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Telecommunications Management Network (TMN); Management information model for the X-type interface between Operation Systems (OSs) of a Virtual Path (VP)/Virtual Channel (VC) cross connected network; Part 1: Configuration management aspects

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**Network Aspects (NA);
Management information model for the X-type
interface between Operation Systems (OSs)
of a Virtual Path (VP)/Virtual Channel (VC)
cross connected network;
Part 1: Configuration management aspects**

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Foreword

This European Standard (Telecommunication series) has been produced by ETSI Technical Committee Network Aspects (NA).

The present document is part 1 of a multi-part EN covering the management information model for the X-type interface between Operation Systems (OSs) of a Virtual Path (VP)/Virtual Channel (VC) cross connected network, as identified below:

Part 1: "Configuration management aspects";

Part 2: "Asynchronous Transfer Mode (ATM) VP alarm management";

Part 3: "Performance management aspects".

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1 Scope

The present document addresses the requirements of network, and service providers of Asynchronous Transfer Mode (ATM) cross connected networks for establishing, maintaining and releasing Virtual Path (VP) Virtual Channel (VC) connections, which span several administrative ATM domains. These requirements are satisfied by the use of a standardized interface (the "X-interface") between Operation Systems (OSs) belonging to different network operators.

The present document contains a general overview describing the different management areas that will be covered in the different X-interface ENs - configuration, fault and performance - as well as the relationships between them.

The present document describes the configuration management area covering the following aspects:

- a management architecture that shows how the X-interface is to be used between service or network providers;
- the management services and functions needed to manage ATM connections, which span several administrative domains. These management services and functions cover the requirements for the X-interface;
- the management information crossing the X-interface. This management information specification uses the Guidelines for the Definition of Managed Objects (GDMO) formalism, described in ITU-T Recommendation X.722 [6].

2 Normative references

References may be made to:

- a) specific versions of publications (identified by date of publication, edition number, version number, etc.), in which case, subsequent revisions to the referenced document do not apply; or
- b) all versions up to and including the identified version (identified by "up to and including" before the version identity); or
- c) all versions subsequent to and including the identified version (identified by "onwards" following the version identity); or
- d) publications without mention of a specific version, in which case the latest version applies.

A non-specific reference to an ETS shall also be taken to refer to later versions published as an EN with the same number.

- [1] ITU-T Recommendation M.3100: "Generic network information model".
- [2] ITU-T Recommendation X.721 | ISO 10165-2: "Information technology - Open Systems Interconnection - Structure of management information: Definition of management information".
- [3] I-ETS 300 653 (1996): "Telecommunications Management Network (TMN); Generic managed object class library for the network level view".
- [4] ITU-T Recommendation M.1400: "Designations for international networks".
- [5] ITU-T Recommendation I.751 (03/96): "Asynchronous transfer mode management of the network element view".
- [6] ITU-T Recommendation X.722: "Information technology - Open Systems Interconnection - Structure of Management information: Guidelines for the definition of managed objects".
- [7] EN 300 820-2: "Telecommunications Management Networks (TMN); Management information model for the X-type interface between Operation Systems (OSs) of a Virtual Path (VP) / Virtual Channel (VC) cross connected network; Part 2: Fault management aspects".

3 Definitions and abbreviations

3.1 Definitions

For the purposes of the present document, the following definitions apply:

(Some definitions depend on the future acceptance of the "cascaded/mixed mode" as described in annex D. This dependence is already taken into account in these definitions.)

A Public Network Operator (PNO): The A PNO is the PNO whose subnet is connected to the A User. The A PNO can be the Initiating one, but this is not always the case. It is the Consumer of other PNO's parts of the VP / VC connection.

connection: A "transport entity" which is capable of transferring information transparently between "Connection Points (CP)". A "connection" defines the association between the "CPs" and the "CPs" delimit the "connection".

consumer and provider roles of a PNO: With respect to a particular VP / VCC, a Consumer PNO is a PNO that has delegated the management of a VP / VC subnetwork connection plus the outgoing link connection (both shall be part of the connection) to another PNO (being a Provider PNO). If, in future, the „cascaded/mixed" mode should be accepted (annex D) a PNO can have both roles at once, if it is providing part of the VP / VCC (being a Provider), and at the same time asks another PNO to provide a part of the connection (being a Consumer).

initiating Public Network Operator (PNO): The Initiating PNO is the PNO requesting for a particular ATM connection starting in the subnetwork of the A side; It controls the overall VP / VC connection.

