The ATM Forum
Technical Committee

CES Interworking M4 Interface
"NE View" Requirements,
Logical and CMIP MIB

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CES Interworking M4 Interface “NE View” Requirements, Logical and CMIP MIB

The ATM Forum
Worldwide Headquarters
2570 West El Camino Real, Ste 304
Mountain View, CA, CA 94040-1313
Tel: +1-415-949-6700
Fax: +1-415-949-6705

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1. Introduction

This document specifies the requirements for Circuit Emulation Service Interworking to be supported by the M4 Network Element View Interface. The requirements for the Circuit Emulation Service Interoperability are specified in ATM Forum af-vtoa-0078.000 [3]. This document proposes the protocol independent managed entities and CMIP Specification for the M4 Network Element View Interface. This model supports nDS0/DS1/E1/DS3/E3/J2 Circuit Emulation services. The requirements, protocol independent managed entities and CMIP specification for common AAL management are covered in the ATM Forum af-nm-0071.000 [4].

The model presented here in this document reuses existing ATM Forum's specifications and ITU-T Recommendations. The documents referenced in this model are as follows:

- The ATM Forum M4 Interface Specification[1]
- The ATM Forum M4 CMIP Specification[2]
- The ATM Forum Circuit Emulation Service Interoperability Specification[3]
- The ATM Forum AAL Management for the M4 Interface[4]
- ITU-T Recommendation M.3100[5]

2. Requirements for Circuit Emulation Service Interworking

2.1 Configuration Management

This section identifies the ATM NE management interface functions that enable management systems to configure Interworking Functions (e.g. Circuit Emulation Service).

(R) CM-1 The M4 Interface shall support management system requests to configure Interworking VCC Termination Point. The following information shall be provided with each configuration request:

1. Upstream and Downstream Connectivity Pointer (points to vcCTP)
2. VPI value (Agent selects this value)
3. Service Profile Pointer
4. AAL Profile Pointer
5. Termination Points List (ordered list of TPs which are being interworked)
6. Operational State
7. Administrative State
8. Current Problem List
9. Alarm Status
10. Alarm Severity Assignment Profile Pointer

(R) CM-2 The M4 Interface shall support management system requests to retrieve configuration data associated with each Interworking VCC Termination Point.

(R) CM-3 The M4 Interface shall support management system requests to reconfigure the data elements identified in CM-1.

(R) CM-4 The M4 Interface shall support management system requests to add or remove interworked termination points from Termination Points List.

(R) CM-5 The M4 Interface shall support management system requests to configure CES Service Profile. The following information shall be provided with each configuration request:

1. CES Service Profile ID
2. Buffered CDV tolerance timing in 10 micro seconds increment
3. Channel Associated Signalling

(R) CM-6 The M4 Interface shall support management system requests to retrieve configuration data associated with each CES Service Profile.

(R) CM-7 The M4 Interface shall support management system requests to reconfigure the data elements identified in CM-5.

2.1.1 Related Managed Entities

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

- Interworking VCC Termination Point
- CES Service Profile

2.2 Fault Management

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

1. The failed component or list of potentially failed components (if known by the ATM NE). The component identified should represent the smallest replaceable/repairable unit(s) of hardware or software.
2. Generic Trouble Description
3. Specific Problems (optionally provided)

   This parameter identifies further refinements (e.g. ,sub-cause indicator information) to the generic trouble description of the alarm.
4. Severity (i.e., critical, major, minor, warning, indeterminate, and cleared)

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

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

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

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

Indeterminate - Indicates that the severity level cannot be determined.

Cleared - Indicates the clearing of one or more previously reported alarms.

Alarm severities can be assigned by the management system only for equipment alarms and physical layer communications alarms

5. Back-up Status

   This parameter indicates whether or not the entity emitting the alarm has been backed-up. A value of “true” indicates that the entity has been backed-up; a value of “false” indicates that the entity has not been backed-up.

6. Back-up Entity

   This parameter identifies the managed entity that is providing back-up services to the failed managed entity. If no back-up service is being provided, the value of this parameter shall be NULL.

7. Additional Text (optionally provided)

   This parameter is used to allow for additional text to be supplied with the alarm. Such text may further describe problem and/or failed entity (e.g., name and location).

8. Proposed Repair Actions (optionally provided)

   This parameter, when present, is used if the cause of the alarm is known and the ATM NE can suggest one or more solutions.

