. Name-Bindings

### 2.4.1. atmAccessProfile-tcAdaptorTTPBidirectional

atmAccessProfile-tcAdaptorTTPBidirectional NAME BINDING  
 SUBORDINATE OBJECT CLASS atmAccessProfile AND SUBCLASSES;  
 NAMED BY SUPERIOR OBJECT CLASS tcAdaptorTTPBidirectional AND  
 SUBCLASSES;  
 WITH ATTRIBUTE atmAccessProfileId;  
 CREATE  
   WITH-REFERENCE-OBJECT,  
   WITH-AUTOMATIC-INSTANCE-NAMING;  
 DELETE  
   DELETES-CONTAINED-OBJECTS;  
 REGISTERED AS {atmfM4NameBinding 1};

### 2.4.2. atmCrossConnection-atmFabric

atmCrossConnection-atmFabric NAME BINDING  
 SUBORDINATE OBJECT CLASS atmCrossConnection AND SUBCLASSES;  
 NAMED BY SUPERIOR OBJECT CLASS atmFabric AND SUBCLASSES;  
 WITH ATTRIBUTE "ITU-T M.3100":crossConnectionId;  
 DELETE  
   ONLY-IF-NO-CONTAINED-OBJECTS;  
 REGISTERED AS {atmfM4NameBinding 2};

### 2.4.3. atmFabric-managedElementR1

atmFabric-managedElementR1 NAME BINDING  
 SUBORDINATE OBJECT CLASS atmFabric AND SUBCLASSES;  
 NAMED BY SUPERIOR OBJECT CLASS "ITU-T M.3100": managedElementR1  
 AND SUBCLASSES;  
 WITH ATTRIBUTE atmFabricId;  
 REGISTERED AS {atmfM4NameBinding 3};

### 2.4.4. cellHeaderAbnormalityLogRecord-latestOccurrenceLog

cellHeaderAbnormalityLogRecord-latestOccurrenceLog NAME BINDING  
 SUBORDINATE OBJECT CLASS cellHeaderAbnormalityLogRecord AND  
 SUBCLASSES;  
 NAMED BY SUPERIOR OBJECT CLASS latestOccurrenceLog AND SUBCLASSES;  
 WITH ATTRIBUTE "Rec. X.721 | ISO/IEC 10165-2":logRecordId;  
 DELETE

DELETES-CONTAINED-OBJECTS;  
REGISTERED AS {atmfM4NameBinding 4};

#### 2.4.5. cellLevelProtocolCurrentData-interNNI

cellLevelProtocolCurrentData-interNNI NAME BINDING  
SUBORDINATE OBJECT CLASS cellLevelProtocolCurrentData AND  
SUBCLASSES;  
NAMED BY SUPERIOR OBJECT CLASS interNNI AND SUBCLASSES;  
WITH ATTRIBUTE "ITU-T X.739":scannerId;  
CREATE  
WITH-REFERENCE-OBJECT,  
WITH-AUTOMATIC-INSTANCE-NAMING;  
DELETE  
DELETES-CONTAINED-OBJECTS;  
REGISTERED AS {atmfM4NameBinding 5};

#### 2.4.6. cellLevelProtocolCurrentData-intraNNI

cellLevelProtocolCurrentData-intraNNI NAME BINDING  
SUBORDINATE OBJECT CLASS cellLevelProtocolCurrentData AND  
SUBCLASSES;  
NAMED BY SUPERIOR OBJECT CLASS intraNNI AND SUBCLASSES;  
WITH ATTRIBUTE "ITU-T X.739":scannerId;  
CREATE  
WITH-REFERENCE-OBJECT,  
WITH-AUTOMATIC-INSTANCE-NAMING;  
DELETE  
DELETES-CONTAINED-OBJECTS;  
REGISTERED AS {atmfM4NameBinding 6};

#### 2.4.7. cellLevelProtocolCurrentData-uni

cellLevelProtocolCurrentData-uni NAME BINDING  
SUBORDINATE OBJECT CLASS cellLevelProtocolCurrentData AND  
SUBCLASSES;  
NAMED BY SUPERIOR OBJECT CLASS uni AND SUBCLASSES;  
WITH ATTRIBUTE "ITU-T X.739":scannerId;  
CREATE  
WITH-REFERENCE-OBJECT,  
WITH-AUTOMATIC-INSTANCE-NAMING;  
DELETE  
DELETES-CONTAINED-OBJECTS;  
REGISTERED AS {atmfM4NameBinding 7};

**2.4.8. ds3PLCPPathCTPBidirectional-ds3PathTTPBidirectional**

ds3PLCPPathCTPBidirectional-ds3PathTTPBidirectional NAME BINDING  
SUBORDINATE OBJECT CLASS ds3PLCPPathCTPBidirectional AND  
SUBCLASSES;  
NAMED BY SUPERIOR OBJECT CLASS "Bellcore GR-  
836":ds3PathTTPBidirectional AND  
SUBCLASSES;  
WITH ATTRIBUTE ds3PLCPPathCTPId;  
REGISTERED AS {atmfM4NameBinding 8};

**2.4.9. ds3PLCPPathTTPBidirectional-managedElementR1**

ds3PLCPPathTTPBidirectional-managedElementR1 NAME BINDING  
SUBORDINATE OBJECT CLASS ds3PLCPPathTTPBidirectional AND  
SUBCLASSES;  
NAMED BY SUPERIOR OBJECT CLASS "ITU-T M.3100":managedElementR1  
AND SUBCLASSES;  
WITH ATTRIBUTE "Bellcore GR-836":ds3PathTTPId;  
CREATE  
WITH-REFERENCE-OBJECT,  
WITH-AUTOMATIC-INSTANCE-NAMING;  
DELETE  
DELETES-CONTAINED-OBJECTS;  
REGISTERED AS {atmfM4NameBinding 9};

