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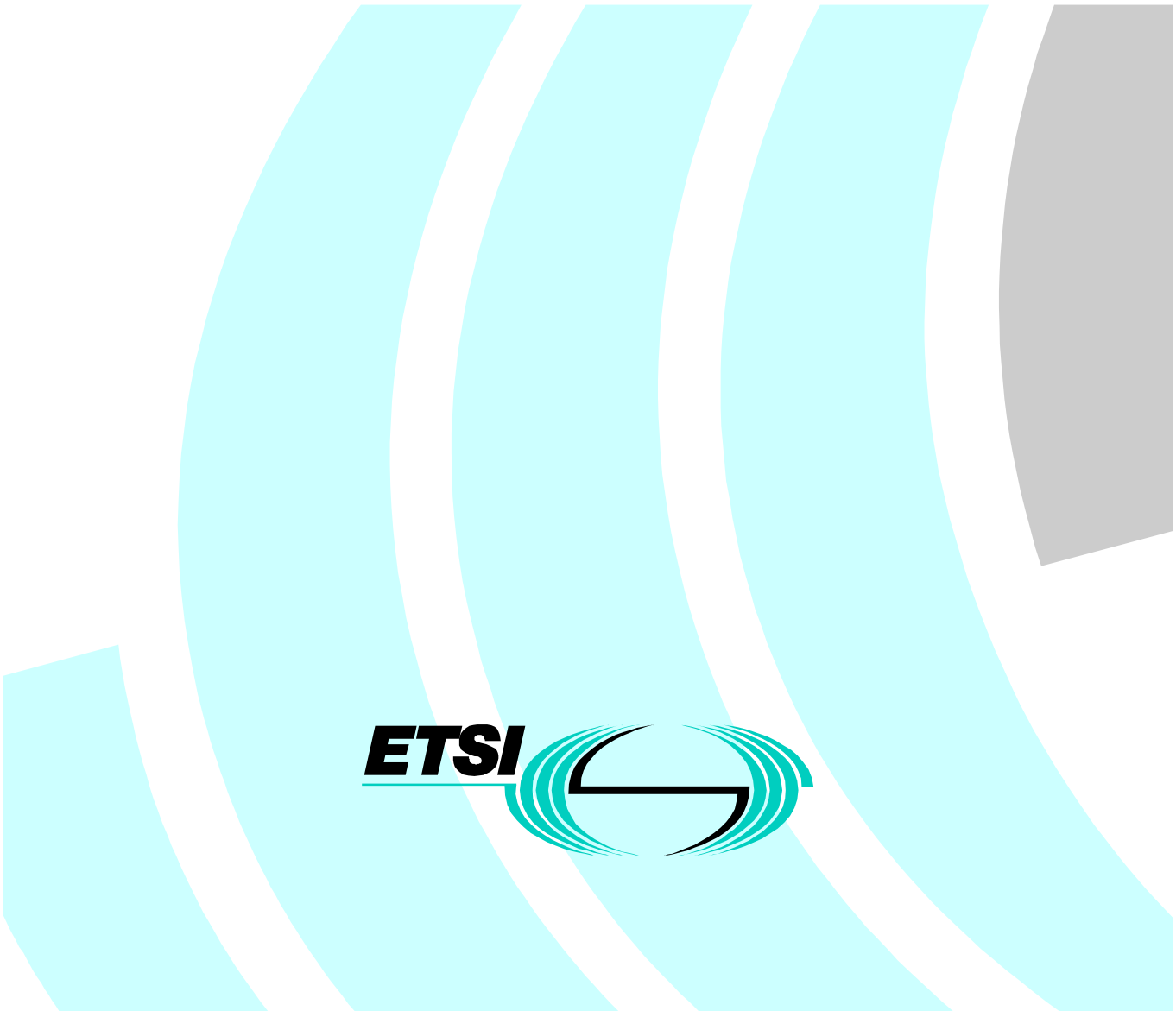
Technical Specification

Technical Framework for the Provision of Interoperable ATM Services; Part 2: Network Management (X-interface) Specification for Phase 1 Implementation



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Contents

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Foreword

This Technical Specification (TS) has been produced by ETSI Project ATM Services Interoperability (EASI).

The present document is part 2 of a multi-part TS covering the Technical Framework for the Provision of Interoperable ATM Services, as identified below:

Part 1: "NNI-Interface User and Control plane specification (including network functions and service aspects) Phase 1";

Part 2: "Network Management (X-interface) Specification for Phase 1 Implementation".

The draft of the present document has been produced from studies mostly carried out in EURESCOM P813. EURESCOM documents may be obtained by writing to EURESCOM GmbH, Schloss-Wolfsbrunnenweg 35, D-69118 Heidelberg, Germany, or referring to: http://www.eurescom.de.

Further detailed information can be found in ETSI TR 101 477 [1] "Guidelines for the use of ETSI TS 101 674-2".

1 Scope

The present document specifies a TMN X-interface for the transfer of network management information for interoperable ATM services. This interface, for which hereafter in the present document the term "X.easi interface" is used, allows for the management of interconnected ATM networks in order to provide ATM based services across network boundaries.

The present document describes the X.easi interface together with essential supporting administrative processes including:

- A description of the network architecture and related aspects including management processes;
- ATM network management requirements and capabilities of the X.easi interface;
- Testing issues.

In addition, two informative annexes are provided to describe (A) an "ATM interconnect services and processes model", which provides an example of processes associated with the use of the User and Control network to network interface specification ("NNI.easi") specified in ETSI TS 101 674-1 [2] and the X.easi interface; (B) an example of a reasonable "Business Model" for the roles which organizations might play in the framework of providing ATM interconnection services.

2 References

The following documents contain provisions that, through reference in the text, constitute provisions of the present document.

- References are either specific (identified by date of publication, edition number, version number, etc.) or non-specific.
- For a specific reference, subsequent revisions do not apply.
- For a non-specific reference, 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] ETSI TR 101 477 (V1.1): "Guidelines for the use of ETSI TS 101 674-2".

[2] ETSI TS 101 674-1 (V1.2): "Technical Framework for the Provision of Interoperable ATM Services; Part 1: NNI-Interface User and Control plane specification (including network functions and service aspects) Phase 1".

[3] ETSI EN 300 820-1 (V1.1): "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".

[4] ITU-T Recommendation M.1400 (1997): "Designations for international networks", and Amendment.

[5] ITU-T Recommendation E.164: "Numbering Plan for the ISDN Era".

[6] ITU-T Recommendation E.191: "B-ISDN numbering and addressing".

[7] ITU-T Recommendation I.371: "Traffic control and congestion control in B-ISDN".

[8] ETSI ETS 300 301 (1997): "Broadband Integrated Services Digital Network (B-ISDN); Traffic control and congestion control in B-ISDN [ITU-T Recommendation I.371 (1996)]".

[9] ITU-T Recommendation E.735 (1997): "Framework for traffic control and dimensioning in B-ISDN".