9. Time and Date Failure was Detected.

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

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

2.2.1 Related Managed Entities

The management entities that are needed to support the ATM NE failure reporting of Service Interworking are as follows:

- Interworking VCC Termination Point

3. Protocol Independent MIB

3.1 Interworking VCC Termination Point

An instance of this managed entity represents a point in the ATM NE where the interworking of a service (e.g., frame relay, SMDS) or underlying physical infrastructure (e.g. nDS0/DS1/DS3/E3/J2) takes place. At this point ATM cells are generated from bit stream(e.g. nDS0/DS1/DS3/E3/Frame Relay) or bit stream is re-constructed from ATM cells.

Instances of this managed entity may be created and deleted automatically by the ATM NE or explicitly created and deleted by the management system.

Attributes

Managed Entity ID: This read-only attribute provides a unique name for the managed entity instance in the ATM NE.

VPI Value: This read-only attribute identifies the VPI value associated with this Interworking VCC Termination Point.

Service Profile Pointer: This read/write attribute provides a pointer to the instance of a service profile.

AAL Profile Pointer: This read/write attribute provides a pointer to an instance of AAL Profile.

Termination Points List: This read only attribute provides an ordered list of Termination points which are being interworked.

Operational State: This read only attribute identifies whether or not the Interworking VCC termination point is capable of performing its normal functions (in-service or out-of-service).

Administrative State: This read/write attribute is used to inhibit (lock) and allow (unlock) the flow of cells through Interworking VCC termination point. However, the value of this attribute shall not affect the ability of Interworking VCC termination point to perform OAM processing functions.

Alarm Status: This read only attribute is used to indicate the existence of an alarm condition for the interworking VCC termination point.

Current Problem List: This read only attribute identifies the current existing problems, witth severity, associated with the interworking VCC termination point.

Alarm Severity Assignment Profile Pointer: This read/write attribute provides a pointer relationship to an Alarm severity assignment profile.

Connectivity Pointer: This read only attribute serves as a pointer to the instance of the VCL Termination point managed entity instance in the ATM NE.

Actions

Loopback OAM Cell: This operation is used to request the Interworking VCC Termination Point to insert a loopback OAM cell into the ATM cell stream, verify its return, and report the results of the loopback (i.e., passed or failed) back to the management system. Along with each request will be the location where the inserted OAM cell shall loop-back and an indication as to whether a *segment or end-to-end* OAM cell shall be used. The Loopback Location Code attribute value of the UNI where the loopback is to take place may be used to identify the loopback location. Additionally, a globally unique default value (e.g., "end-point") may also be used to perform a loopback at the end of a VCC.

Add Interworked TP: This optional operation adds a new termination point (e.g. nDS0/DS1/DS3/E3/J2/Frame Relay) to the Termination Points List. The traffic characteristics of the interworked ATM VCC must be able to accomodate the additional termination point.

Remove Interworked TP: This optional operation removes a termination point from the Termination Points List.

Notifications

Alarm: This message is used to notify the management system when a failure has been detected or cleared. The following parameters shall be supplied with this notification:

- The Nature of the Alarm (i.e. , communications alarm)
- Specific Problems (optional)
- The ID of the Managed Entity Reporting the Alarm
- The Failed Switch Component or list of Failed (or possibly Failed) components
- Back-up Status
  This is a Boolean indication as to whether or not the failed entity has been backed-up.
- Backed-up Entity
  This is the ID of the managed entity providing back-up services to the failed entity. This parameter shall be NULL when the value of the "Back-up Status" parameter is *false*.
- Severity of Failure (critical, major, minor, warning, indeterminate, and cleared)
- Additional Information (optional)
- Proposed Repair Actions (optional)
- Time and Date Failure was Detected

Attribute Value Change: This notification is used to report changes to the Alarm Severity Assignment Profile Pointer, Service Profile Pointer, or AAL Profile Pointer of this managed entity. The notification shall identify the attribute that changed, its old value, and its new value.

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

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

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

Relationships

One instance of this managed entity shall exist for each occurrence of transformation of data stream into ATM cells.

3.2 CES Service Profile

An instance of this managed entity is a support managed entity used to organize data that describes the CES Service functions of the ATM NE.

An instance of this managed entity shall be explicitly created and deleted by the management system.

Attributes

Managed Entity ID: This read-only attribute provides a unique name for the managed entity instance in the ATM NE.

