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SERIES Y: GLOBAL INFORMATION
INFRASTRUCTURE, INTERNET PROTOCOL ASPECTS
AND NEXT GENERATION NETWORKS

Internet protocol aspects – Operation, administration and
maintenance

OAM functionality for ATM-MPLS interworking

ITU-T Recommendation Y.1712

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ITU-T Recommendation Y.1712

OAM functionality for ATM-MPLS interworking

Summary

This Recommendation describes OAM functionality for interworking between ATM and MPLS networks; specifically, procedures for interworking ATM OAM functionality (as described in ITU-T Rec. I.610) and MPLS OAM functionality (as described in ITU-T Rec. Y.1711) for fault management, notification and alarm suppression.

Source

ITU-T Recommendation Y.1712 was approved on 10 January 2004 by ITU-T Study Group 13 (2001-2004) under the ITU-T Recommendation A.8 procedure.

Keywords

ATM, interworking, MPLS, OAM

FOREWORD

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ITU-T Recommendation Y.1712

OAM functionality for ATM-MPLS interworking

1 Scope

This Recommendation addresses the interworking of ATM (I.610) and MPLS (Y.1711) OAM functionality in two scenarios:

The first is network interworking, whereby ATM is transported (as the client layer) by MPLS (as the server layer) as defined in ITU-T Rec. Y.1411 or similar Recommendations.

The second is layer network interworking [5], whereby the traffic's data-plane for a p2p path is constructed of concatenated ATM and MPLS data-plane partitions.

Defect states and consequent actions resulting from interworking of payload adaptation between ATM and MPLS is for further study (an example would be MTU or sequencing problems).

2 References

The following ITU-T Recommendations and other references contain provisions which, through reference in this text, constitute provisions of this Recommendation. At the time of publication, the editions indicated were valid. All Recommendations and other references are subject to revision; users of this Recommendation are therefore encouraged to investigate the possibility of applying the most recent edition of the Recommendations and other references listed below. A list of the currently valid ITU-T Recommendations is regularly published. The reference to a document within this Recommendation does not give it, as a stand-alone document, the status of a Recommendation.

- [1] ITU-T Recommendation Y.1711 (2004), *Operation and maintenance mechanism for MPLS networks*.
- [2] ITU-T Recommendation I.610 (1999), *B-ISDN operation and maintenance principles and functions*.
- [3] ITU-T Recommendation Y.1411 (2003), *ATM-MPLS network interworking – Cell mode user plane interworking*.
- [4] ITU-T Recommendation I.732 (2000), *Functional characteristics of ATM equipment*.
- [5] ITU-T Recommendation G.805 (2000), *Generic functional architecture of transport networks*.
- [6] ITU-T Recommendation I.357 (2000), *B-ISDN semi-permanent connection availability*.
- [7] IETF RFC 3031 (2001), *Multiprotocol Label Switching Architecture*.

3 Definitions and terminology

This Recommendation uses definitions and terminology from ITU-T Recs G.805, I.610, I.732, Y.1411 and Y.1711.

4 Abbreviations

This Recommendation uses the following abbreviations:

AIS	Alarm Indication Signal
ATM	Asynchronous Transfer Mode
BDI	Backward Defect Indication

CC	Continuity Check
CP	Connection Point
CV	Connectivity Verification
e-t-e	end-to-end
FDI	Forward Defect Indication
LC	Link Connection
LMI	Layer Management Interface
LSH	Label Switch Hop
LSP	Label Switch Path
ME	Maintenance Entity
MPLS	Multi-Protocol Label Switching
NE	Network Element
NS	Native Service
RDI	Remote Defect Indication
TP	Transmission Path
VCC	Virtual Channel Connection
VCLC	Virtual Channel Link Connection
VPC	Virtual Path Connection
VPLC	Virtual Path Link Connection

5 ATM-MPLS network interworking management model (overview)

The ATM-MPLS interworking function is composed of two management planes: the ATM management plane and the MPLS management plane. This Recommendation focuses on OAM information that has to be communicated between the two network data-planes without making any attempt to specify the mechanism for interaction between the two management planes.

There are two classes of maintenance entities (MEs) in the case of ATM-MPLS network interworking:

- ATM and MPLS MEs (for example, a VPC/VCC in case of ATM, and an LSP in case of MPLS);
- Network interworking MEs (NI-MEs), which refer to the portion of the ATM ME that is interworked between the IWF ATM connection points.

Note that an MPLS trail here is proving a link connection in the ATM layer network. This is a G.805 client/server relationship. It is useful to note that between other ATM nodes (in either of the end partitions) there will be trails of other (for example) L1 CO-CS technology providing the link connections between the ATM nodes. The same is expected to be true for the link connections between the MPLS nodes. These relationships are also examples of network interworking.