[10] ITU-T Recommendation M.3010 (1996): "Principles for a Telecommunications management network".

[11] ITU-T Recommendation M.3400 (1997): "TMN management functions".

[12] ITU-T Recommendation I.751 (1996): "Asynchronous transfer mode management of the network element view".

[13] ETSI ETS 300 469 (1998): "Broadband Integrated Services Digital Network (B-ISDN); Asynchronous Transfer Mode (ATM); Management of the network element view [ITU-T Recommendation I.751 (1996)]".

[14] ITU-T Recommendation X.700 (1992): "Management framework for Open Systems Interconnection (OSI) for CCITT applications".

[15] ITU-T Recommendation X.721: "Information technology - Open Systems Interconnection - Structure of management information: definition of management information", February 1992 + later corrigenda to June 1998.

[16] ITU-T Recommendation M.3100 (1995): "Generic network information model".

[17] ETSI ES 200 653 (V1.2): "Telecommunications Management Network (TMN); Network level generic class library".

[18] ITU-T Recommendation X.790 (1995): "Trouble management function for ITU-T applications".

[19] ITU-T Recommendation M.1540 (1994): "Exchange of information for planned outages of transmission systems".

[20] ITU-T Recommendation M.1550 (1992): "Escalation procedure".

[21] ITU-T Recommendation M.1560 (1992): "Escalation procedure for international leased circuits".

[22] ITU-T Recommendation M.1530 (1999): "Network maintenance information".

[23] ETSI EN 300 820-3 (V0.1): "Telecommunications Management Network (TMN); Asynchronous Transfer Mode (ATM) management information model for the X interface between Operation Systems (OSs) of a Virtual Path (VP)/Virtual Channel (VC) cross connected networks; Part 3: VP Performance management".

[24] ITU-T Recommendation D.224: "Charging and Accounting principles for ATM/B-ISDN".

[25] ITU-T Recommendation D.285 (1996): "Guiding principles for charging and accounting for intelligent network supported services".

[26] ITU-T Recommendation D.232 (1997): "Specific tariff and accounting principles applicable to ISDN supplementary services".

[27] ITU-T Recommendation D.230 (1995): "General charging and accounting principles for supplementary services associated with international telecommunication services provided over the Integrated Services Digital Network (ISDN)".

[28] ITU-T Recommendation D.225 (1997): "Charging and accounting principles to be applied to frame relay data transmission service".

[29] ITU-T Recommendation D.212 (1996): "Charging and accounting principles for the use of Signalling System No. 7".

[30] ITU-T Recommendation D.211 (1998): "International accounting for the use of the signal transfer point and/or signalling point for relay in Signalling System No.7".

[31] ITU-T Recommendation D.210 (1994): "General charging and accounting principles for international telecommunications services over the integrated services digital network (ISDN)".

[32] ITU-T Recommendation Q.813 (1998): "Security Transformation Application Service Element for Remote Operations Service Element (STASE-ROSE)".

[33] ETSI EN 300 820-2 (V1.2): "Telecommunications Management Network (TMN); Asynchronous Transfer Mode (ATM) 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: VP alarm management".

3 Definitions and abbreviations

3.1 Definitions

For the purposes of the present document, the following terms and definitions apply.

ATM Access Point: means by which a subnetwork offers external interfaces to other subnetworks. It is associated with an end point of an IPPL

ATM Gateway: represents an ATM access point in one subnetwork, which is associated with an ATM access point in another subnetwork for the purpose of topological interconnection

connection: ATM cell transport entity, which is capable of transferring information transparently between connection points. A connection defines the association between the connection points and the connection points delimit the connection

Connection Admission Control (CAC): set of actions taken by the network at the connection set up phase (or during connection re-negotiation phase) in order to establish whether a virtual channel connection or a virtual path connection can be accepted or rejected

Data Communications Network (DCN): dedicated network used to interconnect operators' network management platforms supporting automated X.easi interface processes. (The DCN may be configured as a "closed user group" among these operator's management platforms)

Inter-PNO Physical Link (IPPL): represents a physical link that offers bi-directional transmission capabilities and connects two subnetworks. Each InterPNOPhysicalLink is terminated by two ATM Access Points, which are in charge of notifying failures related to the link or to the access point itself. An IPPL can be realized by any transmission capability (SDH, PDH etc.)

link: "topological component" which describes the fixed relationship between a "sub-network" and another "sub-network" or "access group". It is defined by an access point on one subnetwork, which is associated with an access point on another subnetwork

NNI.easi interface: network to network interface in the User and Control Planes, specified in ETSI TS 101 674-1 [2]

subnetwork: "topological component" of a network used to effect routing and management.

subnetwork connection: subnetwork connection is capable of transferring information transparently across a subnetwork. It is delimited by connection termination points at the boundary of the subnetwork and represents the association between these connection points. It can be a VP or a VC connection

Trouble Ticket: report used to exchange information about the resolution of faults, degradations or provisioning problems between operators. Refer also to ITU-T Recommendation X.790 [18] for a definition of Trouble Management and Trouble Reporting

Virtual Channel Connection (VCC): ATM cell transport entity formed by a series of connections between the end-points. A Virtual Channel Connection is contained in a Virtual Path Connection. However, over the management interface, this containment need not always be visible

Virtual Path Connection (VPC): ATM cell transport entity formed by a series of connections between the end-points. A Virtual Path Connection can contain one or more Virtual Channel Connections. However, over the management interface, this containment need not always be visible

3.2 Abbreviations

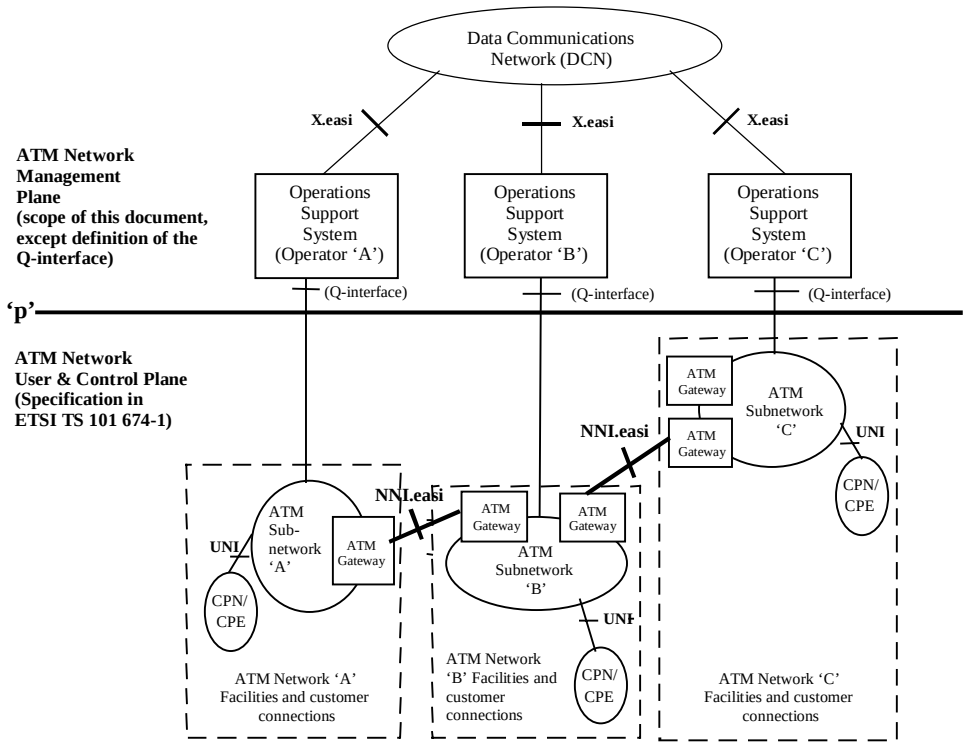
For the purposes of the present document, the following abbreviations apply:

AESA	ATM Forum End System Addresses
AM	Accounting Management
ATC	ATM Transfer Capability
ATM	Asynchronous Transfer Mode
B-ISDN	Broadband - Integrated Services Digital Network
CAC	Connection Admission Control
CCR	Chargeable Cell Rate
CM	Configuration Management
CP	Connectivity Provider
CPE	Customer Premises Equipment
CPN	Customer Private Network
CUG	Closed User Group
DCN	Data Communications Network
EASI (or easi)	ETSI project ATM Services Interoperability
EN	European Norm
ETS	European Telecommunications Standard
ETSI	European Telecommunications Standards Institute
EURESCOM	European Institute for Research and Strategic Studies in Telecommunications
FM	Fault Management
ID	Identity
IPPL	Inter-PNO Physical Link
IPR	Intellectual Property Rights
ISA	Interconnect Service Administration
ISD	Interconnect Service Definition
ISE	Interconnect Service Establishment
ISO	Interconnect Service Operation
ITU-T	International Telecommunications Union, Telecommunications Standardization Sector
MBS	Maximum Burst Size
MCR	Minimum Cell Rate
NM	Network Management
NNI	Network to Network Interface
NNI.easi	NNI specified by ETSI EASI project (defined in ETSI TS 101 674-1 [2])
NSAP	Network Service Access Point
OS	Operating System
OSI	Open Systems Interconnection
OSS	Operations Support System
PCR	Peak Cell Rate
PM	Performance Management
PNO	Providing Network Operator
POI	Point of Interconnect
QoS	Quality of Service
SCR	Sustainable Cell Rate
SPC	Signalling Point Code
SS7	Signalling System No. 7
STASE-ROSE	Secure Transformation Application Service Element – Remote Operations Service Element
SVC	Switched Virtual Channel
TMN	Telecommunications Management Network
UNI	User to Network Interface
VA-SP	Value Added Service Provider
VC	Virtual Channel
VCC	Virtual Channel Connection
VP	Virtual Path
VPC	Virtual Path Connection
X.easi	Network Management interface specified in the present document
X.user	Interface from PNO to VA-SP or other consumer

4 Network Architecture and related aspects

4.1 Overview

The network architecture and related network management architecture forming the basis for the present document is illustrated in figure 1, respectively below and above the line denoted by "**p**". The standard describing the network architecture and associated interoperability requirements is provided in ETSI TS 101 674-1 [2] and is not discussed in detail other than to illustrate the relationship with the "X.easi" interface specification in the present document. Consequently, the purpose of the present document is to provide a specification for Network Management that correlates with the ATM network specification provided in ETSI TS 101 674-1 [2].



Legend:

X.easi	Network Management interface between operators' Operations Support Systems
CPN/CPE	Customer Private Network / Customer Premises Equipment
NNI	Network-to-Network Interface (specified in [3])
UNI	User-to-Network Interface
(Q-interface)	Management interface to the network technology in each operator's domain Note: This is proprietary to each operator and not defined or specified in this document.

Figure 1: Technical Scope and the Interfaces

Refer to ETSI TR 101 477 [1] for a more general management architecture involving an Initiating Operator "I". The "I" operator initiating a particular service is not explicitly shown but could be any of the three operators (A, B, C) shown.

The present document assumes that operators have undertaken all the necessary ATM interconnect service definition, establishment and administrative processes consistent with the network level and network management level interconnection arrangements illustrated in figure 1. Annex A presents an "ATM interconnect service processes model". This shows a logical ordering of all such processes in relation to use of the NNI.easi interface ETSI TS 101 674-1 [2] and the X.easi interface for the provision and management of ATM interconnect services.

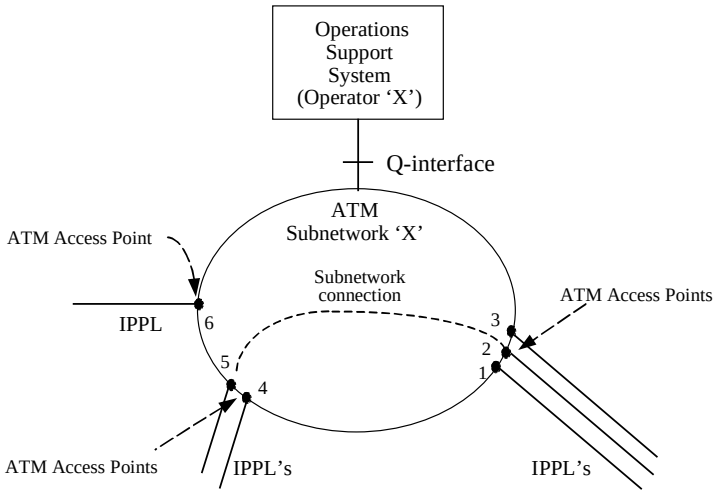
The overall architecture depicted in figure 1 allows for the interoperability of ATM subnetworks and the exchange of network management information, in order to provide services based on, or supported by, ATM across network boundaries. The Network Management specification is founded on the requirement for each interconnected operator to be able to manage its "Operations Support Systems (OSS)". The OSS's, in turn, manage the inter-domain parts and internal parts of the ATM networks together with the management of the physical links by which interconnections are provided between ATM networks. For Phase 1, this specification assumes that each operator provides only one ATM subnetwork for the purpose of managed interconnection to the equivalent ATM subnetwork of another operator. Interconnection requires business and contractual arrangements to be agreed between involved operators and an example of the possible roles, relationships and interfaces is provided in annex B.

The remainder of clause 5 addresses six additional network related aspects: (i) the requirement for shared network topology information, (ii) the network management identifier scheme to be supported, (iii) connection admission control, (iv) traffic & capacity planning, (v) management of multiplexing of VCCs into a VPC and (vi) management of interworking with non-ATM networks.

For Phase 1, interconnected ATM network management should be organized in alignment with the ETSI star model ETSI EN 300 820-1 [3], which is in accordance with the scheme shown in the network management plane in figure 1.