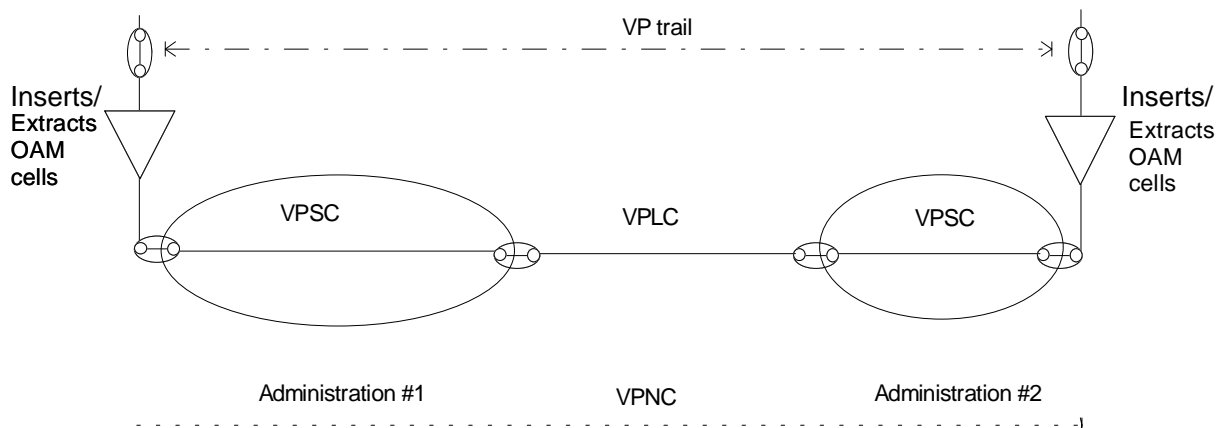
link connection: A "transport entity" provided by the "client/server" association. It is formed by a near-end "adaptation" function, a server "trail" and a far-end "adaptation" function between "CPs". It can be configured as part of the "trail management process" in the associated server layer.

link: A "topological component" which describes the fixed relationship between a "sub-network" and another "sub-network" or "access group".

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network connection: A "transport entity" formed by the series of "connections" between "termination CPs".

sub-network connection: A "transport entity" formed by a "connection" across a "sub-network" between "CPs". It can be configured as part of the "trail management process".



VPLC: VP Link Connection
 VPNC: VP Network Connection
 VPSC: VPSub Network Connection

Figure 1: Functional architecture of a VPC provided by two administrations

subnetwork view: A subtree of the X-interface tree. A subnetwork view belongs to a particular PNO: The PNO at the root of the subtree.

sub-network: A "topological component" used to effect routing and management. It describes the potential for "sub-network connections" across the "sub-network". It can be partitioned into interconnected "sub-networks" and "links". Each "sub-network" in turn can be partitioned into smaller "sub-networks" and "links" and so on. A "sub-network" may be contained within one physical node.

transit PNO: A Transit PNO is a PNO using its own subnetwork to perform its required transit part of VP / VC connection. It has a provider role and corresponds to a leaf in the X-interface tree, not being the Z side. In the "cascaded/mixed approach" case it can be both a Provider (where it acts as a Transit) and a Consumer (where it virtually acts as an Initiating).

X-interface tree: With respect to a particular VP / VCC, X-interface relations exist between each Provider PNO and their Consumer PNO. Because each Provider has exactly one Consumer, the X-interface relations between all PNOs involved in the management of a particular VP / VCC form a tree, the X-interface relation tree.

NOTE: For a particular VP / VCC there can be several possible X-interface relation trees; the actual tree is formed at VP / VCC setup. The root of the tree is the Initiating PNO; it uses (and via an X-interface controls) the PNOs (often Transit PNOs), to which it is connected in the tree via its branches. The most right leaf of the tree is the Z PNO. Figure 2 shows an example of a X-interface tree.

