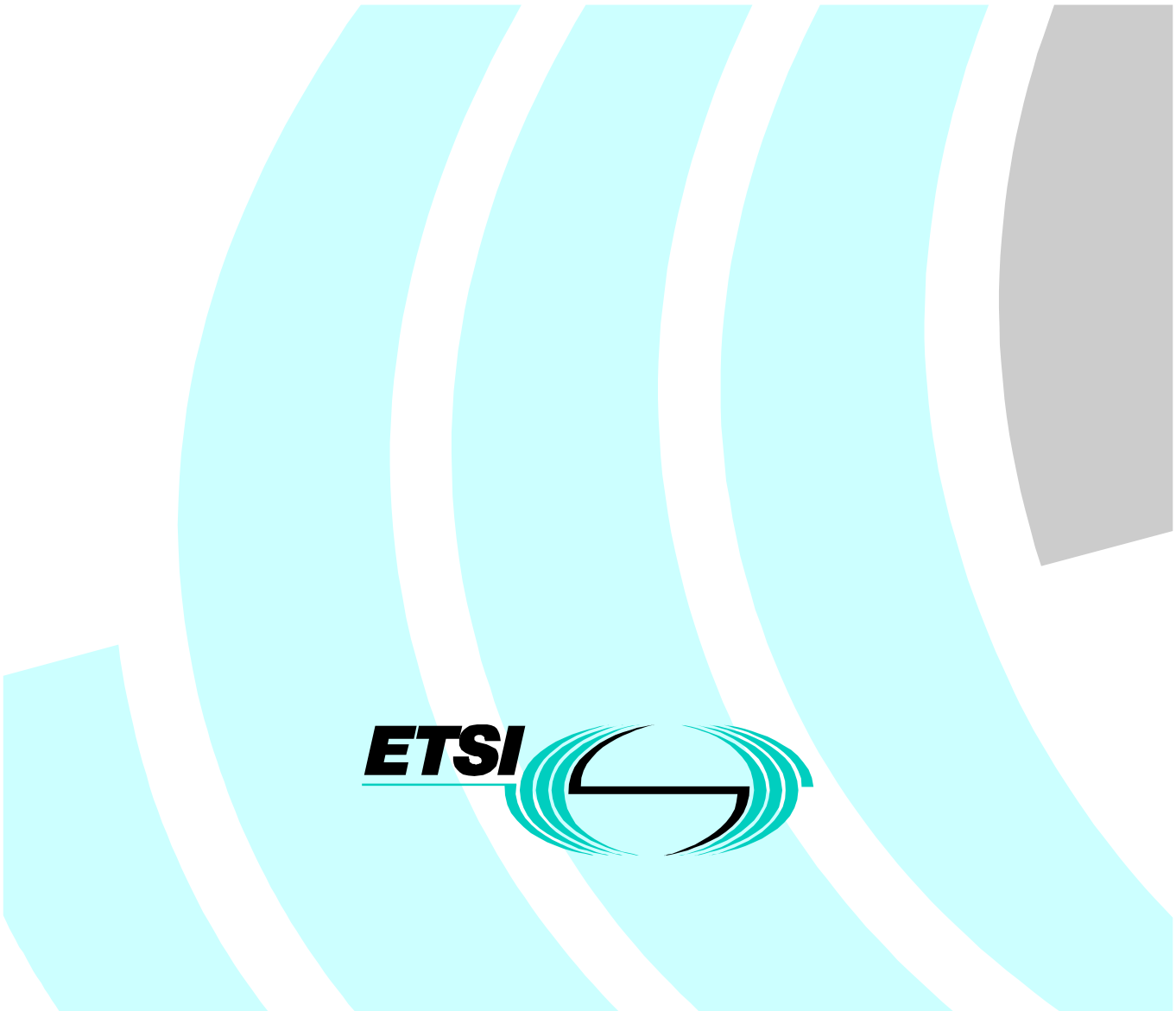
ETSI TS 101 675 V1.1.1 (2000-06)

Technical Specification

Technical Framework for the Provision of Interoperable ATM Services; Network-Network Interface (NNI) User and Control Plane Specification (including Network Functions and Service Aspects) Phase 2



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Contents

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Foreword

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

The present document is part of a set of specifications (see ETSI TS 101 673 [1]) defining the network-network interface to enable service interoperability between ATM networks. These documents specify an interface for the transfer of user information and connection control for interoperable ATM services. This interface, for which hereafter the term "NNI.easi interface" will be used, allows for the interconnection of ATM networks in order to provide ATM based services also across network boundaries.