4.2 Requirement for shared network topology information

Operators should be required to show only the ATM Access Points to their ATM subnetwork and the physical links (IPPLs) between their ATM subnetwork and other interconnected ATM subnetworks, in accordance with ETSI EN 300 820-1 [3].



Legend:

IPPL	Inter PNO Physical Link (logically associated with Subnetwork interconnections)
ATM Access Points	(logically associated with ATM Gateways)
Q-interface	Note: This is proprietary to Operator 'X' and is not defined or specified in this document

Figure 2: Depiction of the extent of shared network topology information

The shared topology information requirement, for any interconnected ATM operator "X", is shown in figure 2. Operators should **not** be required to disclose the internal topology of their ATM subnetwork to interconnecting operators.

4.3 Management Identifier Scheme

The X.easi interface should support a management identifier scheme based on ITU-T Recommendation M.1400 [4] line code identifiers, ITU-T Recommendation E.164 [5] ATM end system addresses (AESAs) based on the OSI-NSAP format defined in ITU-T Recommendation E.191 [6].

4.4 Connection Admission Control

Connection Admission Control (CAC) is defined as the set of actions taken by the network at the call set up phase (or during call re-negotiation phase) in order to establish whether a virtual channel connection or a virtual path connection can be accepted or rejected (ITU-T Recommendation I.371 [7]). Interconnected ATM network management therefore should support the provision of connections in alignment with the CAC guidelines and parameters described in ITU-T Recommendation I.371 [7] and ETSI ETS 300 301 [8].

4.5 Traffic and Capacity Planning

Traffic and capacity planning is not an automated process supported on the X.easi interface. However, operators supporting ATM interconnection should accept responsibility for regular negotiation and review of the network and interconnect architecture and resources required to support the specification defined in ETSI TS 101 674-1 [2], taking into account the demand for provision of services. Operators should endeavour to provide ATM VP/VC connections in accordance with the limits set by bi-lateral traffic forecasting agreements.

4.6 Management of the Multiplexing of VCCs into a VPC

Operators should, when undertaking traffic and capacity planning, provide the (management) resources to multiplex VCCs into a network-to-network VPC and should note that the characterization of such VPCs should be in alignment with ITU-T Recommendation E.735 [9]. Operators should support multiplexing of any combination of VCCs, either with the same or with different ATCs into a single network-to-network VPC (by network management processes). Such a VPC should be established using a single cell rate and should meet the quality of service requirements of the most stringent VCC multiplexed into this VPC. Note that the X.easi management interface presumes that VCCs, which are contained in a VPC, are not individually "visible".

4.7 Management of Interworking with non-ATM-Networks

The ATM capabilities defined in the NNI.easi specification ETSI TS 101 674-1 [2] may also be used to support other services, e.g. 64 kbit/s ISDN and frame relay services. However, for Phase 1, no network management is defined to support interworking with non-ATM networks.

5 Generic requirements and capabilities of the ATM X.easi Interface (NM Plane) for Phase 1

This clause describes the generic requirements and management capabilities required to provide and manage ATM VP/VC services in alignment with the physical model (see figure 1), including the "star" management organizational aspects ETSI EN 300 820-1 [3].

- All requirements and resources necessary for exchange of management information using the X.easi interface should be defined by technical and administrative agreements established between the interconnected ATM network operators.

5.1 Inter-operator Communications

For Phase 1, it is recommended that operators use automated information exchange to support the management functions of VP and VC configuration, alarm reporting, security management and Trouble Ticketing. ("Trouble Ticketing" is the action of exchanging Trouble Tickets). In all cases, operators shall provide a "manual" interface alternative where an "automated" interface is implemented.

Other management functions shall be undertaken using a manual interface.

5.1.1 Automated Exchange of Management Information

Operators should be able to exchange network management information by "automated" methods if agreed by bi-lateral or multilateral negotiation. An automated interface applies to processes that are operated using interconnected computer-based technology, configured to support TMN-based principles in accordance with, for example ITU-T Recommendations M.3010 [10] and M.3400 [11]. The network that is used for interconnections between the groups of operators supporting automated interfaces is known as the "Data Communications Network" (DCN). It should be implemented using established technology such as X.25 or ISDN communication services.

5.1.2 Manual Exchange of Management Information

Operators shall be able to exchange network management information by "manual" methods (i.e., implying communication between human operators). Such methods should be agreed by bi-lateral negotiation and may include, for example, the use of fax, telex, telephone or e-mail. The X.easi interface is then defined as a "manual" interface.

5.2 Network Management Functional Areas

5.2.1 Overview

Network management for the configuration and related aspects required to support and manage interconnected ATM VP/VC permanent or semi-permanent services may be partitioned into generic functional areas, which are in general alignment with those listed in ITU-T Recommendations M.3010 [10] and M.3400 [11]. These functional areas are depicted in figure 3 and show a logical relationship to the user and control (network) level specification ETSI TS 101 674-1 [2], by means of assuming the use of a "Q-interface". The term "Q-interface" is used in a generic sense to mean any competent means by which an operator manages its network technology. In addition, to the generic management functional areas, a requirement for network management support of the "supplementary services" defined in ETSI TS 101 674-1 [2] is recognized.

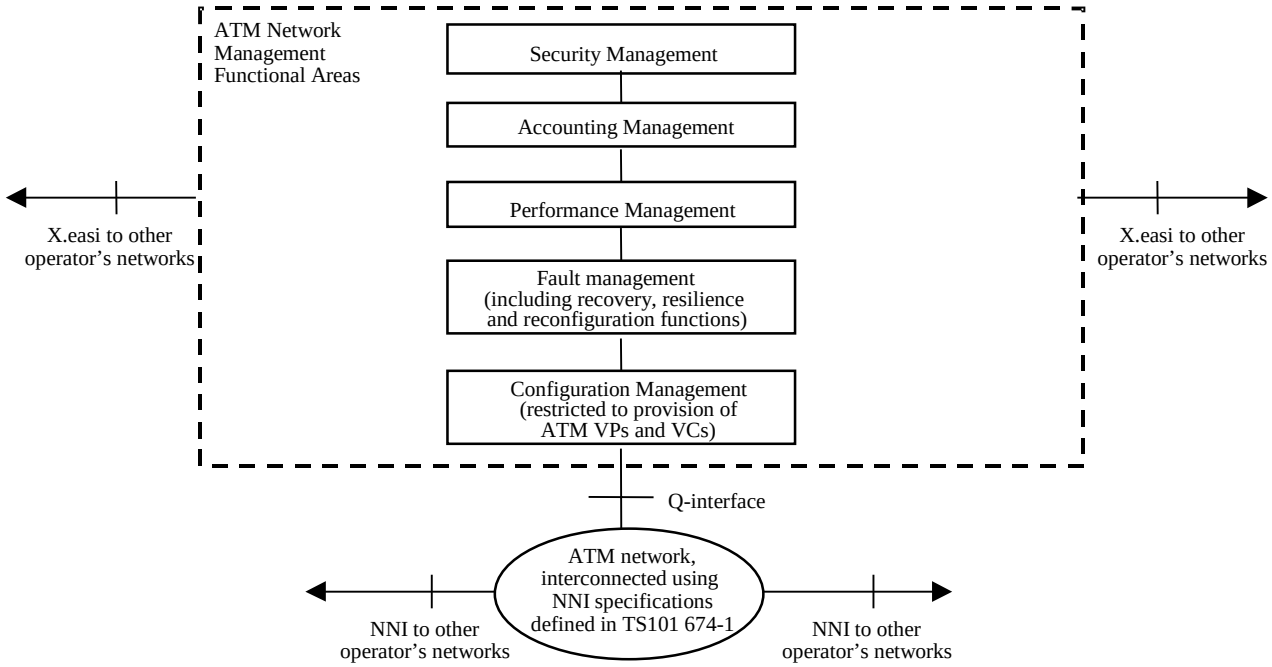


Figure 3: NM Functional areas in relation to management of interconnected ATM networks