**2.4.10. electricalSPITTPBidirectional-managedElementR1**

electricalSPITTPBidirectional-managedElementR1 NAME BINDING  
SUBORDINATE OBJECT CLASS "ITU-T G.774":electricalSPITTPBidirectional  
AND SUBCLASSES;  
NAMED BY SUPERIOR OBJECT CLASS "ITU-T M.3100":managedElementR1  
AND SUBCLASSES;  
WITH ATTRIBUTE "ITU-T G.774":electricalSPITTPId;  
CREATE  
WITH-REFERENCE-OBJECT,  
WITH-AUTOMATIC-INSTANCE-NAMING;  
DELETE  
DELETES-CONTAINED-OBJECTS;  
REGISTERED AS {atmfM4NameBinding 10};

**2.4.11. equipmentHolder-equipmentR1**

equipmentHolder-equipmentR1 NAME BINDING  
SUBORDINATE OBJECT CLASS "ITU-T M.3100":equipmentHolder  
AND SUBCLASSES;  
NAMED BY SUPERIOR OBJECT CLASS "ITU-T M.3100": equipmentR1 AND  
SUBCLASSES;  
WITH ATTRIBUTE "ITU-T M.3100": equipmentId;  
CREATE  
WITH-REFERENCE-OBJECT,  
WITH-AUTOMATIC-INSTANCE-NAMING;  
DELETE  
DELETES-CONTAINED-OBJECTS;  
REGISTERED AS {atmfM4NameBinding 11};

**2.4.12. interNNI-managedElementR1**

interNNI-managedElementR1 NAME BINDING  
SUBORDINATE OBJECT CLASS interNNI AND SUBCLASSES;  
NAMED BY SUPERIOR OBJECT CLASS "ITU-T M.3100": managedElementR1  
AND SUBCLASSES;  
WITH ATTRIBUTE interNNIId;  
CREATE  
WITH-AUTOMATIC-INSTANCE-NAMING;  
DELETE  
DELETES-CONTAINED-OBJECTS;  
REGISTERED AS {atmfM4NameBinding 12};

**2.4.13. intraNNI-managedElementR1**

intraNNI-managedElementR1 NAME BINDING  
SUBORDINATE OBJECT CLASS intraNNI AND SUBCLASSES;  
NAMED BY SUPERIOR OBJECT CLASS "ITU-T M.3100": managedElementR1  
AND SUBCLASSES;  
WITH ATTRIBUTE intraNNIId;  
CREATE  
WITH-AUTOMATIC-INSTANCE-NAMING;  
DELETE  
DELETES-CONTAINED-OBJECTS;  
REGISTERED AS {atmfM4NameBinding 13};

**2.4.14. latestOccurrenceLog-managedElementR1**

latestOccurrenceLog-managedElementR1 NAME BINDING  
SUBORDINATE OBJECT CLASS latestOccurrenceLog AND SUBCLASSES;  
NAMED BY SUPERIOR OBJECT CLASS "ITU-T M.3100": managedElementR1  
AND SUBCLASSES;



```
WITH ATTRIBUTE "Rec. X.721 | ISO/IEC 10165-2":logId;
CREATE
  WITH-REFERENCE-OBJECT,
  WITH-AUTOMATIC-INSTANCE-NAMING;
DELETE
  DELETES-CONTAINED-OBJECTS;
REGISTERED AS {atmfM4NameBinding 14};
```

#### 2.4.15. **msTTPBidirectional-managedElementR1**

```
msTTPBidirectional-managedElementR1 NAME BINDING
SUBORDINATE OBJECT CLASS "ITU-T G.774":msTTPBidirectional AND
SUBCLASSES;
NAMED BY SUPERIOR OBJECT CLASS "ITU-T M.3100": managedElementR1
AND SUBCLASSES;
WITH ATTRIBUTE "ITU-T G.774":msTTPId;
CREATE
  WITH-REFERENCE-OBJECT,
  WITH-AUTOMATIC-INSTANCE-NAMING;
DELETE
  DELETES-CONTAINED-OBJECTS;
REGISTERED AS {atmfM4NameBinding 15};
```

#### 2.4.16. **multipointBridge-managedElementR1**

```
multipointBridge-managedElementR1 NAME BINDING
SUBORDINATE OBJECT CLASS multipointBridge AND SUBCLASSES;
NAMED BY SUPERIOR OBJECT CLASS "ITU-T M.3100": managedElementR1
AND SUBCLASSES;
WITH ATTRIBUTE multipointBridgeId;
CREATE
  WITH-AUTOMATIC-INSTANCE-NAMING;
DELETE
  ONLY-IF-NO-CONTAINED-OBJECTS;
REGISTERED AS {atmfM4NameBinding 16};
```

#### 2.4.17. **opticalSPITTPBidirectional-managedElementR1**

```
opticalSPITTPBidirectional-managedElementR1 NAME BINDING
SUBORDINATE OBJECT CLASS "ITU-T G.774":opticalSPITTPBidirectional AND
SUBCLASSES;
NAMED BY SUPERIOR OBJECT CLASS "ITU-T M.3100": managedElementR1
AND SUBCLASSES;
WITH ATTRIBUTE "ITU-T G.774":opticalSPITTPId;
CREATE
  WITH-REFERENCE-OBJECT,
  WITH-AUTOMATIC-INSTANCE-NAMING;
```

DELETE  
 DELETES-CONTAINED-OBJECTS;  
 REGISTERED AS {atmfM4NameBinding 17};

#### 2.4.18. rsTTPBidirectional-managedElementR1

rsTTPBidirectional-managedElementR1 NAME BINDING  
 SUBORDINATE OBJECT CLASS "ITU-T G.774":rsTTPBidirectional AND  
 SUBCLASSES;  
 NAMED BY SUPERIOR OBJECT CLASS "ITU-T M.3100": managedElementR1  
 AND SUBCLASSES;  
 WITH ATTRIBUTE "ITU-T G.774":rsTTPId;  
 CREATE  
 WITH-REFERENCE-OBJECT,  
 WITH-AUTOMATIC-INSTANCE-NAMING;  
 DELETE  
 DELETES-CONTAINED-OBJECTS;  
 REGISTERED AS {atmfM4NameBinding 18};