1 Scope

The present document provides an enhanced description of interoperability on the basis of B-ISUP functionality using the B-ISUP protocol. It also contains a description of interoperability on the basis of the functionality defined in ITU-T Recommendation Q.2130 [9], where the interconnected networks may be using B-ISUP or PNNI protocols internally.

The present document is the Phase 2 specification for the NNI.easi interface. It is written as a delta-document and includes only differences as compared with the corresponding Phase 1 document ETSI TS 101 674-1 [2]. Therefore, the present document follows the same internal structure as the Phase 1 document. The additional features specified in the present document are as follows:

- Additional ATM transfer capabilities, i.e. SBR3 and ABR;
- Additional signalling capabilities, i.e. support of Soft PVC; SVP connection and point-to-multipoint connections;
- Interworking capabilities, i.e. with 64 kbit/s ISDN; PNNI; Frame Relaying.

All network capabilities and functions that have been identified, as requirements for Phase 1 are also valid for Phase 2. Therefore, all clauses of the Phase 1 specification shall apply.

2 References

The following documents contain provisions which, through reference in this 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 TS 101 673 (V1.1): "Technical Framework for the Provision of Interoperable ATM Services; Overview".

[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 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)]".

[4] ETSI EN 300 301-1 (V1.1): "Broadband Integrated Services Digital Network (B-ISDN); Traffic control and congestion control in B-ISDN; Conformance definitions for Available Bit Rate (ABR) and ATM Blocked Transfer (ABT) [ITU-T Recommendation I.371.1 (1997)]".

[5] ITU-T Recommendation I.356 (1996): "B-ISDN ATM layer cell transfer performance".

[6] ATM Forum AF-TM-0121.000 (1999): "Traffic Management Specification Version 4.1".

[7] ITU-T Recommendation Q.2722.1 (1996): "B-ISDN User Part - Network node interface for point to multipoint call/connection control".

[8] ITU-T Recommendation Q.2140 (1995): "B-ISDN ATM adaptation layer - Service specific coordination function for signalling at the network node interface (SSCF at NNI)".

[9] ITU-T Recommendation Q.2130 (1994): "B-ISDN signalling ATM adaptation layer - Service specific coordination function for support of signalling at the user-network interface (SSFC At UNI)".

[10] IETF RFC 2225 (1998): "Classical IP and ARP over ATM".

[11] IETF RFC 1755 (1995): "ATM Signalling Support for IP over ATM".

[12] ITU-T Recommendation Q.2660 (1995): "B-ISDN – Interworking between Signalling System No. 7 – Broadband ISDN User Part (B-ISUP) and Narrow-Band ISDN User Part (N-ISUP)".

[13] ITU-T Recommendation I.555 (1997): "Frame Relaying Bearer Service interworking".

[14] ITU-T Recommendation I.580 (1995): "General arrangements for interworking between B-ISDN and 64 kbit/s based ISDN".

[15] ATM Forum AF-PNNI-0055.000 (1996): "PNNI Specification V1.0".

[16] ATM Forum AF-CS-0125.000 (1999): "ATM Inter-Network Interface (AINI) Specification".

[17] ITU-T Recommendation Q.2727 (1996): "B-ISDN User part - Support of Frame Relay".

[18] ITU-T Recommendation Q.2933 (1996): "Digital Subscriber Signalling System No.2 (DSS2) - Signalling specification for Frame Relay service".

[19] ATM Forum AF-SIG-0061.000 (1996): "UNI Signaling 4.0".

[20] ITU-T Recommendation Q.2766.1 (1998) "Switched virtual path capability".

[21] ITU-T Recommendation Q.2767.1 (1998): "Soft PVC capability".

[22] ITU-T Recommendation Q.2110 (1994): "B-ISDN ATM adaptation layer - Service specific connection oriented protocol (SSCOP)".

[23] IETF RFC2149 (1997): "Multicast Server Architectures for MARS-based ATM multicasting".