The specifications for the ATM Network management functional areas of the X.easi interface are provided in subclauses 6.2.2 to 6.2.7.

5.2.2 Configuration Management

Configuration Management (CM), where applicable to interconnected networks specified in ETSI TS 101 674-1 [2] for the provision of ATM services, is the functional area required for creation of VP and VC Connections. CM management services and functions should be implemented to provide an initiating, transit or destination operator with the required abilities to reserve, modify, reconfigure, activate, deactivate and release communications resources.

CM should, for Phase 1, be organized according to the "Star" model defined in ETSI EN 300 820-1 [3] and illustrated in figure 1. The set of management services and functions defined in ETSI EN 300 820-1 [3] should be provided as the CM functional area of the X.easi interface. The management functions of the CM functional area are recommended to be undertaken by automated communication methods between interconnected operators. The management functions shall also be possible by manual methods, following bi-lateral or multi-lateral implementation agreements.

Where use of an automated interface is considered, implementation should be based on approved public standards in the generic TMN and OSI areas. These include ITU-T Recommendation M.3400 [11], ITU-T Recommendation I.751 [12], ETSI ETS 300 469 [13], ITU-T Recommendation X.700 [14], ITU-T Recommendation X.721 [15], ITU-T Recommendation M.3100 [16] and ETSI ES 200 653 [17].

For any VP or VC connection, the CM requirements including the choice of ATM transfer Capabilities (ATCs), Quality of Service (QoS) and Traffic Parameters defined in ETSI TS 101 674-1 [2] should be provided in the connection reservation request.

Operators should define, by bilateral agreement, common bandwidth allocation policies in relation to the forecast mixture of ATM connection reservations and the availability of traffic capacity on ATM links and within ATM network resources.

5.2.3 Fault Management

Fault Management (FM), where applicable to interconnected networks specified in ETSI TS 101 674-1 [2] for the provision of ATM services, is the functional area required for repairs to impairments in the network infrastructure (i.e. for providing the network resilience requirements identified in ETSI TS 101 674-1 [2]). FM management services and functions should be provided as the FM functional area of the X.easi interface. The implementation of FM should provide responses to Performance degradation notifications, to identify "ownership" of faults and their associated resolution, to arrange the issue of and responses to "Trouble Tickets" and to arrange the issue of and responses to ATM VP or VC alarm notifications exchanged over the X.easi interface. This set of Fault Management processes should also include a strategy for providing "network protection and resilience".

FM management services and functions should be implemented to ensure that the network maintenance and repair processes of interconnected ATM network operators (including the exchange of Trouble Tickets and failed VP or VC connection alarm reports) are conducted efficiently and rapidly in order to minimize or eliminate out-of-service conditions.

The management functions of the FM functional area are recommended to be undertaken by automated communication methods between interconnected operators. The management functions shall also be possible by manual methods, following bi-lateral or multi-lateral implementation agreements.

In general, where use of an automated interface is considered, implementation should be based on approved public standards. These include ETSI EN 300 820-2 [33] (for ATM VP alarm reporting management) and ITU-T Recommendation X.790 [18] (for Trouble Ticket management).

An automated FM functional area of the X.easi interface should also provide functions for planned service outages, defined in ITU-T Recommendation M.1540 [19], management escalation procedures defined in ITU-T Recommendations M.1550 [20] and M.1560 [21] and maintenance standards defined in ITU-T Recommendation M.1530 [22]. Where manual X.easi interface communication is deployed, the functionality should be equivalent to that specified in this clause for automated communication.

5.2.4 Performance Management

Performance Management (PM), where applicable to interconnected networks specified in ETSI TS 101 674-1 [2] for the provision of ATM services, is the functional area required for monitoring and reporting on Quality of Service (QoS) aspects relating to any ATM VP or VC connection. PM services and functions should be provided as the PM functional

area of the X.easi interface. Only manual X.easi performance management functions are recommended for Phase 1 implementation.

For Phase 1, operators may enter into bi-lateral agreements on manual reporting of performance monitoring data, where relevant to ATM interconnect services. PM data should usually be obtained from network elements or gateway switches and should be used to build a statistical picture of the performance of the interconnected ATM networks and the services supported on them. Where PM data shows network or service degradation beyond a defined threshold level, the information should be used in association with the Fault Management processes specified in subclause 6.2.3. Implementation processes should consider the requirements provided in ETSI EN 300 820-3 [23], so far as these requirements are applicable to the use of a manual interface.

5.2.5 Accounting Management

Accounting Management (AM), where applicable to interconnected networks specified in ETSI TS 101 674-1 [2] for the provision of ATM services, is the functional area required for the exchange of service-usage accounting data between operators. Such data may be used as the basis for accounting between interconnecting operators or for billing and charging end-users of the ATM interconnect services.

The present document is not suggesting any common or prescriptive method for inter-operator ATM services charging or levels of charging and restricts itself to specifying processes for exchanging service-usage accounting data on the X.easi interface.

The AM function of the X.easi interface should be implemented using manual communications methods and would therefore not support real-time exchange of management information. Accounting and associated charging of end-users or other interconnected operators for provision of resources should generally use a non-usage sensitive system based on service definitions and parameters. (An exception should be associated with the provision of switched services described in subclause 6.2.8, when operators may deploy usage-sensitive accounting methods.)

Some or all of the following ATM traffic parameters should be used to establish the basis for the "non-usage sensitive" accounting management information:

- Service class;
- Quality of Service, including traffic parameters such as:

  - Minimum cell rate (MCR);

  - Peak cell rate (PCR);

  - Sustainable cell rate (SCR);

  - Maximum burst size (MBS).

- Bandwidth;
- Distance;
- Duration;
- Date and Time of Day.