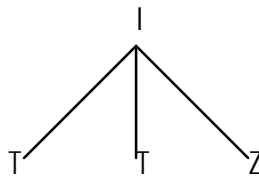


Figure 2: Example of a X-interface tree with the Initiating PNO being the A PNO

Z PNO: A Z PNO is a PNO whose subnet is connected to the Z User. It has a Provider role and corresponds to the rightmost leaf in the X-interface tree and connects the Z User to the reservation. In the „cascaded/mixed" approach case it can be both a Provider (where it acts as the Z side) and a Consumer (where it virtually acts as an Initiating PNO).

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3.2 Abbreviations

For the purposes of the present document, the following abbreviations apply:

ASN.1	Abstract Syntax Notation One
ATM	Asynchronous Transfer Mode
BM	Business Management
CMIP	Common Management Information Protocol
CMISE	Common Management Information Service Element
CP	Connection Point
CTP	Connection Termination Point
EM	Element Management
GDMO	Guidelines for the Definition of Managed Objects
GOM	Generic Object Model
MF	Management Function
MS	Management Service
MSC	Management Service Component
NE	Network Element
NEF	Network Element Function
NM	Network Management
NMS	Network Management System
OS	Operations System
OSF	Operations System Function
PNO	Public Network Operator
QoS	Quality of Service
SM	Service Management
TMN	Telecommunications Management Network
TP	Termination Point
VC	Virtual Channel

VCC	Virtual Channel Connection
VP	Virtual Path
VPC	Virtual Path Connection
VPLC	Virtual Path Link Connection
VPNC	Virtual Path Network Connection
VPSC	Virtual Path Subnetwork Connection

4 Management architecture

This clause describes the functional architecture for the X-interface for ATM cross connected networks. It provides an informative overview of the use of the X-interface and is therefore not normative. (Some definitions partially depend on the future acceptance of the „cascaded/mixed mode" as described in annex D. This dependence is already taken into account.)

Three concepts underpin the functional architecture for the X-interface:

- The X-interface connects two management systems, for the purpose of exchanging service level and/or network level requests with each other.
- Consumer/Provider roles (also reflected by Manager/Agent).
- The future use of Star or Cascaded organizational models for communication, or a mixture of both. The choice of the organizational model will be determined by agreements between the PNOs involved in the X-interface.

These concepts are elaborated in the following subclauses.

4.1 X-interface at the Service Management level

In order to clarify the position of the X-interface within the layered management architecture outlined in ITU-T Recommendation M.3100 [1], the following definitions are adopted within the present document (figure 3):

- The Network Management (NM) level is concerned with connections within the network. This means the control of topological information (subnetworks and the links between subnetworks), and subnetwork connections.
- The Service Management (SM) level is concerned with the overall connection and its associated Quality of Service (QoS).

Since Network operators can request other network operators to deliver a connection with a certain QoS, over the X-interface, this interface can be considered at the SM level. However, some functionalities described in the present document are allocated to the NM level, such as the management of topological information.