[24] IEEE 802.3 (1998): "Part 3: Carrier Sense Multiple Access with Collision Detection (CSMA/CD) Access Method and Physical Layer Specifications, Information technologyTelecommunications and information exchange between systemsLocal and metropolitan area networks-Specific requirements".

[25] IEEE 802.5 (1989): "IEEE Standard for Local Area Networks: Token Ring Access Method and Physical Layer Specifications".

[26] IETF RFC2332 (1998): "NBMA Next Hop Resolution Protocol (NHRP)".

[27] IETF RFC2380 (1998): "RSVP over ATM Implementation Requirements".

[28] IETF RFC2474 (1998): "Definition of the Differentiated Services Field (DS Field) in the IPv4 and IPv6 Headers".

3 Abbreviations

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

AAL	ATM Adaptation Layer
ABR	Available Bit Rate
AESA	ATM End system address
AINI	ATM Inter-Network Interface
ARP	Address Resolution Protocol
ATC	ATM Transfer Capability
ATM	Asynchronous Transfer Mode
ATMARP	ATM Address Resolution Protocol

ATMF	ATM Forum
B-ISUP	Broadband ISDN User Part (protocol)
CBDS	Connectionless Broadband Data Service
CBR	Constant Bit Rate (ATM Forum term for DBR)
CS	Capability Set
DBR	Deterministic Bit Rate (ITU-T term for CBR)
EASI	ETSI project, ATM based Services Interoperability
IP	Internet Protocol
ITU-T	International Telecommunication Union - Telecommunication Standardization Sector
IWU	Interworking Unit
LIS	Logical IP Subnet
MTP	Message Transfer Part
NNI	Network-to-Network Interface
nrt	non real time
OAM	Operation And Maintenance
PCR	Peak Cell Rate
PNNI	Private Network - Network Interface
PVC	Permanent Virtual Channel
PVCC	Permanent Virtual Channel Connection
PVP	Permanent Virtual Path
PVPC	Permanent Virtual Path Connection
QoS	Quality of Service
RSVP	resource ReSerVation Protocol
rt	real time
SAAL	Signalling ATM Adaptation Layer
SBR	Statistical Bit Rate
SCR	Sustainable Cell Rate
SMDS	Switched Multimegabit Data Service
S-PVCC	Soft PVCC
S-PVPC	Soft PVPC
SSCF	Service Specific Co-ordination Function
SSCOP	Service Specific Connection Orientated Protocol
STP	Signalling Transfer Point
SVC	Switched Virtual Channel
SVP	Switched Virtual Path
TM	Traffic Management
UBR	Unspecified Bit Rate
UNI	User Network Interface
VBR	Variable Bit Rate
VC	Virtual Channel
VCC	Virtual Channel Connection
VP	Virtual Path
VPC	Virtual Path Connection

4 Network Architecture

No additions to clause 4 of ETSI TS 101 674-1 [2].

4.1 Numbering Plan

No additions to subclause 4.1 of ETSI TS 101 674-1 [2].

4.2 Interworking with non-ATM Networks

4.2.1 Network and Service Interworking with Narrow-band ISDN

The ATM capabilities defined in the present document may also be used to support 64 kbit/s ISDN services. The ISUP parameters needed for the support of these services shall be transported by the B-ISUP protocol.

Consequently, support of Narrow-band ISDN services across the NNI.easi interface where the ATM network is used as a backbone network, which provides only transport functions for both signalling and user information, does not result in additional requirements at the NNI.easi interface. The same applies when two terminals communicate while one is connected to a Narrow-band ISDN and the other to an ATM network.

Since ATM networks do not provide tones and announcements, and support a restricted set of supplementary services, voice calls may fail because the interworking units at the destination side may not support the functions required for this service.

Any interworking shall be based on the relevant ITU-T Recommendations within the Q-series (in particular Q.2660 [12]) and within the I-series (e.g. I.580 [14]). No specific functions or capabilities for interworking with N-ISDN are defined in the present document.

4.2.2 Frame Relaying Bearer Service Interworking

The requirements for the B-ISDN - Frame Relay Bearer Service interworking as defined in ITU-T Recommendation I.555 [13] shall apply.

The support of frame relay in B-ISUP shall be in accordance with ITU-T Recommendation Q.2727 [17]. Interworking with CS-1 nodes shall be in accordance with this recommendation. ITU-T Recommendation Q.2727 [17] describes the end-to-end B-ISDN connection between B-ISDN users and is not about service interworking.