For the Phase 1 specification the following requirement should apply:

- Operators should ensure that bilateral agreements are in place for the exchange of non-usage sensitive accounting management information, using the X.easi interface, for Phase 1 ATM interconnect service introduction. The basis of the bilateral agreements may vary according to the services and Quality of Service offered.
- In order to minimize management costs, operators are permitted to use the "Chargeable Cell Rate" (CCR) concept specified by ITU-T Recommendation D.224 [24] (or any subsequent public recommendation derived from this) to provide a pragmatic approximation for accounting management information, based on the parameters listed above.
- Operators should establish bi-lateral accounting and revenue settlement principles on similar principles to those currently available for "traditional" interconnected telecommunications services, such as ISDN, frame-relay or

X.25. These are based on appropriate usage of several of ITU-T "D-series" Recommendations, which include ITU-T Recommendations D.285 [25], D.232 [26], D.230 [27], D.225 [28], D.212 [29], D.211 [30] and D.210 [31].

5.2.6 Security Management

Security Management (SM), where applicable to interconnected networks specified in ETSI TS 101 674-1 [2] for the provision of ATM services, is the functional area required for ensuring the secure transfer of management information between the OSS's of interconnected operators. The requirements for the SM function of the X.easi interface differ according to whether the interface is operated by manual or automated means, as defined in subclauses 6.1.1 and 6.1.2.

For implementation and operation of a manual X.easi interface, operators are recommended to ensure that due diligence is observed when responding to fax-based, or other "manual" forms of X.easi interface communication. Such diligence should include use of established procedures to check signatures on faxes and make telephone calls to known persons within the interconnected operators' premises on any indication whatsoever of irregular, malicious or absent communication involving any of the inter-operator processes. Operators are recommended to document all manual X.easi interface communication processes and to include rules for control of access to respective operators' OSS's and authentication rules between persons accredited with managing ATM interconnect services.

For implementation and operation of all management functions of an automated X.easi interface, operators should implement agreed bilateral security specifications and undertake agreed validation processes.

Operators should configure the DCN interconnecting the TMN management platforms as a "closed user group" (CUG) with confidential exchange of X.25 (or equivalent) addresses by non-electronic means.

For Phase 1 ATM service introduction, operators are recommended to implement security management for automated X.easi interface deployment, taking the security services in the following table into account.

Table 1: Security service recommendations for ATM interconnect management

X.easi interface Security Services	Level of importance	Comment
Peer-to-peer Authentication	High	Mutual authentication at the granularity of individual application or application entities is required.
Incoming Access Control at association establishment. See note	High	Access Control List scheme based on authenticated calling entity is preferred.
Incoming Access Control for requested management operations	High	Access Control List scheme with supporting target granularity at the level of individual Managed Objects.
Incoming Access Control for notifications	Low	Notifications should be accepted as long as they come from a known authenticated party.
Data Origin Authentication	Medium	The purpose of this service is to ensure prolonged authenticity of the communicating applications after association establishment has taken place.
Data Integrity Protection	High	Data integrity protection at the application level provides similar security as data origin authentication.
Data Confidentiality Protection	High	Requires DCN configured as a "closed user group".
Non-repudiation with proof of origin	Medium	Requires implementation to ITU-T Recommendation Q.813 [32].
Non-repudiation with proof of delivery	Medium/High	Requires implementation to ITU-T Recommendation Q.813 [32].
Security Audit Logging	High	Local (non-X.easi) security service, supporting use of an automated X.easi interface.
Security Alarm Reporting	High	Local (non-X.easi) security service, supporting use of an automated X.easi interface.
NOTE: "Access Control" and "association" refer to the inter-operation, via the DCN, of the TMN management platforms and their associated software applications.		

In all cases of use of either a manual or automated X.easi interface, operators should ensure that customer-sensitive or business-sensitive data remains strictly confidential to those parties entitled to have access to it.

5.2.7 Management of "Supplementary Services"

For Phase 1, the Management of Supplementary Services described in ETSI TS 101 674-1 [2], is not defined or specified in the present document. Operators should specify such management by bilateral agreement.

5.2.8 Management of Switched Services

This is specific to the requirements in ETSI TS 101 674-1 [2] for the provision and management of SVCs.

Operators wishing to support SVC services across networks should configure systems whereby SVCs are established by signalling. The signalling should provide functions similar to the management plane functions used to set up (semi) permanent connections. Operators should ensure that suitable processes are in place to provide and support the necessary signalling, routing, capacity management and customer service management aspects. Any deployment of automated interfaces, (probably restricted to the areas of Fault Management / Trouble Ticketing in Phase 1), should be accommodated by bilateral agreements between operators that are providing the interconnected network capacity to support switched services. Consequently, use of the X.easi interface, configured in the Star organizational model, is not specified for SVC services offered within Phase 1 and all inter-operator management communication is on a bi-lateral basis.

6 Interoperability Testing

Interoperability testing of network management interfaces and processes should be agreed bilaterally, and is not further specified here. The requirement for testing is shown as one of the necessary interconnect service establishment processes within the model described in annex A.

Annex A (informative): An ATM Interconnect Service Processes Model

This annex provides a recommendation for an "ATM interconnect service processes model", which operators should consider as indicative of a logical partitioning of actions and processes required to create ATM interconnected networks and services. Further discussion is provided in ETSI TR 101 477 [1]. The model is divided into the following four process areas and assumes use of NNI.easi and X.easi interfaces:

- Interconnect Service Definition (ISD)

The interconnect service definition should include the technical specifications for the required interfaces (i.e., NNI.easi and X.easi), agreements and codes of practice to be used between operators.

- Interconnect Service Establishment (ISE)

This is the process by which each pair of operators negotiates a specific interconnect service and brings it into service. This would normally include a programme of pre-service testing and validation of resources and interfaces.

- Interconnect Service Administration (ISA)

This covers the processes by which each operator keeps others updated with changes to aspects of the physical provision of the interconnect service, e.g. new links, points of interconnect (POI), new switches and network interconnect developments (generally in alignment with the NNI.easi specification). Lists of manual and automated interfaces and associated statuses should also be maintained within this process area.

- Interconnect Service Operation (ISO)

This covers the routine OAM processes for keeping the Service operational for individual customers. This would include use of a manual and/or automated X.easi management interface for the configuration and maintenance of an ATM VP/VC, for example.