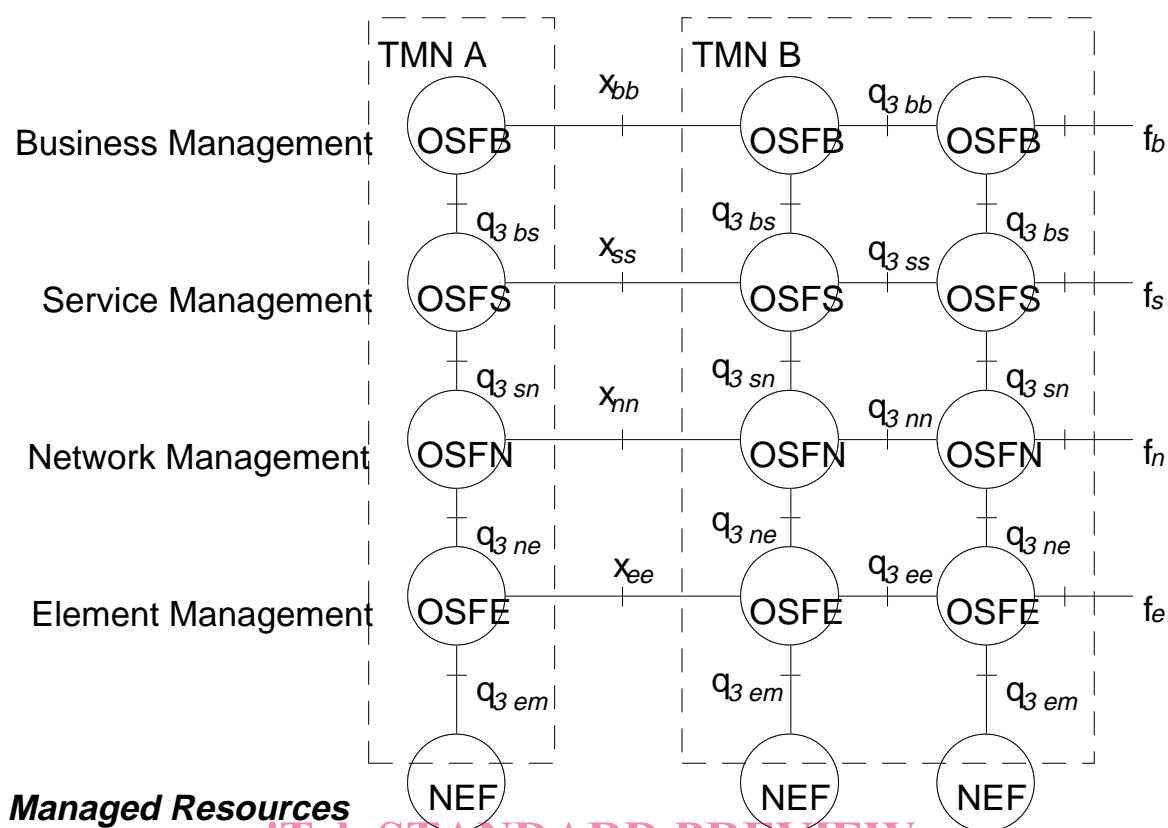


Figure 3: Layers of management (from ITU-T Recommendation M.3100 [1])

4.2 Consumer/Provider

The functional architecture for the X-interface for ATM Cross Connected networks is characterized by Consumer/Provider roles: each PNO in a VP / VC Connection is a Provider of a part of that connection. However, if the "cascaded/mixed mode" will be accepted, some PNOs might also have a Consumer role, since they use parts of other PNO's networks to provide their part of the connection. This is illustrated in figure 4.

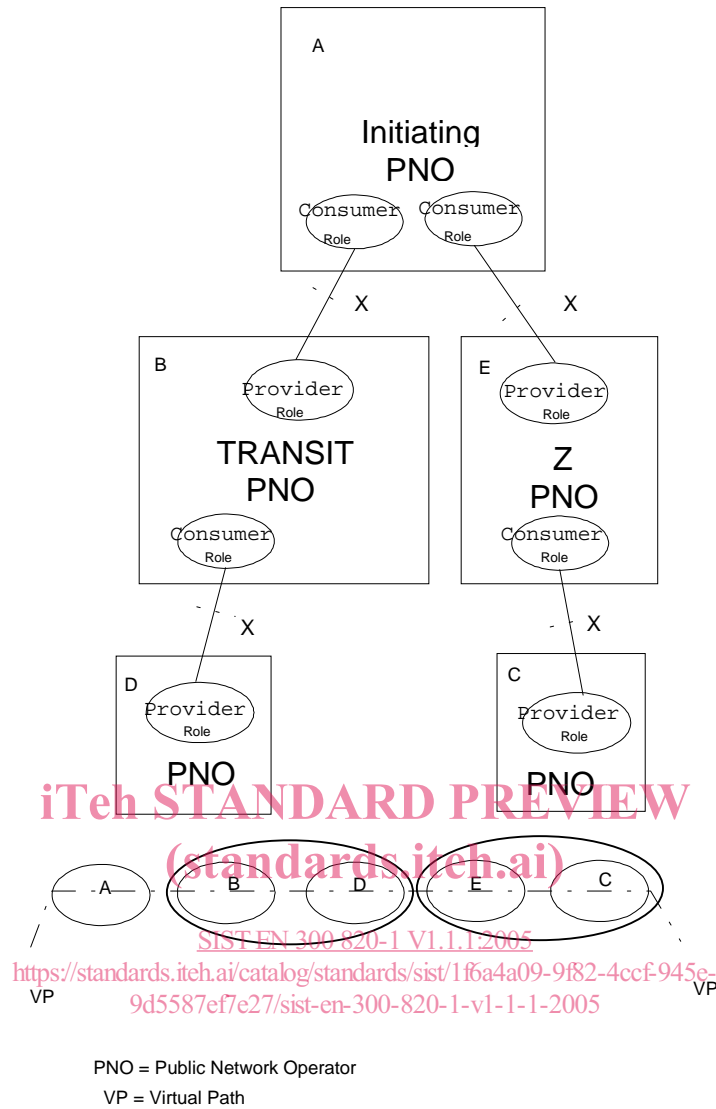


Figure 4: Consumer/provider roles over an X-interface for a specific connection

4.3 Organizational model

This subclause describes the organizational model, which will be used in establishing X-interface relationships between PNOs. It is shown in figure 5.