4.2.3 Network Interworking for Connectionless services

No specific functions or capabilities for interworking with Connectionless services are defined, since the interworking with connectionless services takes place outside the scope of the NNI interface, and therefore outside the scope of the present document.

Given the importance of interworking with Connectionless services, in particular IP based, additional information useful for supporting such services is included in clause A.3. This information is mostly based on IETF specifications, and is given "for information only".

4.2.4 Network Interworking for mobile networks

It is currently proposed by 3GPP (Third Generation Partnership Project), that in the third Generation mobile networks, ATM will be used in the core network ITU-T Recommendation Q.2766.1 [20]. Therefore it is possible that the ATM core network may be interconnected with other broadband ATM based networks, but this is not yet defined.

5 Generic Requirements and Capabilities of the ATM NNI.easi Interface for Phase 2

No additions to clause 5 of ETSI TS 101 674-1 [2].

5.1 User Plane

5.1.1 Physical Layer

No additions to subclause 5.1.1 of ETSI TS 101 674-1 [2].

5.1.2 ATM Layer

5.1.2.1 Cell Header Format and Encoding

No additions to subclause 5.1.2.1 of ETSI TS 101 674-1 [2].

5.1.2.2 ATM Traffic Control

5.1.2.2.1 ATM Transfer Capabilities and Traffic Parameters

In addition to the traffic parameters of Phase 1, the ABR transfer capability requires the support of the minimum cell rate parameter, and the SBR3 transfer capability requires the support of the tagging function. For details see table 1.

Table 1: ATM Transfer Capabilities and Corresponding Traffic Parameters

Parameters (ETSI ETS 300 301 [3] and ETSI EN 300 301-1 [4])	DBR	SBR1	SBR2	SBR3	ABR
PCR (0+1), τ_{PCR} (0+1)	X	X	X	X	X
SCR (0), MBS (0), τ_{SCR} (0)			X	X	
SCR (0+1), MBS (0+1), τ_{SCR} (0+1)		X			
MCR (0+1)					X
PCR (OAM), τ_{PCR} (OAM)	X (option)				
Tagging				X	
ATC supported in	Phases 1 + 2	Phases 1 + 2	Phases 1 + 2	Phase 2	Phase 2

5.1.2.2.2 Association of ATM Transfer Capabilities and QoS Classes

The ATM transfer capabilities and the associated QoS Classes that will be supported in addition to those defined for the Phase 1 (see ETSI TS 101 674-1 [2]) are depicted in table 2.

Table 2: ATM Transfer Capabilities and QoS Classes

ATC name (ETSI ETS 300 301 [3] and ETSI EN 300 301-1 [4])	QoS class (ETSI EN 300 301-1 [4] and ITU-T Recommendation I.356 [5])	ATM Transfer Capability (ATC) definition	Equivalent ATM Forum service category and conformance definition in AF-TM-0121.000 [6]
SBR 3 (Statistical Bitrate configuration 3)	QoS class 3	Category based on average (statistical) bandwidth allocation with priority control - agging applied	nrt VBR.3 (non real time Variable Bitrate type 3)
ABR (Available Bitrate)	QoS class 3	Category based on elastic bandwidth allocation, depending on bandwidth availability	ABR (Available Bitrate)

5.1.2.2.3 Functions of Traffic Control and Congestion Control

- *Connection Admission Control*

No additions to subclause 5.1.2.2.3 of ETSI TS 101 674-1 [2].

- *Network Parameter Control*

No additions to subclause 5.1.2.2.3 of ETSI TS 101 674-1 [2].

- *Tagging*

The applicability of cell tagging - as specified in ETS 300 301 [3] - depends on the ATM transfer capability. Support of tagging is required when SBR3 is used for a call.

- *Priority Control and Selective Cell Discard*

No additions to subclause 5.1.2.2.3 of ETSI TS 101 674-1 [2].

- *Shaping*

No additions to subclause 5.1.2.2.3 of ETSI TS 101 674-1 [2].

5.1.2.3 ATM Performance and Availability

No additions to subclause 5.1.2.3 of ETSI TS 101 674-1 [2].

5.1.2.4 ATM Operation and Maintenance

No additions to subclause 5.1.2.4 of ETSI TS 101 674-1 [2].