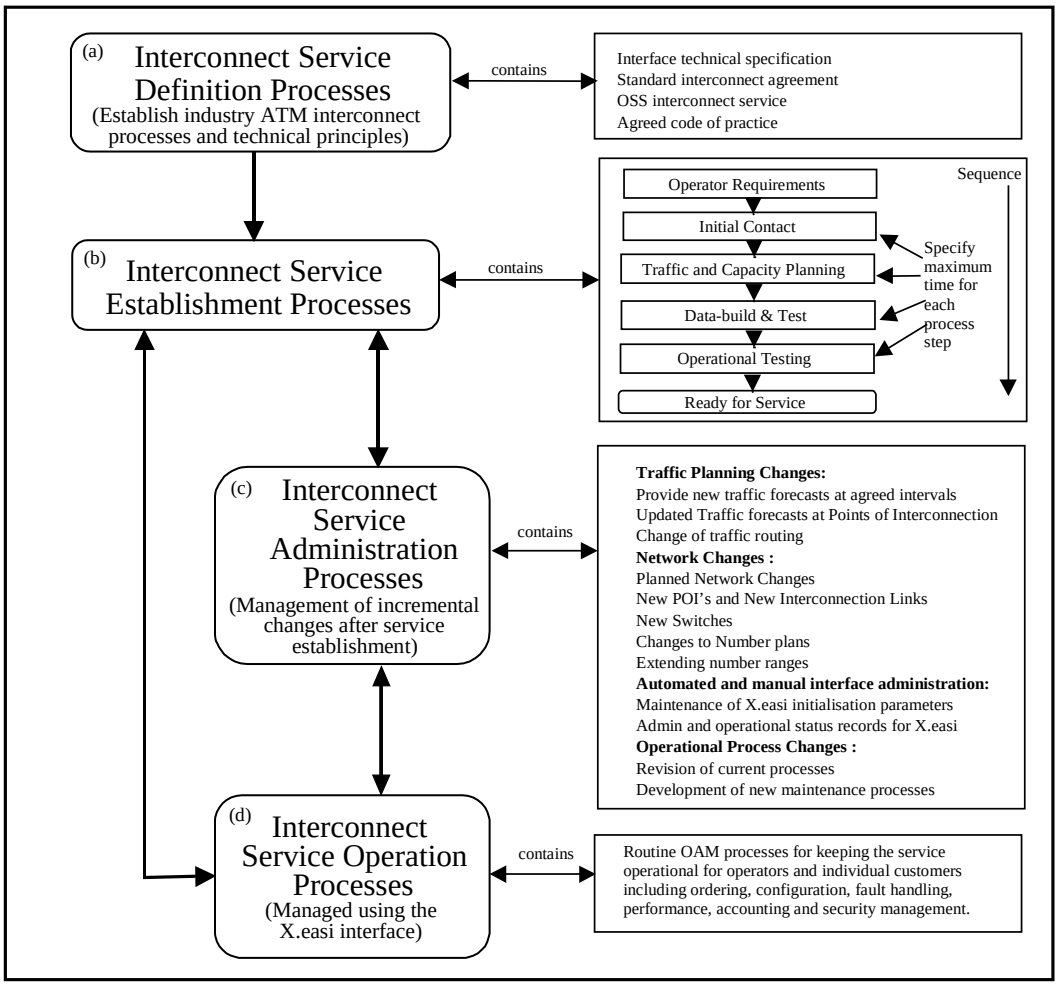


Figure A.1: ATM interconnect service processes model

The model presumes that an "industry process", denoted within box (a) of figure A.1, will take place to initiate the ISD processes. This process will include agreement on use of technical specifications e.g. NNI.easi-specified transmission link interfaces, signalling interfaces, data communications network to support an automated X.easi interface (where implemented), etc. The identified sub-processes contained within the ISD process are also shown. ISD processes make no assumptions about operator's investment or business decisions to support the various aspects of ATM interconnect service provision.

The ISE processes, depicted in box (b), contain many further sub-processes required to establish ATM interconnect services. In more specific detail these may be identified as follows:

- Operator Requirements:

  - Operator has the technical specification and principles for the interconnect service;

  - Operator has a licence permitting use of interconnect services;

  - Operator has the necessary carrier ID codes (Operator ID, routing codes, SPCs etc).

- Initial Contact:

  - Operator requests interconnect service contract;

  - Operator identifies contact points (i.e., persons responsible for enacting processes);

  - Operator identifies specific service establishment process documents and forms;

  - A formal application form is sent requesting an Interconnect service from a supplying operator.

- Traffic and Capacity Planning:

  - Operators discuss and exchange traffic and capacity planning information;

  - Operators provide traffic forecasts and Points of Interconnection (POIs);

  - Operators provide network-related information, for example: SS7, SPC and routing prefixes;

  - Operators plan network resilience, performance and quality of service criteria;

  - Operators plan network resource introduction to support the forecast traffic.

- Data build and test:

  - Operators undertake initial data build information exchanges for POIs;

  - Operators confirm completion of data build (for POIs, switches, routing, etc).

- Operational Testing:

  - Operators ensure that an agreed test plan is available;

  - Operators undertake tests of VP/VC connections;

  - Operators test availability of other management processes (e.g., Configuration, Fault, Accounting…);

  - Operators confirm and agree that operational process tests are completed;

  - Operators exchange "Ready for Service" certificates.

- Ready for Service:

  - Operators are ready to use the X.easi management interface for ATM service configuration and related activities. This point should coincide with the in-service availability and use of the "Interconnect Service Operation Processes".

The ISA processes, depicted in box (c), and in the associated sub-process box. Simplistically, the ISA processes are required for both to day-to-day management of ATM interconnect services and to make incremental changes to the system for providing such interconnect services.

The ISO processes, depicted in box (d), are used mostly for the provision and management of ATM VPs and VCs for customers. Such processes may be provided by use of an automated or manual X.easi management interface.

Annex B (informative): Example of a "Business Model" for the provisioning of managed ATM transport services across multiple interconnected ATM networks

Introduction

The delivery of Pan-European ATM services across the networks of multiple operators is a complex process, which involves many different parties. European ATM Service interconnect service introduction therefore requires a business model which describes the responsibilities of each party involved and the business relationships between them. This annex provides an example of such a business model, which may be acceptable to interconnected operators and other service providers, to meet this objective. A more detailed discussion is provided in ETSI TR 101 477 [1].