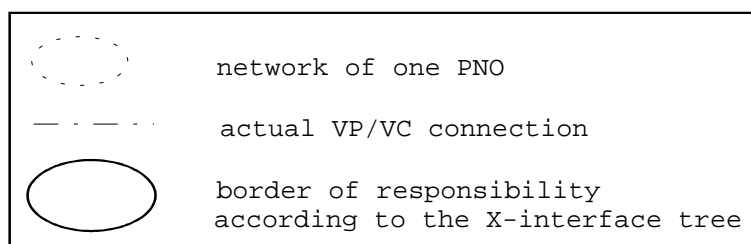
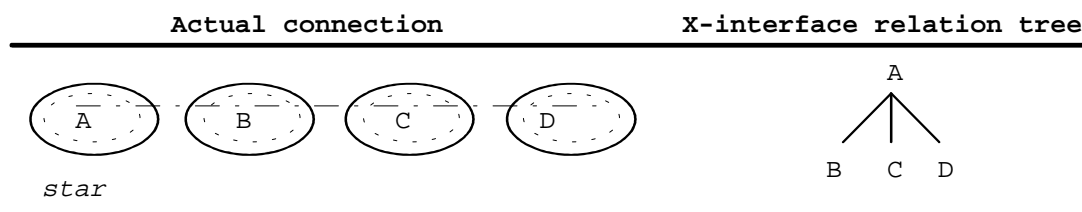


Figure 5: Organizational model

In the *Star* organization as exemplified in the figure above, PNO A uses the X-interface relation with all the PNOs involved. This means that PNO A has full responsibility for the entire connection and all the other PNOs are only responsible for their own network towards PNO A.

The Consumer/Provider roles, introduced in subclause 4.2, are reflected by the X-interface tree: in the *Star* example above, PNO A has a Consumer role, whereas PNO B, C and D have a Provider role.

4.4 Responsibility of PNOs regarding a VP / VC connection

This subclause denotes which responsibility is required from each PNO involved a particular VP / VC connection. The following rules apply:

- Rule 1** A PNO is responsible for the management of a particular VP / VCC within its own PNO Subnetwork (if not being the *Initiating PNO*, who is responsible towards the connection customer).
- Rule 2** Besides the responsibility in rule 1, a PNO is also responsible for the ATM Connection over the physical connection from its PNO Subnetwork to the next PNO Subnetwork on the route of a VP / VCC (seen from the *A* network towards the *Z* network).

4.4.1 Examples of application of the responsibility rules

The responsibility rules described in subclause 4.4 are illustrated by the following scenario description. The scenario starts with the existence of a particular VP / VCC between PNOs A and C via B and a particular X-interface relation tree. The scenario describes the occurrence of 4 failures that need management action; each of them is described in one step of the scenario description. The 2 steps are an example of part of the life cycle of this particular VP / VCC and take place in sequence. The scenario description is illustrated in figures 6 through 7.

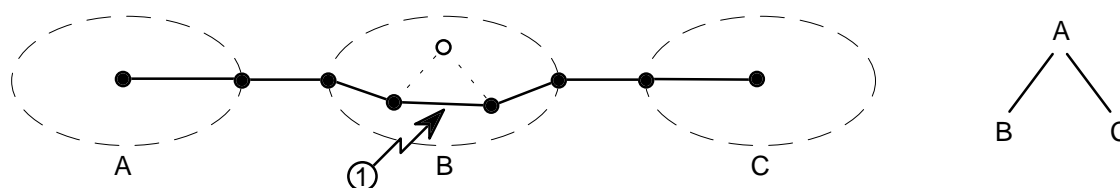


Figure 6: Step 1 of example scenario