5.2 Control Plane

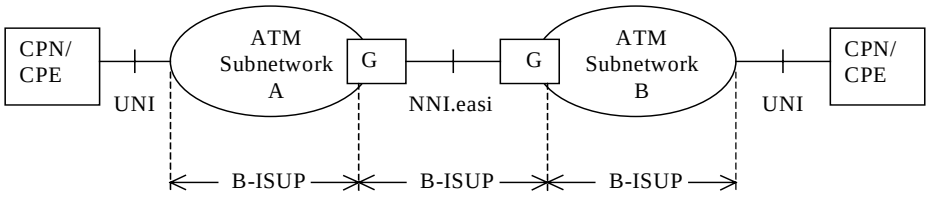
In Phase 2, in addition to the ITU-T standardized Signalling System No. 7 protocol stack (see subclause 5.2.1 of ETSI TS 101 674-1 [2]), a protocol stack based on ATM-Forum specifications including the AINI protocol may alternatively be used at the NNI.easi interface (see subclause 5.2.2). The selection of one of the two interfaces is subject to bilateral agreement.

The network on either side of the NNI.easi interface may run the PNNI protocol ATM Forum AF-CS-0125.000 [16] or the B-ISUP protocol internally. In order to facilitate interworking of one network running PNNI internally with another network running B-ISUP internally, the ATM Inter-Network Interface (AINI) has been specified by the ATM Forum. The AINI specification ITU-T Recommendation Q.2727 [17] consists of two major parts:

- one part specifies the protocol at the ATM Inter-Network Interface (AINI protocol) which is based on the PNNI protocol ATM Forum AF-CS-0125.000 [16];
- another part specifies the interworking of the AINI protocol with the protocols B-ISUP and PNNI.

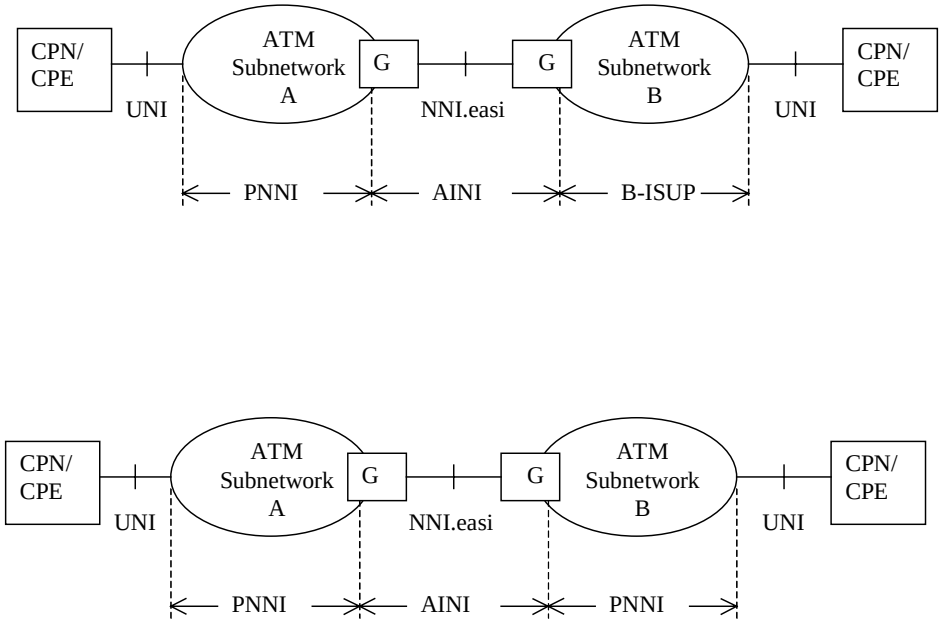
The NNI.easi interface can be based on either the B-ISUP or the AINI protocol. It is therefore necessary that AINI is implemented where one network is running PNNI internally and the other network is running either PNNI or B-ISUP internally.

Figure 1a shows interconnection of networks using the B-ISUP protocol at the NNI.easi interface. Figure 1b illustrates both the interconnection of PNNI based networks, and the interworking of PNNI and B-ISUP based networks, using AINI at the NNI.easi interface.