CES Buffered CDV Tolerance: This read/write attribute represents the duration of user data that must be buffered by the CES interworking entity to offset cell delay variation. This timing will be in 10 micro seconds increment. The default value for DS1 CES is 750 seconds and 1000 micro seconds for DS3 CES.

Channel Associated Signalling: This read/write attribute selects which AAL1 format should be used. It applies to structured interfaces only. For unstructured interfaces this value , if present, must be set to the default of basic. The valid values are basic, e1Cas, SfCas, ds1EsfCas, j2Cas.

Actions

No actions have been defined for this managed entity.

Notifications

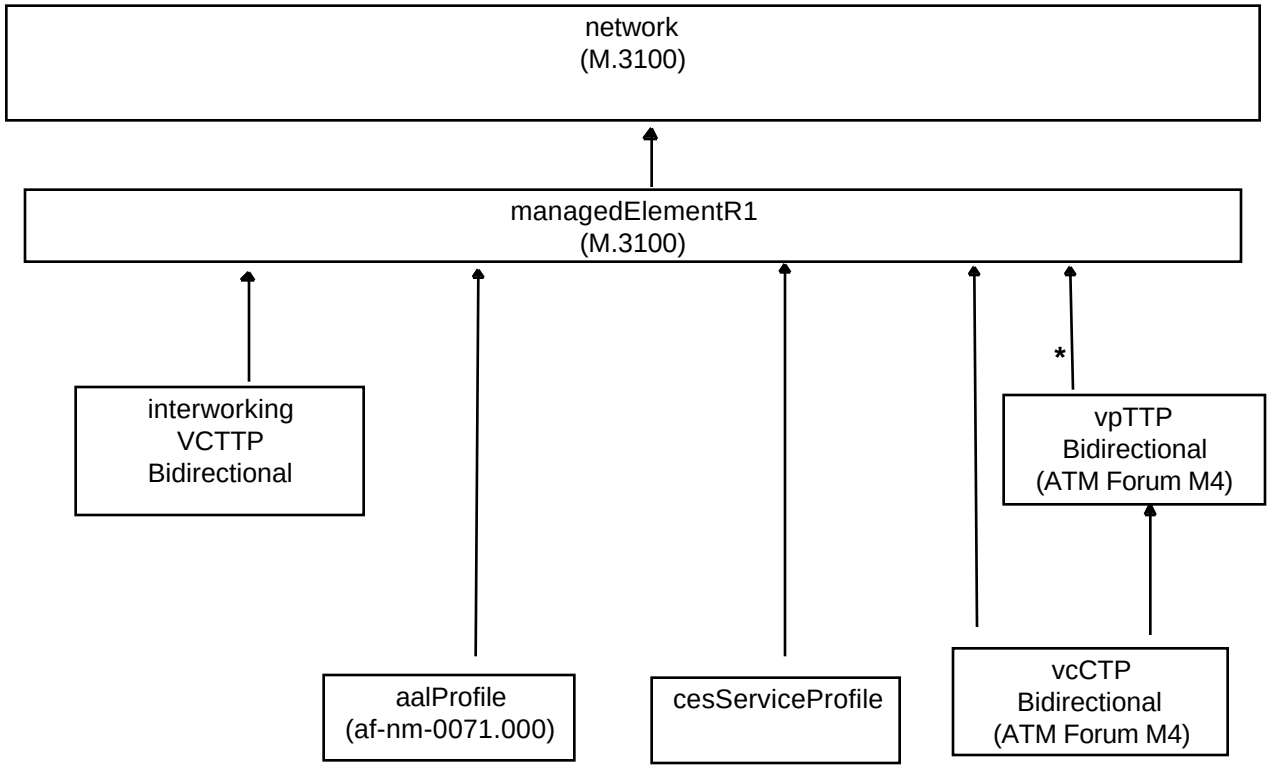
No notifications have been defined for this managed entity.

Relationships

Zero or more instances of this managed entity shall be contained in the ATM NE managed entity.