#### 2.4.19. tcAdaptorCurrentData-tcAdaptorTTPBidirectional

tcAdaptorCurrentData-tcAdaptorTTPBidirectional NAME BINDING  
 SUBORDINATE OBJECT CLASS tcAdaptorCurrentData AND SUBCLASSES;  
 NAMED BY SUPERIOR OBJECT CLASS tcAdaptorTTPBidirectional AND  
 SUBCLASSES;  
 WITH ATTRIBUTE "ITU-T X.739":scannerId;  
 CREATE  
 WITH-REFERENCE-OBJECT,  
 WITH-AUTOMATIC-INSTANCE-NAMING;  
 DELETE  
 DELETES-CONTAINED-OBJECTS;  
 REGISTERED AS {atmfM4NameBinding 19};

#### 2.4.20. tcAdaptorTTPBidirectional-managedElementR1

tcAdaptorTTPBidirectional-managedElementR1 NAME BINDING  
 SUBORDINATE OBJECT CLASS tcAdaptorTTPBidirectional AND SUBCLASSES;  
 NAMED BY SUPERIOR OBJECT CLASS "ITU-T M.3100": managedElementR1  
 AND SUBCLASSES;  
 WITH ATTRIBUTE tcTTPId;  
 CREATE  
 WITH-REFERENCE-OBJECT,  
 WITH-AUTOMATIC-INSTANCE-NAMING;  
 DELETE  
 DELETES-CONTAINED-OBJECTS;

REGISTERED AS {atmfM4NameBinding 20};

#### 2.4.21. uni-managedElementR1

uni-managedElementR1 NAME BINDING  
SUBORDINATE OBJECT CLASS uni AND SUBCLASSES;  
NAMED BY SUPERIOR OBJECT CLASS "ITU-T M.3100":managedElementR1  
AND SUBCLASSES;  
WITH ATTRIBUTE uniId;  
CREATE  
WITH-AUTOMATIC-INSTANCE-NAMING;  
DELETE  
DELETES-CONTAINED-OBJECTS;  
REGISTERED AS {atmfM4NameBinding 21};

#### 2.4.22. upcNpcCurrentData-vcCTPBidirectional

upcNpcCurrentData-vcCTPBidirectional NAME BINDING  
SUBORDINATE OBJECT CLASS upcNpcCurrentData AND SUBCLASSES;  
NAMED BY SUPERIOR OBJECT CLASS vcCTPBidirectional AND SUBCLASSES;  
WITH ATTRIBUTE "ITU-T X.739":scannerId;  
CREATE  
WITH-REFERENCE-OBJECT,  
WITH-AUTOMATIC-INSTANCE-NAMING;  
DELETE  
DELETES-CONTAINED-OBJECTS;  
REGISTERED AS {atmfM4NameBinding 22};

#### 2.4.23. upcNpcCurrentData-vpCTPBidirectional

upcNpcCurrentData-vpCTPBidirectional NAME BINDING  
SUBORDINATE OBJECT CLASS upcNpcCurrentData AND SUBCLASSES;  
NAMED BY SUPERIOR OBJECT CLASS vpCTPBidirectional AND SUBCLASSES;  
WITH ATTRIBUTE "ITU-T X.739":scannerId;  
CREATE  
WITH-REFERENCE-OBJECT,  
WITH-AUTOMATIC-INSTANCE-NAMING;  
DELETE  
DELETES-CONTAINED-OBJECTS;  
REGISTERED AS {atmfM4NameBinding 23};

**2.4.24. vc4TTPBidirectional-managedElementR1**

vc4TTPBidirectional-managedElementR1 NAME BINDING  
 SUBORDINATE OBJECT CLASS "ITU-T G.774":vc4TTPBidirectional AND  
 SUBCLASSES;  
 NAMED BY SUPERIOR OBJECT CLASS "ITU-T M.3100":managedElementR1  
 AND SUBCLASSES;  
 WITH ATTRIBUTE "ITU-T G.774":vc4TTPId;  
 CREATE  
 WITH-REFERENCE-OBJECT,  
 WITH-AUTOMATIC-INSTANCE-NAMING;  
 DELETE  
 DELETES-CONTAINED-OBJECTS;  
 REGISTERED AS {atmfM4NameBinding 24};

**2.4.25. vcCTPBidirectional-vpTTPBidirectional**

vcCTPBidirectional-vpTTPBidirectional NAME BINDING  
 SUBORDINATE OBJECT CLASS vcCTPBidirectional AND SUBCLASSES;  
 NAMED BY SUPERIOR OBJECT CLASS vpTTPBidirectional AND SUBCLASSES;  
 WITH ATTRIBUTE vcCTPId;  
 CREATE  
 WITH-AUTOMATIC-INSTANCE-NAMING;  
 DELETE  
 DELETES-CONTAINED-OBJECTS;  
 REGISTERED AS {atmfM4NameBinding 25};

**2.4.26. vcTTPBidirectional-managedElementR1**

vcTTPBidirectional-managedElementR1 NAME BINDING  
 SUBORDINATE OBJECT CLASS vcTTPBidirectional AND SUBCLASSES;  
 NAMED BY SUPERIOR OBJECT CLASS "ITU-T M.3100":managedElementR1  
 AND SUBCLASSES;  
 WITH ATTRIBUTE vcTTPId;  
 CREATE  
 WITH-AUTOMATIC-INSTANCE-NAMING;  
 DELETE  
 ONLY-IF-NO-CONTAINED-OBJECTS;  
 REGISTERED AS {atmfM4NameBinding 26};