For layer network interworking, there is only one class of ME: the ATM and MPLS maintenance entities. This is a G.805 layer network interworking relationship in which both entities have common semantics and simply require translation of the trail overhead at the interworking point. The link connections in either the ATM or MPLS layer networks can be provided by CO-CS server trails as in the previous case (and where the relationship here is networking-interworking).

6 Network interworking management functional model

Figure 6-1 shows the ATM-MPLS network interworking management reference model.

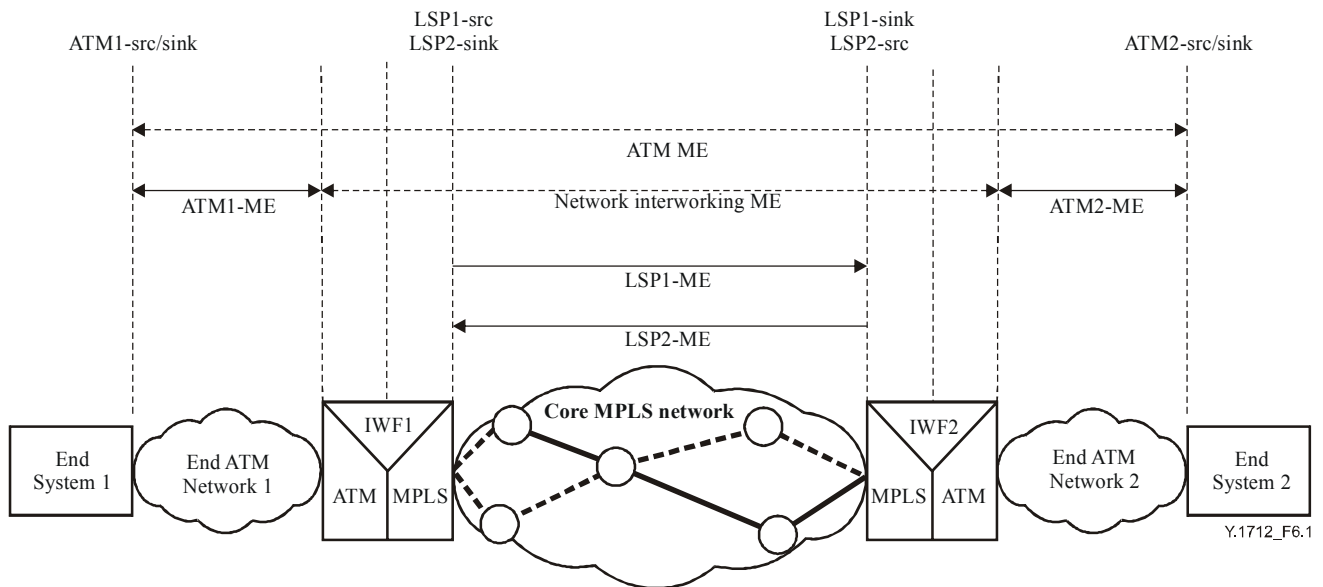


Figure 6-1/Y.1712 – ATM-MPLS network interworking management reference model

The key components of the model are:

- ATM ME: the ATM VCC or VPC transported between the ATM layer network trail termination points.
- End Systems 1 and 2: the ATM layer trail partitions that have a trail termination point at the end system and a connection point at the IWF.
- IWF1, IWF2: interworking functions that use procedures defined in ITU-T Rec. Y.1411 to encapsulate/decapsulate ATM for transport over MPLS.
- LSP1-ME, LSP2-ME: the pair of unidirectional interworking LSPs that together provide bidirectional server layer transport for the ATM client link connection between IWF1 and IWF2.
- Network interworking ME: the portion of the ATM ME that exists between the ATM connection points at IWF1 and IWF2.
- ATM1-ME, ATM2-ME: elements of the ATM ME that are exclusive of the network interworking ME. The ATM layer trail partitions that have a trail termination point at the end system and a connection point at the IWF.

This model assumes that the ATM ME is most usefully partitioned into a minimum of three ATM OAM segments. One or more ATM OAM segments exist between end system 1 and the IWF1 CP. One OAM segment is delineated by the connection points (CPs) co-located with IWF1 and IWF2. One or more ATM OAM segments exist between the IWF2 CP and end system 2.

This model may be mapped onto the I.610 reference model. In the network-interworking case, the MPLS MEs are interposed as a new level between the F3 and F4 OAM levels as illustrated in Figure 6-2. As such, the strict Fx OAM flow numbering relationships should not be taken too literally. The only issue that is relevant is that a link connection in a given client layer network is provided by a trail in a server layer network, and that the OAM flows in each client/server layer network are independent. The VPLC/VCLC transported by the LSP1/2-MEs corresponds to the network interworking ME.