4. Information Model

The following Managed Objects, Package, Attributes, Name Bindings, and Actions are a supplement to the existing ATM Forum CMIP Specification for the M4 Interface described in af-nm-0027.001, September, 1995.[2]



*** =** Containment is existing in ATM Forum M4 Model

Figure 4-1: Containment Tree Diagram

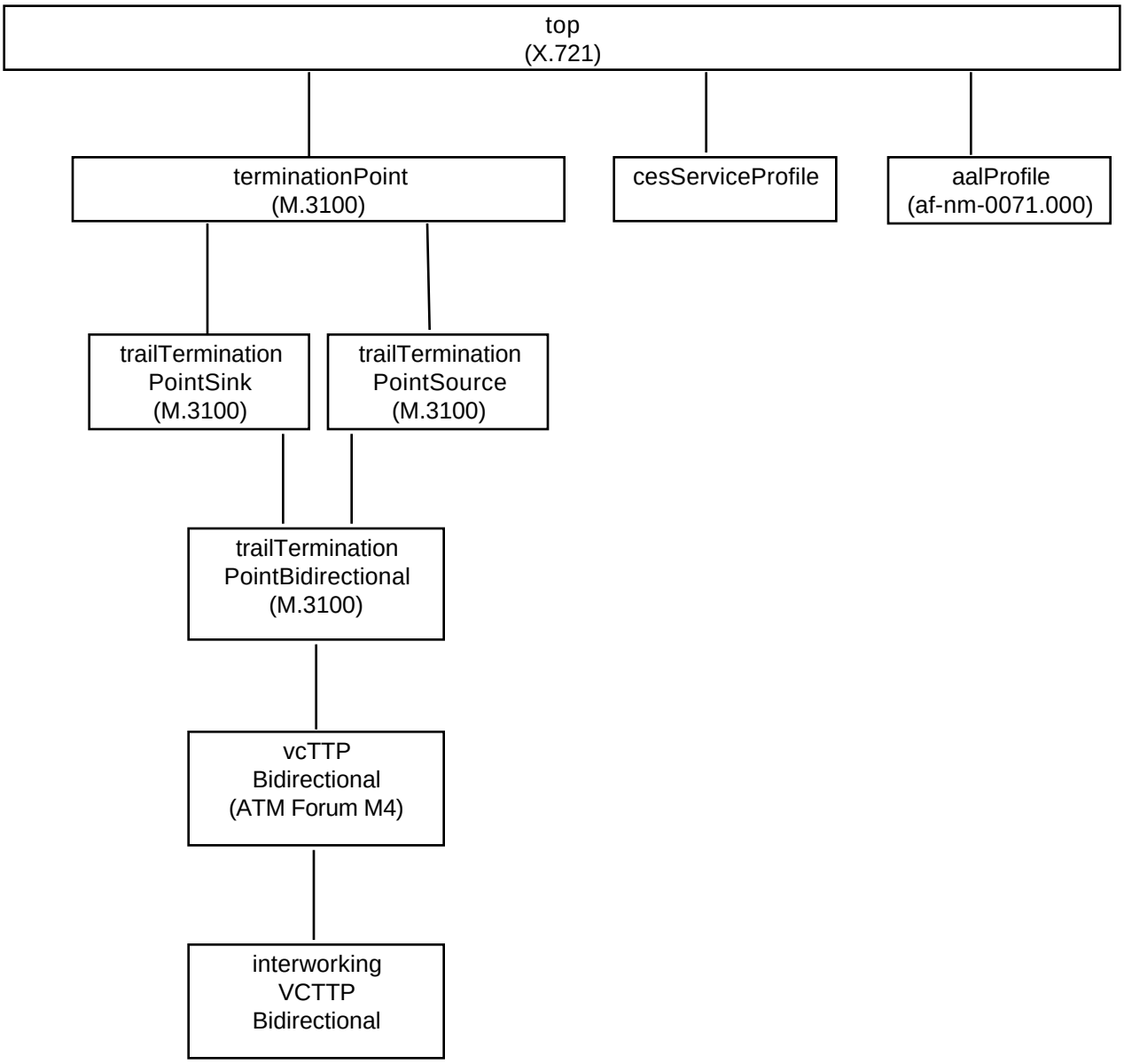


Figure 4-2: Inheritance Tree Diagram

4.1 Additional Managed Objects

4.1.1 interworkingVCTTPBidirectional

```
interworkingVCTTPBidirectional MANAGED OBJECT CLASS
  DERIVED FROM vcTTPBidirectional;
  CHARACTERIZED BY
       interworkingVCTTPBidirectionalPkg PACKAGE
         BEHAVIOUR interworkingVCTTPBidirectionalBeh;
           ATTRIBUTES
              vpiValue
                   GET,
              serviceProfilePointer
                    GET-REPLACE,
              aalProfilePointer
                    GET-REPLACE,
              terminationPointList
                    GET;;;
         CONDITIONAL PACKAGES
           modifyTerminationPointListPkg
              PRESENT IF “an instance supports addition and removal of interworked termination points.”;
REGISTERED AS {atmfM4ObjectClass 28};

interworkingVCTTPBidirectionalBeh BEHAVIOUR
  DEFINED AS

  “This managed object represents a point in the managed system where the interworking of a service
  (e.g., frame relay or SMDS) or an underlying physical infrastructure (e.g. nDS0/DS1/DS3/E3/J2) takes
  place. At this point ATM cells are generated from the service or physical bit stream or vice versa.

  An instance of this object class shall point (via the upstreamConnectivityPointer and
  downstreamConnectivityPointer attributes) to a vcCTPBidirectional managed object (if already created)
  and that instance of vcCTPBidirectional object class shall point back (via supportedByObjectList) to this
  instance of interworkingVCTTPBidirectional object class.

  For the conditional package oamCellLoopbackPkg inherited from vcTTPBidirectional object, the
  loopback cell shall be inserted at the interworkingVCTTPBidirectional side of the network element and
  the direction of the cell shall be into the switch.  Thus the connection matrix of the interworking NE is
  included by the Loopback.

  This managed object shall send a communicationsAlarm notification to the managing system, when the
  cellLossIntegrationPeriod (identified by aalProfile) expires.

  Instances of this object class may be explicitly created and deleted by the managing system.  Instances