**2.4.27. vpCTPBidirectional-tcAdaptorTTPBidirectional**

vpCTPBidirectional-tcAdaptorTTPBidirectional NAME BINDING  
 SUBORDINATE OBJECT CLASS vpCTPBidirectional AND SUBCLASSES;  
 NAMED BY SUPERIOR OBJECT CLASS tcAdaptorTTPBidirectional AND

SUBCLASSES;  
 WITH ATTRIBUTE vpCTPId;  
 CREATE  
   WITH-AUTOMATIC-INSTANCE-NAMING;  
 DELETE  
   DELETES-CONTAINED-OBJECTS;  
 REGISTERED AS {atmfM4NameBinding 27};

#### 2.4.28.        **vpTTPBidirectional-managedElementR1**

vpTTPBidirectional-managedElementR1 NAME BINDING  
 SUBORDINATE OBJECT CLASS vpTTPBidirectional AND SUBCLASSES;  
 NAMED BY SUPERIOR OBJECT CLASS "ITU-T M.3100":managedElementR1  
 AND SUBCLASSES;  
 WITH ATTRIBUTE vpTTPId;  
 CREATE  
   WITH-AUTOMATIC-INSTANCE-NAMING;  
 DELETE  
   ONLY-IF-NO-CONTAINED-OBJECTS;  
 REGISTERED AS {atmfM4NameBinding 28};

## 2.5. Actions

### 2.5.1. addTpsToMultipointBridge

addTpsToMultipointBridge ACTION  
 BEHAVIOUR addTpsToMultipointBridgeBeh;  
 MODE CONFIRMED;  
 WITH INFORMATION SYNTAX AtmMIBMod.AddTpsToMultipointBridgeInfo;  
 WITH REPLY SYNTAX AtmMIBMod.AddTpsToMultipointBridgeReply;  
 REGISTERED AS {atmfM4Action 1};

addTpsToMultipointBridgeBeh BEHAVIOUR  
 DEFINED AS

"This action is used to add one or more vpCTPBidirectional objects or vcCTPBidirectional objects to the identified multipoint connection.

Supplied with this action is the following information:

New CTPs - This parameter identifies the additional CTPs (i.e., the vpCTPBidirectional or vcCTPBidirectional object instances) to add to the existing multipoint connection.

MultipointBridge - This parameter identifies the instance of the multipointBridge object class to which the additional legs need to be connected.

If the request is granted, the commonCTPs attribute, in the multipointBridge object, shall be reset to reflect the new legs added to the multipoint connection. ";

**2.5.2. connect**

```
connect ACTION
  BEHAVIOUR connectBeh;
  MODE CONFIRMED;
  WITH INFORMATION SYNTAX AtmMIBMod.ConnectInformation;
  WITH REPLY SYNTAX AtmMIBMod.ConnectReply;
REGISTERED AS {atmfM4Action 2};
```

```
connectBeh BEHAVIOUR
```

```
  DEFINED AS
```

"This action is used to establish a point-to-point ATM connection two between termination points. The termination points to be connected can be identified explicitly by specifying the associated vcCTPBidirectional object or vpCTPBidirectional object, or by specifying the characteristics of each termination point. Multiple point-to-point connections may be requested with a single connect ACTION.

If a valid end point descriptor is provided and the connect request can be successfully carried out, the NE would reserve the necessary resources such as the VPI and/or VCI value, and automatically create the necessary VP/VC termination points (e.g., the VP CTPs, VP TTPs, and VC CTPs) for the cross-connection.

The result, if successful, always returns an explicit list of termination points.

Successful execution of this action would result in the creation of an instance of the atmCrossConnection object. This cross-connection object has the fromTermination and toTermination attributes pointing to the two termination points. The administrativeState and recoveryType attributes in the cross-connection object are initialized according to the values provided in the action request information. If the administrativeState parameter is omitted, the administrative state will be set to 'unlocked'. If the recoveryType parameter is omitted, the recovery type will be set to recoverable.

If the administrativeState in the atmCrossConnection object is unlocked, the upstreamConnectivityPointer and downstreamConnectivityPointer in the two termination points are set to the local distinguished name of the (peer) termination point to which it is connected. Also, the crossConnectionObjectPointer in the termination points shall point to the atmCrossConnection object.

This action will fail if any of the termination points specified are already involved in a cross-connection, any of the termination point descriptors specified cannot be satisfied, or the two termination points do not have compatible termination point descriptors.";

**2.5.3. connectMultipointBridge**

```
connectMultipointBridge ACTION
  BEHAVIOUR connectMultipointBridgeBeh;
  MODE CONFIRMED;
  WITH INFORMATION SYNTAX AtmMIBMod.ConnectMultipointBridgeInfo;
  WITH REPLY SYNTAX AtmMIBMod.ConnectMultipointBridgeReply;
REGISTERED AS {atmfM4Action 3};
```

```
connectMultipointBridgeBeh BEHAVIOUR
```

## DEFINED AS

"This action is used to establish a multipoint connection between vpCTPBidirectional or vcCTPBidirectional objects. Four types of multipoint connections can be established using this action: broadcast, merge, broadcast/merge (composite), and full multipoint. The multipointConnectionType attribute of this action is used to identify the desired connection type. Note that this action will result in the cross-connection of CTP objects to an instance of the multipointBridge object.

Also supplied with this action is the following information:

**Primary CTP** - This parameter identifies a termination point (vpCTPBidirectional or vcCTPBidirectional object) or termination point descriptor for the termination point that generates traffic to broadcast and/or receives merged traffic for broadcast, merge, or composite multipoint connection types. For full multipoint connections (i.e., all legs communicate with all other legs), the value of this attribute shall be set to NULL. The termination point identified by this parameter shall serve as the basis for the primaryCTP attribute of the multipointBridge object.