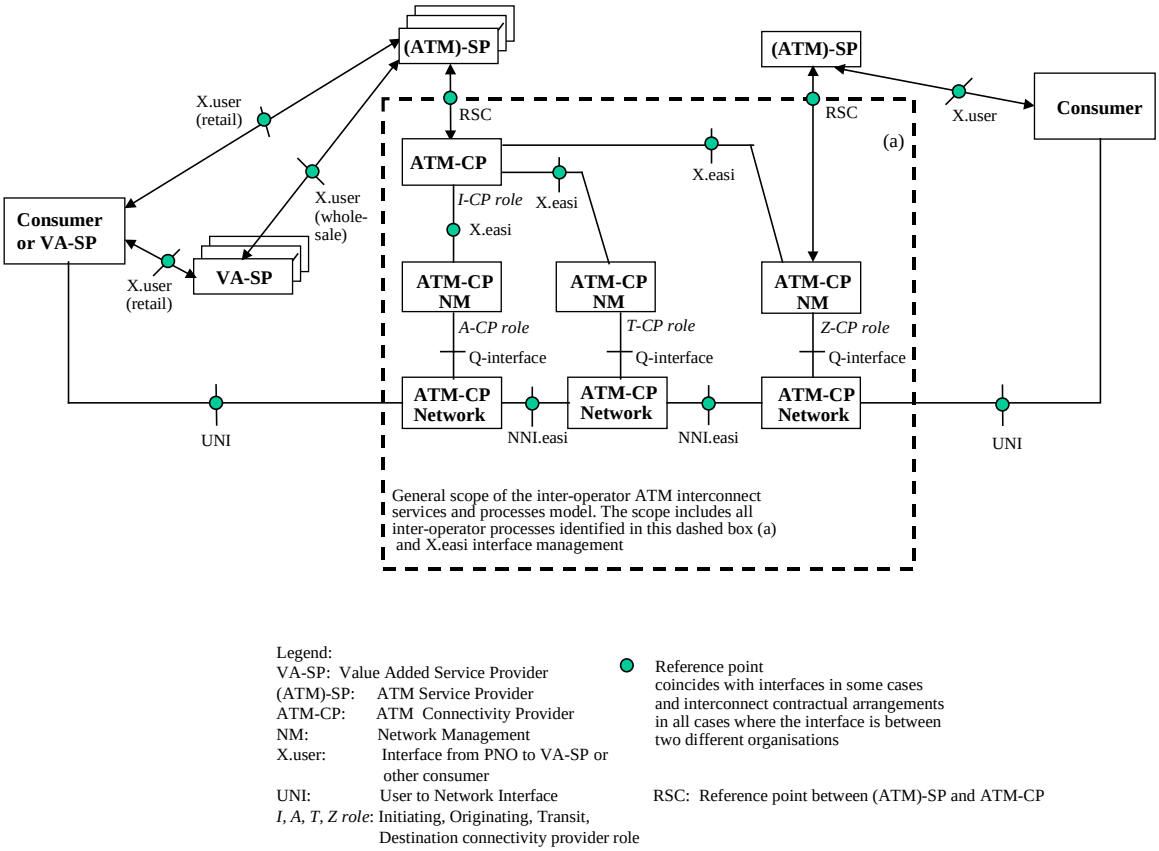
Methodology

The following methodology is considered appropriate for defining the business model example:

- Characterization of responsibilities and roles;
- Characterization of reference points between responsibilities or roles corresponding to business relationships;
- Characterization of the interactions allowed across interfaces corresponding to business agreements and/or information exchanged between legal entities;
- Ensuring compatibility with and support of the User and Control Plane specification defined in ETSI TS 101 674-1 [2].

Business Model

The business model example is presented in figure B.1. It presents a positioning of the ATM interconnect service, which consists of both the ATM interconnect transport services and the ATM interconnect management services. Most importantly, the scope of the X.easi interface specification defined in the present document is restricted to that shown in the dashed box (a). The other responsibilities/roles and reference points are for information only.



Legend:
VA-SP: Value Added Service Provider
(ATM)-SP: ATM Service Provider
ATM-CP: ATM Connectivity Provider
NM: Network Management
X.user: Interface from PNO to VA-SP or other consumer
UNI: User to Network Interface
I, A, T, Z role: Initiating, Originating, Transit, Destination connectivity provider role

Reference point coincides with interfaces in some cases and interconnect contractual arrangements in all cases where the interface is between two different organisations

RSC: Reference point between (ATM)-SP and ATM-CP

Figure B.1: Example Business Model, including Roles and Interfaces

With reference to figure B.1 it should be noted that:

i) The ATM-CP NM roles imply ownership of an OSS aligning with the physical model shown in figure 1.

ii) The Business Model example shows the general case of "I-CP" role as well as an "A-CP NM" role. In many cases, the "I" and "A" roles may be taken by one and the same organization and this general case has been provided to align with the model specified in ETSI EN 300 820-1 [3].

iii) The ATM-CP Network in figure B.1 is equivalent to the "ATM Subnetwork" depicted in figure 1.

iv) The Initiating CP (*I-CP*) may be facilities based or non-facilities based (and may or may not be the same organization as the *A-CP*).

v) The ATM-CP's acting in the *A-CP*, *T-CP* and *Z-CP* roles, have responsibility for originating, transit or destination service connections and for providing ATM Connections of various types. The roles shall be facilities based and have physical connection capabilities. Operating licences may be required.

vi) The Initiating ATM Connectivity Provider (*I-CP*) has responsibility for initiating end-to-end connections between A Endpoints and Z Endpoints.

vii) The (ATM)-SP, in addition to ATM, may provide other connectivity services based on other technologies such as Frame Relay, ADSL, etc. (ATM)-SPs may require licences in some EU Member States.

viii) VA-SP's are shown separated from (ATM)-SP and ATM Connectivity Providers because some EU States have different licensing and rules governing the scope of various Service Provider activities.

ix) The "X.user" reference point represents a service management interface between an (ATM)-SP's management system and that of a VA-SP or directly with that of the private network management system owned by an ATM service consumer. Definitions of the X.user interface or the UNI are out of the scope of the present document.

Characterization of roles in the business model example

All interactions between organizations acting in the roles described below require contractual arrangements to be in place. The role characterizations are an abbreviation of descriptions provided in ETSI TR 101 477 [1] and omit some optional or non-essential roles. One organization can perform several of the business model example roles, but it is also possible that each role is performed by only one organization.

- (ATM) Service Provider ((ATM)-SP)

This role is responsible for providing and selling the ATM service to consumers or Third Parties e.g. (VA-SPs).

- Initiating ATM Connectivity Provider (ATM-CP)

This role (denoted by *I-CP* in figure B.1) is responsible for provisioning managed bandwidth ATM transport services from *A-Endpoint to Z-Endpoint* across multiple interconnected ATM networks.

- ATM Connectivity Provider (ATM-CP)

This role (ATM-CP) is responsible for providing the ATM Interconnect Service to other ATM-CPs.

- Value-Added-Service Provider (VA-SP)

This role is responsible for adding value to the basic ATM and other transport services.

- ATM Service Consumer (AS-C)

This role is responsible for consuming (i.e. using) ATM-based services (including value-added services), according to agreed contractual arrangements.

Further observations concerning the business model example roles

The workings of the business model example may be summarized as follows:

i) The ATM-CP is responsible for ATM network operations and the provisioning of managed bandwidth ATM transport services. It also acts as a contractor leasing network capacity to one or more initiating Connectivity Provider(s). In turn, an (ATM)-SP leases network capacity from a contracted ATM (initiating) Connectivity Provider.

ii) The (ATM)-SP is responsible for providing and (re-) selling the ATM service to end Consumers or Third Parties such as Value-Added-Service Providers (VA-SPs).

iii) All interactions between different organizations acting in the example roles require contractual arrangements.

iv) In figure B.1, only a single Initiating ATM-CP is shown connected to a respective (ATM)-SP whereas there may be multiple connections of this type.

Concluding remarks about the business model example

The business model example shows a significant number of relationships between roles according to which "organizations" can act. The model is considered to be indicative of the minimum number of identifiable roles and required interactions consistent with provision of interconnected ATM services in a multi-operator market.

History

Document history		
V1.1.1	May 2000	Publication