  of this managed object class may also be automatically created by the managed system. ”;
```

4.1.2 cesServiceProfile

```
cesServiceProfile MANAGED OBJECT CLASS
  DERIVED FROM “Rec. X.721 | ISO/IEC 10165-2”:top;
  CHARACTERIZED BY
```

```
cesServiceProfilePkg PACKAGE
  BEHAVIOUR cesServiceProfileBeh;
 ATTRIBUTES
       cesServiceProfileId
    GET,
       cesBufferedCDVtolerance
     GET-REPLACE,
       channelAssociatedSignalling
     GET-REPLACE;;;
       REGISTERED AS {atmfM4ObjectClass 29};


cesServiceProfileBeh BEHAVIOUR
  DEFINED AS
```

"This managed object is used to organize data that describes the circuit emulation service interworking functions of the ATM NE.

The cesBufferedCDVtolerance attribute specifies the duration of user data that must be buffered by the interworkingVCTTPBidirectional managed object to offset Cell Delay variation. The recommended default value for DS1 CES is 750 micro seconds and 1000 micro seconds for DS3 CES.

The channelAssociatedSignalling attribute identifies which AAL1 format should be used. It applies only to structured format. For unstructured format this attribute must be set to the default value of basic.

Instances of this object class shall be explicitly created and deleted by the managing system. An instance of this object class shall not be deleted if it is in use by any interworkingVCTTPBidirectional object instance. ";

4.2 Additional Conditional Packages

4.2.1 modifyTerminationPointListPkg

```
modifyTerminationPointListPkg PACKAGE
 ACTIONS
  addTerminationPoint,
  removeTerminationPoint;
REGISTERED AS {atmfM4Package 19};
```

4.3 Additional Attributes

4.3.1 cesServiceProfileId

cesServiceProfileId ATTRIBUTE
  WITH ATTRIBUTE SYNTAX AtmMIBMod.NameType;
  MATCHES FOR EQUALITY;
  BEHAVIOUR cesServiceProfileIdBeh;
REGISTERED AS {atmfM4Attribute 55};

cesServiceProfileIdBeh BEHAVIOUR
  DEFINED AS

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

4.3.2 cesBufferedCDVtolerance

cesBufferedCDVtolerance ATTRIBUTE
  WITH ATTRIBUTE SYNTAX AtmMIBMod.Integer;
  MATCHES FOR EQUALITY;
  BEHAVIOUR cesBufferedCDVtoleranceBeh;
REGISTERED AS {atmfM4Attribute 56};

cesBufferedCDVtoleranceBeh BEHAVIOUR
  DEFINED AS

  "This attribute identifies the duration of user data that must be buffered by the InterworkingVCTTPBidirectional managed object to offset Cell Delay variation. The timing is in increment of 10 micro seconds. The recommended default value for DS1 CES is 750 micro seconds and 1000 micro seconds for DS3 CES. The use of this attribute is for further study. ";