**Common CTPs** - This identifies termination point descriptor or CTP object instances (vpCTPBidirectional object class or vcCTPBidirectional object class) of all legs of the multipoint connection except the leg identified via the primaryCTP attribute. For full multipoint cross-connections, all the legs of the multipoint cross-connection shall be identified by this attribute. The termination points derived from this parameter shall serve as the basis for the commonCTPs attribute of the multipointBridge.

**Recovery Type** - This parameter indicates if the multipoint session should be recovered in case of service interruption. This parameter serves as the initial values for the recoveryType attribute in all the associated cross-connection objects.

**Administrative State** - This parameter will be used as the initial value for the administrativeState attribute in multipointBridge and its associated cross-connection objects.

The action will fail if the primaryCTP is specified but cannot be connected or none of the commonCTPs can be connected. If the action is accepted, the result would return the primaryCTP termination point, the connected common CTPs, and a problem cause for each of the non-connected common CTPs.";

**2.5.4. disconnect**

disconnect ACTION

BEHAVIOUR disconnectBeh;

MODE CONFIRMED;

WITH INFORMATION SYNTAX ASN1DefinedTypesModule.DisconnectInformation;

WITH REPLY SYNTAX ASN1DefinedTypesModule.DisconnectResult;

REGISTERED AS {atmfM4Action 4};

disconnectBeh BEHAVIOUR

DEFINED AS

"This action is used to take down a point-to-point cross-connection. The connection to be taken down is specified by identifying a termination point of the connection. The other termination point of the point-to-point connection is implicitly disconnected as well and the cross-connection object is deleted. The connectivity pointers in the disconnected termination points will be set to NULL as a result of this action. Disconnection of multiple point-to-point connections can be requested by providing multiple CTP

object instances in the DisconnectInformation. Each component in the DisconnectResult sequence provides the disconnection result for the corresponding components of the DisconnectInformation sequence.

This action shall not result in the deletion any of the termination point objects to disconnect.";

### 2.5.5. disconnectMultipointBridge

disconnectMultipointBridge ACTION  
 BEHAVIOUR disconnectMultipointBridgeBeh;  
 MODE CONFIRMED;  
 WITH INFORMATION SYNTAX AtmMIBMod.DisconnectMultipointBridgeInfo;  
 WITH REPLY SYNTAX AtmMIBMod.DisconnectMultipointBridgeReply;  
 REGISTERED AS {atmfM4Action 5};

disconnectMultipointBridgeBeh BEHAVIOUR  
 DEFINED AS

"This action is used to release a multipoint cross-connection. Supplied with this action is the instance of the multipointBridge object supporting the multipoint cross-connection.

If any of the commonCTPs cannot be disconnected, the primaryCTP, if any, should not be disconnected. If the multipointBridge is not completely disconnected, the action result would indicate which commonCTPs have been disconnected and which commonCTPs are not disconnected and why.";

### 2.5.6. loopbackOAMCell

loopbackOAMCell ACTION  
 BEHAVIOUR loopbackOAMCellBeh;  
 MODE CONFIRMED;  
 WITH INFORMATION SYNTAX AtmMIBMod.LoopbackOAMCellInfo;  
 WITH REPLY SYNTAX AtmMIBMod.LoopbackOAMCellReply;  
 REGISTERED AS {atmfM4Action 6};

loopbackOAMCellBeh BEHAVIOUR  
 DEFINED AS

" This action is used to request a vpCTPBidirectional, vcCTPBidirectional, vpTTPBidirectional, or vcTTPBidirectional object to insert (in the outgoing direction) a loopback OAM cell into the ATM cell stream and verify its return.

Supplied along with this action is the loopbackLocation parameter. This parameter identifies the downstream vpCTPBidirectional, vcCTPBidirectional, vpTTPBidirectional, or vcTTPBidirectional object instance responsible for looping back the OAM cell. The value of TRUE-NULL (default) can be used to request the end-point of the ATM connection or connection segment to loopback the OAM cell. Also supplied with this parameter is an indication as to whether or not the OAM Loopback Cell to be inserted shall be of the segment type or end-to-end type.";



### 2.5.7. removeTpsFromMultipointBridge

removeTpsFromMultipointBridge ACTION

BEHAVIOUR removeTpsFromMultipointBridgeBeh ;

MODE CONFIRMED;

WITH INFORMATION SYNTAX AtmMIBMod.RemoveTpsFromMultipointBridgeInfo;

WITH REPLY SYNTAX AtmMIBMod.RemoveTpsFromMultipointBridgeReply;

REGISTERED AS {atmfM4Action 7};

removeTpsFromMultipointBridgeBeh BEHAVIOUR

DEFINED AS

"This action is used to remove one or more legs (leaf CTPs) from the identified multipoint connection.

Supplied with this action is the following information:

Existing CTPs - This parameter identifies the existing CTPs to remove from the multipoint connection.

MultipointBridge - This parameter identifies the instance of the multipointBridge object class from which the identified legs should be removed (disconnected).

If the request is granted, the commonCTPs attribute, in the multipointBridge object, shall be reset to reflect the remaining legs of the multipoint connection. ";

## 2.6. Supporting Productions

AtmMIBMod -- { 1 3 6 1 4 1 353 atmForumNetworkManagement(5) atmM4(1) atmCmipNEView(1)  
informationModel(0) asn1Module(2) atmMIBMod(0)}