4.3.3 channelAssociatedSignalling

channelAssociatedSignalling ATTRIBUTE
  WITH ATTRIBUTE SYNTAX AtmMIBMod.ChannelAssociatedSignalling;
  MATCHES FOR EQUALITY;
  BEHAVIOUR channelAssociatedSignallingBeh;
REGISTERED AS {atmfM4Attribute 57};

channelAssociatedSignallingBeh BEHAVIOUR
  DEFINED AS

  "This attribute identifies which AAL1 format should be used. This attribute applies only to structured format. The default value Basic does not carry channel associated signalling (CAS) bits and uses a single 125 usec frame. e1Cas, ds1sfCas, and ds1EsfCas carry CAS bits in a multiframe structure for E1, DS1 SF, and DS1 ESF respectively. ";

4.3.4 serviceProfilePointer

```
serviceProfilePointer ATTRIBUTE
  WITH ATTRIBUTE SYNTAX AtmMIBMod.PointerOrNull;
  MATCHES FOR EQUALITY;
  BEHAVIOUR serviceProfilePointerBeh;
REGISTERED AS {atmfM4Attribute 58};

serviceProfilePointerBeh BEHAVIOUR
  DEFINED AS

  "This attribute provides a pointer to a managed object instance that provides information used to control
  service interworking (e.g., a cesServiceProfile object). ";
```

4.3.5 aalProfilePointer

```
aalProfilePointer ATTRIBUTE
  WITH ATTRIBUTE SYNTAX AtmMIBMod.PointerOrNull;
  MATCHES FOR EQUALITY;
  BEHAVIOUR aalProfilePointerBeh;
REGISTERED AS {atmfM4Attribute 59};

aalProfilePointerBeh BEHAVIOUR
  DEFINED AS

  "This attribute provides a pointer to an  aalProfile managed object instance that defines the common
  ATM Adaptation Layer processing needed.  ";
```

4.3.6 terminationPointList

```
terminationPointList ATTRIBUTE
  WITH ATTRIBUTE SYNTAX ASN1DefinedTypesModule.ObjectList;
  MATCHES FOR EQUALITY;
  BEHAVIOUR terminationPointListBeh;
REGISTERED AS {atmfM4Attribute 60};

terminationPointListBeh BEHAVIOUR
  DEFINED AS

  "This attribute provides an ordered list of the termination points (e.g. nDS0/DS1/DS3/E3/J2/Frame
  Relay)  that are interworked.  The traffic characteristics of the interworked ATM VC termination point must
  be able to accommodate the combination of traffic characteristics of all the termination points in this list.
  ";
```

4.4 Additional Name-Bindings

4.4.1 cesServiceProfile-managedElementR1

```
cesServiceProfile-managedElementR1 NAME BINDING
  SUBORDINATE OBJECT CLASS cesServiceProfile AND SUBCLASSES ;
  NAMED BY SUPERIOR OBJECT CLASS “ITU-T M.3100”:managedElementR1 AND SUBCLASSES ;
   WITH ATTRIBUTE cesServiceProfileId;
    CREATE
       WITH-AUTOMATIC-INSTANCE-NAMING;
     DELETE
       ONLY-IF-NO-CONTAINED-OBJECTS;
REGISTERED AS {atmfM4NameBinding 29};
```

4.4.2 vcCTPBidirectional-managedElementR1

```
vcCTPBidirectional-managedElementR1 NAME BINDING
  SUBORDINATE OBJECT CLASS vcCTPBidirectional AND SUBCLASSES ;
  NAMED BY SUPERIOR OBJECT CLASS  “ITU-T M.3100”:managedElementR1 AND SUBCLASSES ;
   WITH ATTRIBUTE “ITU-T M.3100”:cTPId ;
   BEHAVIOUR
    vcCTPBidirectional-managedElementR1Behaviour BEHAVIOUR
        DEFINED AS
        “The value of vcCTPId attribute (VCI value) in the vcCTPBidirectional object is used internal to the
        ATM Network Element and the value it is given is a local matter.”
    CREATE
          WITH-AUTOMATIC-INSTANCE-NAMING;
        DELETE
          ONLY-IF-NO-CONTAINED-OBJECTS;
    REGISTERED AS {atmfM4NameBinding 30};
```

4.5 Additional Actions

4.5.1 addTerminationPoint

addTerminationPoint ACTION
BEHAVIOUR addTerminationPointBeh;
MODE CONFIRMED;
WITH INFORMATION SYNTAX AtmMIBMod.AddTerminationPointInfo;
WITH REPLY SYNTAX AtmMIBMod.AddTerminationPointReply;
REGISTERED AS {atmfM4Action 8};

addTerminationPointBeh BEHAVIOUR
DEFINED AS

"This action is used to add one or more termination point objects to the identified interworkingVCTTPBidirectional. The traffic characteristics of the interworked ATM VC termination point must be able to accommodate the additional termination point.

Supplied with this action is the following information:

New TPs - This parameter identifies the additional Termination Points to be added to the existing terminationPointList attribute of the identified interworkingVCTTPBidirectional object.

InterworkingVCTTPBidirectional - This parameter identifies the instance of the interworkingVCTTPBidirectional object class to which the additional termination point to be interworked.

If the request is granted, the terminationPointList attribute, in the interworkingVCTTPBidirectional object, shall be reset to reflect the new termination point added. ";

4.5.2 removeTerminationPoint

removeTerminationPoint ACTION
BEHAVIOUR removeTerminationPointBeh;
MODE CONFIRMED;
WITH INFORMATION SYNTAX AtmMIBMod.RemoveTerminationPointInfo;
WITH REPLY SYNTAX AtmMIBMod.RemoveTerminationPointReply;
REGISTERED AS {atmfM4Action 9};

removeTerminationPointBeh BEHAVIOUR
DEFINED AS

"This action is used to remove one or more termination point objects from the identified interworkingVCTTPBidirectional.

Supplied with this action is the following information:

Existing TPs - This parameter identifies the existing Termination Points to be removed from the identified interworkingVCTTPBidirectional object.

InterworkingVCTTPBidirectional - This parameter identifies the instance of the interworkingVCTTPBidirectional object class from which the identified termination points should be removed.

If the request is granted, the terminationPointList attribute, in the interworkingVCTTPBidirectional object, shall be reset to reflect the remaining termination points. ";

4.6 Supporting Productions

The following supporting productions must be added to AtmMIBMod described in the CMIP Specification for M4 Interface [2] for Circuit Emulation Service Interworking model.

```
-- supporting productions

AddTerminationPointInfo ::= SEQUENCE {
        newTPs                                          NewTPs,
        interworkingVCTTPBidirectionalInstance ObjectInstance}

AddTerminationPointReply ::= SEQUENCE OF SEQUENCE {
        tpAdded         ObjectInstance,
        tpNotAdded      ProblemCause OPTIONAL}


ChannelAssociatedSignalling ::= ENUMERATED {
  basic (0),
  e1Cas (1),
  ds1SfCas (2),
  ds1EsfCas (3),
   j2Cas (4)
}

ExistingTPs ::= SEQUENCE OF ObjectInstance

NewTPs ::= SEQUENCE OF ObjectInstance

RemoveTerminationPointInfo ::= SEQUENCE {
        existingTPs                                     ExistingTPs,
        interworkingVCTTPBidirectionalInstance ObjectInstance}

RemoveTerminationPointReply ::= SEQUENCE  OF SEQUENCE {
        tpInstance              ObjectInstance,
        tpRemovalProblem        ProblemCause OPTIONAL
        -- absent if tpInstance is removed
        }
```

4.7 Information Model Usage Guidelines

This section provides a set of guidelines intended to help clarify how the objects defined in this document may be used to manage ATM NEs.