DEFINITIONS IMPLICIT TAGS ::= BEGIN

-- exports everything

IMPORTS

Boolean,

DisconnectInformation,

DisconnectResult,

Failed,

NameType,

PointerOrNull,

ProblemCause

FROM

ASN1DefinedTypesModule {ccitt recommendation m(13) gnm(3100)

informationModel(0) asn1Modules(2) asn1DefinedTypesModule(0)}

DistinguishedName,

RelativeDistinguishedName

FROM

InformationFramework {joint-iso-ccitt ds(5) modules(1) informationFramework(1)}

EventTypeId,

ObjectInstance

FROM

CMIP-1 {joint-iso-ccitt ms(9) cmip(1) modules(0) protocol(3)}

AdministrativeState,

AttributeList,

ProbableCause,

SimpleNameType

FROM

Attribute-ASN1Module {joint-iso-ccitt ms(9) smi(3) part2(2) asn1Module(2) 1};

atmM4ObjectClass OBJECT IDENTIFIER ::= { 1 3 6 1 4 1 353 atmForumNetworkManagement(5) atmM4(1)  
atmCmipNEView(1) informationModel(0) managedObjectClass(3)}

atmM4Package OBJECT IDENTIFIER ::= { 1 3 6 1 4 1 353 atmForumNetworkManagement(5) atmM4(1)  
atmCmipNEView(1) informationModel(0) package(4)}

atmM4Attribute OBJECT IDENTIFIER ::= { 1 3 6 1 4 1 353 atmForumNetworkManagement(5) atmM4(1)  
atmCmipNEView(1) informationModel(0) attribute(7)}

atmM4NameBinding OBJECT IDENTIFIER ::= { 1 3 6 1 4 1 353 atmForumNetworkManagement(5) atmM4(1)  
atmCmipNEView(1) informationModel(0) nameBinding(6)}

atmM4Action OBJECT IDENTIFIER ::= { 1 3 6 1 4 1 353 atmForumNetworkManagement(5) atmM4(1)  
atmCmipNEView(1) informationModel(0) action(9)}

```

-- default value definitions

booleanFalseDefault Boolean ::= FALSE

booleanTrueDefault Boolean ::= TRUE

integerZero INTEGER ::= 0

-- additional value definitions to probableCause production

atmProbableCause OBJECT IDENTIFIER ::= { 1 3 6 1 4 1 353 atmForumNetworkManagement(5) atmM4(1)
atmfCmipNEView(1) atmMIB(99) standardSpecificExtension(0) atmProbableCause(0) }

lossOfCellDelineation ProbableCause ::= globalValue : { atmProbableCause 1 }

congestion ProbableCause ::= globalValue : { atmProbableCause 2 }

unspecified ProbableCause ::= globalValue : { atmProbableCause 3 }

-- additional eventTypes

atmEventType OBJECT IDENTIFIER ::= { 1 3 6 1 4 1 353 atmForumNetworkManagement(5) atmM4(1)
atmfCmipNEView(1) atmMIB(99) standardSpecificExtension(0) atmEventType(1) }

cellHeaderAbnormalityEvent EventTypeId ::= globalForm : { atmEventType 1 }

-- supporting productions

AddTpsToMultipointBridgeInfo ::= SEQUENCE {
    newCTPs NewCTPs,
    multipointBridgeInstance ObjectInstance }

AddTpsToMultipointBridgeReply ::= SEQUENCE OF SEQUENCE {
    legAdded ObjectInstance,
    legNotAdded ProblemCause OPTIONAL }

AtmSubscriberAddress ::= SEQUENCE OF PrintableString

CDVTolerance ::= SEQUENCE {
    cellDealyVariationToleranceCLP0plus1 [1] INTEGER OPTIONAL,
    cellDelayVariationToleranceCLP0 [2] INTEGER OPTIONAL }

CellHeaderAbnormalityType ::= ENUMERATED {
    unassignedVpiVciValue (0),
    outOfRangeVpiVciValue (1) }

CommonCTPs ::= SEQUENCE OF CtpOrDescriptor

ConnectCtpStatus ::= CHOICE {
    ctpConnected [0] ObjectInstance,
    ctpFailed [1] ProblemCause }

Connected ::= SEQUENCE {
    fromTp ObjectInstance,

```

```

toTp    ObjectInstance,
xCon    ObjectInstance}

```

```

ConnectInformation ::= SEQUENCE OF SEQUENCE {
  fromTermination [0] CtpOrDescriptor,
  toTermination   [1] CtpOrDescriptor,
  recoveryType    [2] RecoveryType OPTIONAL,
  administrativeState [3] AdministrativeState OPTIONAL}

```

```

ConnectMultipointBridgeInfo ::= SEQUENCE {
  primaryCTP      [0] PrimaryCTP,
  commonCTPs     [1] CommonCTPs OPTIONAL,
  multipointBridgeInstance [2] ObjectInstance,
  multipointConnectionType [3] MultipointConnectionType,
  recoveryType    [4] RecoveryType OPTIONAL,
  -- the recoveryType value is shared by all legs
  administrativeState [5] AdministrativeState OPTIONAL}
-- the administrativeState value is shared by all legs

```

```

ConnectMultipointBridgeReply ::= CHOICE {
  mpConnected    MpConnected,
  mpFailed       MpFailed}

```

```

ConnectReply ::= SEQUENCE OF CHOICE {
  connected [0] Connected,
  failed    [1] Failed} -- import from M.3100

```

```

CtpOrDescriptor ::= CHOICE {
  ctp      [0] ObjectInstance,
  descriptor [1] Descriptor}

```

```

CtpStatus ::= CHOICE {
  disconnected [0] NULL,
  failed      [1] ProblemCause}

```

```

Descriptor ::= SEQUENCE {
  interfaceId [0] ObjectInstance, -- a uni, intraNNI, or interNNI
  vpi [1] INTEGER OPTIONAL, -- assigned by NE if absent
  vci [2] INTEGER OPTIONAL, -- set to 0 for VP cross connect
  egressCDVTolerance [3] CDVTolerance OPTIONAL,
  ingressCDVTolerance [4] CDVTolerance OPTIONAL,
  egressMaxBurstSize [5] MaxBurstSize OPTIONAL,
  ingressMaxBurstSize [6] MaxBurstSize OPTIONAL,
  egressPeakCellRate [7] PeakCellRate OPTIONAL,
  ingressPeakCellRate [8] PeakCellRate OPTIONAL,
  egressSustainableCellRate [9] SustainableCellRate OPTIONAL,
  ingressSustainableCellRate [10] SustainableCellRate OPTIONAL,
  egressQosClass [11] QosClass OPTIONAL,
  ingressQosClass [12] QosClass OPTIONAL}

```

```

DisconnectMultipointBridgeInfo ::= ObjectInstance -- multipointBridge

```

```

DisconnectMultipointBridgeReply ::= CHOICE {
  disconnected NULL,

```

```

    notDisconnected SEQUENCE OF DisconnectCtpStatus}

DisconnectCtpStatus ::= SEQUENCE OF SEQUENCE {
    ctpInstance      ObjectInstance,
    ctpStatus        CtpStatus}

ExistingCTPs ::= SEQUENCE OF ObjectInstance

FarEndCarrierNetwork ::= GraphicString

GraphicStringOrNull ::= CHOICE {
    graphicString GraphicString,
    null NULL}

IlmiChannelIdentifier ::= SEQUENCE {
    vpiValue INTEGER,
    vciValue INTEGER}

Integer ::= INTEGER

InterfacePointer ::= ObjectInstance -- uni, interNNI, or intraNNI

LoopbackLocation ::= SEQUENCE {
    endPoint BOOLEAN, -- default is TRUE
    loopbackLocationCode OctetStringOrNull -- default is NULL
}

LoopbackOAMCellInfo ::= SEQUENCE {
    loopbackLocation LoopbackLocation,
    oamCellType OamCellType}

LoopbackOAMCellReply ::= SEQUENCE {
    loopbackSuccessful BOOLEAN,
    problemCause ProblemCause OPTIONAL}

MaxBurstSize ::= SEQUENCE {
    maxBurstSizeCLP0plus1 [1] INTEGER OPTIONAL,
    maxBurstSizeCLP0 [2] INTEGER OPTIONAL}

MpConnected ::= SEQUENCE {
    primary [0] ObjectInstance,
    commonCTPs [1] SEQUENCE OF ConnectCtpStatus}
-- in the same sequence as the ConnectMultipointBridgeInfo

MpFailed ::= ProblemCause

MultipointConnectionType ::= CHOICE {
    typeNotAssigned NULL,
    multipointType ENUMERATED {
        broadcast (0), -- point-to-multipoint
        merge (1), -- multipoint-to-point
        composite (2), -- root-to-leaves & leaves-to-root
        multipoint (3) -- multipoint-to-multipoint
    }}

```

NewCTPs ::= SEQUENCE OF CtpOrDescriptor

Null ::= NULL

OctetString ::= OCTET STRING

OctetStringOrNull ::= CHOICE {  
   octetString OctetString,  
   null NULL}

PeakCellRate ::= SEQUENCE {  
   peakCellRateCLP0plus1 [1] INTEGER OPTIONAL,  
   peakCellRateCLP0 [2] INTEGER OPTIONAL}

PreferredCarrier ::= SEQUENCE OF GraphicString

PrimaryCTP ::= CHOICE {  
   null NULL,  
   ctp ObjectInstance,  
   descriptor Descriptor}

OamCellType ::= ENUMERATED {  
   segment (0),  
   endToEnd (1)}

OctetString ::= OCTET STRING

QosClass ::= ENUMERATED {  
   class0 (0),  
   class1 (1),  
   class2 (2),  
   class3 (3),  
   class4 (4)}

RecoveryType ::= ENUMERATED {  
   recoverable (0),  
   nonrecoverable (1)}

RemoveTpsFromMultipointBridgeInfo ::= SEQUENCE {  
   existingCTPs ExistingCTPs,  
   multipointBridgeInstance ObjectInstance}

RemoveTpsFromMultipointBridgeReply ::= SEQUENCE OF SEQUENCE {  
   ctpInstance ObjectInstance,  
   legRemovalProblem ProblemCause OPTIONAL  
   -- absent if ctpInstance is disconnected  
 }

SustainableCellRate ::= SEQUENCE {  
   sustainableCellRateCLP0plus1 [1] INTEGER OPTIONAL,  
   sustainableCellRateCLP0 [2] INTEGER OPTIONAL}

END

## References

- [1] ATM Forum af-nm-0020.000, *M4 Interface Requirements and Logical MIB: ATM Network Element View*, October 1994.
- [2] ITU-T Recommendation G.774, *Synchronous Digital Hierarchy (SDH) Management Information Model*, November 1991; and ITU-T Recommendation G.774-01, *Synchronous Digital Hierarchy (SDH) Performance Monitoring for the Network Element View*, January 1994.
- [3] ITU-T Recommendation M.3100, *Generic Network Information Model*, Version 2, March 1995.
- [4] ITU-T Recommendation Q.822, *Stage 1, State 2, and Stage 3 Description for the Q3 Interface. Performance Management*, April 1994.
- [5] ITU-T Recommendation X.721, *Information Technology - Open Systems Interconnection - Structure of Management Information - Part 2: Definition of Management Information*, February 1992, plus Technical Corrigendum 1.
- [6] ITU-T Recommendation X.739, *Information Technology - Open Systems Interconnection - Systems Management -- Part 11: Workload Monitoring Function*, November 1993.
- [7] Bellcore GR-836-IMD, *Generic Operations Interfaces Using OSI Tools - Information Model Details: Transport Configuration and Surveillance for Network Elements*, Issue 1, August 1994, plus Revision October 1994.
- [8] ANSI T1.247, *Operations, Administration, Maintenance, and Provisioning (OAM&P) - Performance Management Functional Area Services and Information Model for Interfaces between Operations Systems and Network Elements*, 1995.
- [9] ETSI NA5-2210, *B-ISDN Management Architecture and Management Information Model for the ATM Crossconnect*, Version 2, February 1994.
- [10] Bellcore TA-NWT-001114, *Generic Requirements for Operations Interfaces Using OSI Tools: ATM/Broadband Network Management*, Issue 2, October 1993.
- [11] ITU-T Recommendation I.321, *B-ISDN Protocol Reference Model and its Application*, February 1990.