4.7.1 Name Bindings Reference Guide

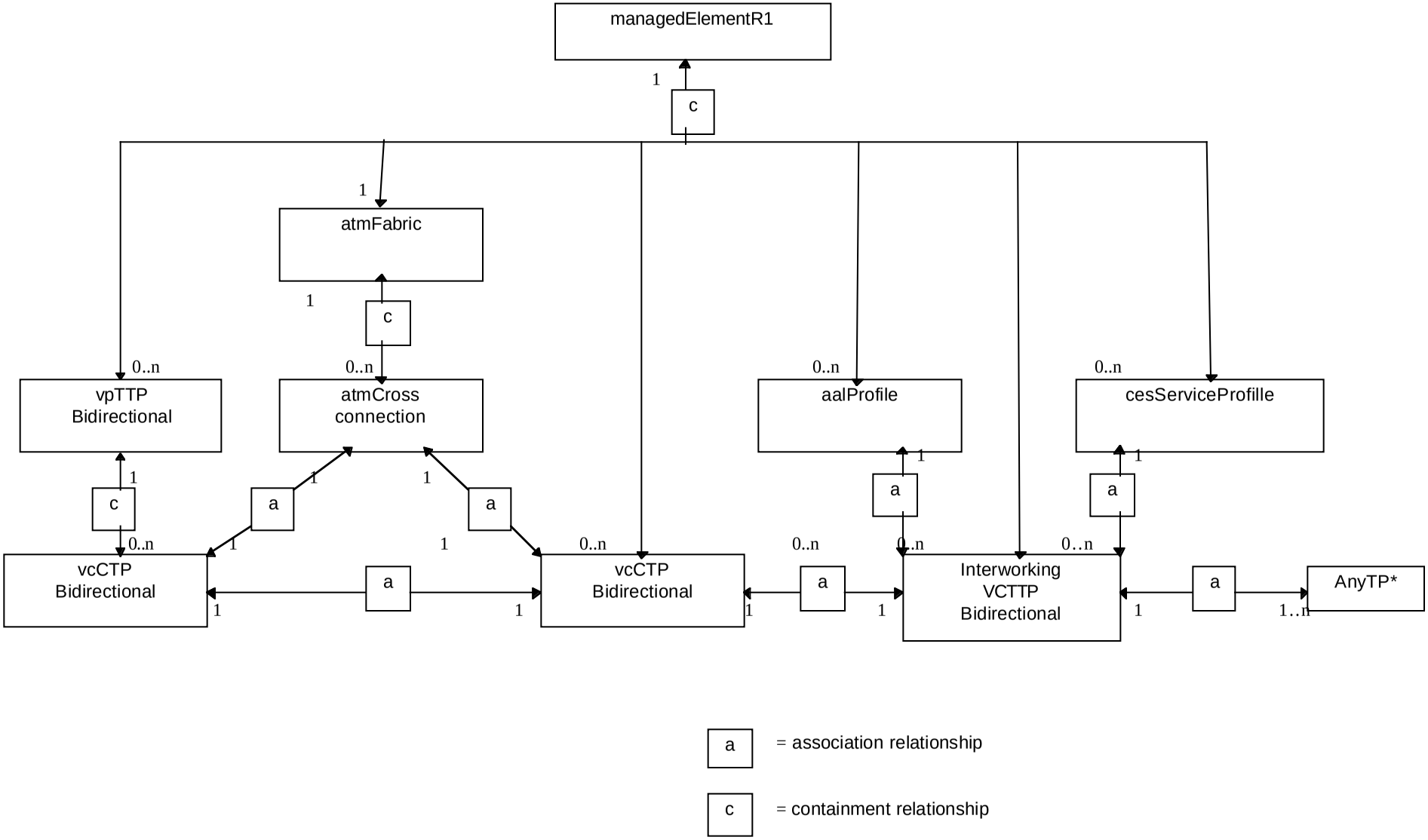
Table 4-1 lists name bindings for the object classes required for the Circuit Emulation Service management. The column heading "Source Document" refers to the document in which the name binding template for a subordinate object class is defined.

Table 4-1: Name Binding Table

Subordinate Managed Object	Name Binding	Source Document
aalProfile	aalProfile-managedElementR1	ATMF af-nm-0071.000
cesServiceProfile	cesServiceProfile-managedElementR1	ATMF af-nm-0072.000
interworkingVCTTPBidirectional	vcTTPBidirectional-managedElementR1	ATMF M4 [2]
vcCTPBidirectional	vcCTPBidirectional-managedElementR1 vcCTPBidirectional-vpTTPBidirectional	ATMF af-nm-0072.000 ATMF M4 [2]

5. Example

This section provides an example that illustrate specific application of the Circuit Emulation Service Interworking Information model described in this document. **Figure 5-1** shows how to model Point-to-Point VC cross-connection for circuit emulation service.



***** **=** can be any termination point e.g. ds0, ds1, Frame Relay etc.

Figure 5-1: Circuit Emulation Service Interworking model

References

[1] ATM Forum af-nm-0020.000, *M4 Interface Requirements and Logical MIB: ATM Network Element View,* October 1994.

[2] ATM Forum af-nm-0027.001, *CMIP Specification for the M4 Interface,* September 1995.

[3] ATM Forum af-vtoa-0078.000, *Circuit Emulation service Interoperability Specification Version 2.0,* November 1996.

[4] ATM Forum af-nm-0071.000, *AAL Management for the M4 "NE View" Interface,* November 1996.

[5] ITU-T Recommendation M.3100, *Generic Network Information Model,* Version 2, March 1995.