## **Annex A : Communications Support for the CMIP M4 Interface**

In order to promote interoperability, this Annex describes recommended communications stacks to support the CMIP M4 Interface. These recommendations are depicted in Figure A-1 below.

### **A.1. Protocol Profiles for OSI Stacks**

ITU-T Recommendations Q.812 and Q.811 define the protocol profiles for the Q3 interface as defined in Recommendation M.3010.

Implementations of the CMIP M4 Interface that use OSI protocol stacks, should implement the Q3 interface as defined in Recommendation Q.812 for transaction type services (CMISE), and implement supporting lower layer services as defined in Recommendation Q.811.

Note that Recommendations Q.811 and Q.812 are currently being revised with the intention to base the next editions on International Standard Profiles (ISPs) including those of the AOM1x series.

### **A.2. Protocol Profiles for TCP/IP Stacks**

#### **A.2.1. Upper Layer Profiles for TCP/IP Stacks, Layers 5-7**

Implementations of the CMIP M4 Interface that use TCP/IP protocol stacks, should implement the OSI upper layers (5-7) as defined in Recommendation Q.812 for transaction type services (CMISE).

#### **A.2.2. Lower Layer Profiles for TCP/IP Stacks, Layers 3-4**

Implementations of the CMIP M4 Interface that use the TCP/IP protocol stack, should implement the ISO TP0 protocol on top of TCP/IP as defined in RFC1006.

#### **A.2.3. Lower Layer Profiles for TCP/IP Stacks, ATM Layer**

Implementations of the CMIP M4 Interface that use the TCP/IP protocol stack over ATM, should implement IP over AAL5/ATM as defined in RFC1577 using the LLC/SNAP Encapsulation method defined in RFC1483.

### **A.3. Interim Protocol Profile using CMOT**

In order to support early deployment of the CMIP M4 Interface, some implementations may temporarily use the CMOT protocol stack. Implementations of the CMIP M4 Interface that use the TCP/IP protocol stack, may optionally implement the CMOT profile defined in RFC1095<sup>1</sup>.

---

<sup>1</sup> Note: RFC1095 has been declared obsolete by the IETF having been replaced by RFC1189, which itself has been classified as a "Historic" RFC with "Not Recommended" status. The option to use a CMOT profile will be removed in the next edition of this specification.

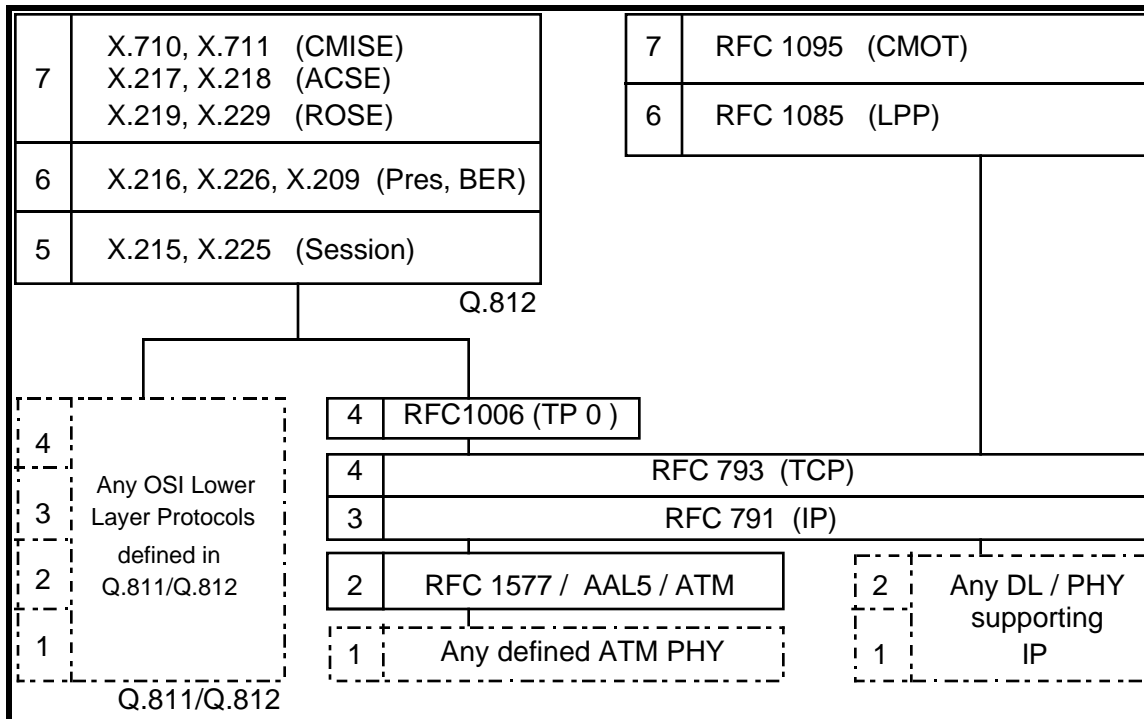


Figure A-1: Communications Stacks for the CMIP M4 Interface

## A.4. References

ITU-T Recommendation Q.811, *Q3 - Lower Layer Protocols*, 1990

ITU-T Recommendation Q.812, *Q3 - Higher Layer Protocols*, 1990

RFC1006, D. Cass, M. Rose, *ISO transport services on top of the TCP: Version: 3*, 05/01/1987.

RFC1095, U. Warrier, L. Besaw, *Common Management Information Services and Protocol over TCP/IP (CMOT)*, 04/01/1989.

RFC1189, L. Besaw, B. Handspicker, L. LaBarre, U. Warrier, *The Common Management Information Services and Protocols for the Internet*, 10/26/1990.

RFC1483, J. Heinanen, *Multiprotocol Encapsulation over ATM Adaptation Layer 5*, 07/20/1993.

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