CPN Customer Premises Network
CPE Customer Premises Equipment
UNI User Network Interface
G ATM Gateway
B-ISUP Broadband ISDN User Part (protocol)

Figure 1a: B-ISUP based NNI.easi interface



CPN Customer Premises Network
CPE Customer Premises Equipment
UNI User Network Interface
G ATM Gateway
B-ISUP Broadband ISDN User Part (protocol)
PNNI Private Network Node Interface
AINI ATM Inter-Network Interface

Figure 1b: AINI based NNI.easi interface

Since the application of one or the other protocol may place different requirements on the NNI.easi interface, this clause is structured such that subclause 5.2.1 is devoted to the B-ISUP based interface, and subclause 5.2.2 specifies the requirements on the AINI based NNI.easi interface.

5.2.1 ITU-T specified Signalling System No. 7 Protocol Stack at the NNI.easi Interface

The protocol stack at the NNI.easi interface for the Phase 2 shall be the same as in Phase 1 (see ETSI TS 101 674-1 [2]).

5.2.1.1 SAAL

No additions to subclause 5.2.1.1 of ETSI TS 101 674-1 [2].

5.2.1.2 MTP

In addition to the functions required for Phase 1, the following requirements apply for Phase 2.

MTP-3b functions ITU-T Recommendation Q.2140 [8] may be required for the support of:

1) both associated and quasi-associated signalling modes of operation, **without** integrated STP function in the ATM Switch;

2) both associated and quasi-associated signalling modes of operation, **with** STP function integrated in the ATM Switch.

When the STP function is integrated in the ATM switch, then system management operator commands shall be available to enable/disable the STP related functions.

5.2.1.3 B-ISUP

5.2.1.3.1 Extensions required to support additional connection types and connection configurations

Unidirectional point-to-multipoint connection configuration is supported as defined in ITU-T Recommendation Q.2722.1 [7].

5.2.1.3.2 Extensions required to support Switched Virtual Path Capability

Extensions to support Switched Virtual Path Capability are as defined in ITU-T Recommendation Q.2766.1 [20].

5.2.1.3.3 Extensions required to support Soft PVC capability

Extensions to support Switched Virtual Path Capability are as defined in ITU-T Recommendation Q.2767.1 [21].

5.2.1.3.4 Extensions required to support interworking with N-ISDN

Interworking between the N-ISUP and the B-ISUP protocols may take place within an individual network operator's domain. This interworking shall be in accordance with ITU-T Recommendation Q.2660 [12]. When such an interworking occurs, the N-ISDN specific parameters shall be transported transparently across the NNI.easi interface.

NOTE: A B-ISDN call destined for an access within the N-ISDN can only be successful when IWUs towards the destination of the call are available and support the functions required.

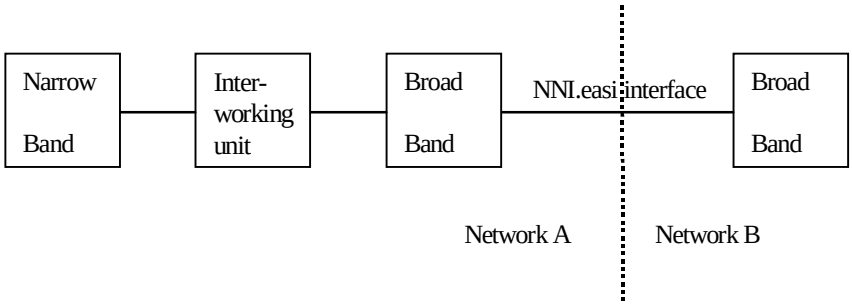


Figure 2: Example scenario of interworking between broadband and narrowband

5.2.1.3.5 Extensions required to support Frame Relaying services

For establishing, maintaining and clearing B-ISDN Frame Relaying connections the procedures shall be in accordance with ITU-T Recommendations Q.2933 [18] and Q.2727 [17]. The scenario supported in ITU-T Recommendation Q.2933 [18] is only single step call control with one virtual connection supporting only one frame relay connection. The protocol on the user plane uses AAL5 and the FR-SSCS above it according to ITU-T Recommendation I.555 [13].

5.2.2 Protocol Stack at the NNI.easi Interface based on the ATM-Forum AINI

The ATM-Forum Specification ATM Inter-Network Interface (AINI) Specification (AF-CS-0125.000 [16]) and ITU-T Recommendation Q.2727 [17] shall be used, with the following limitation:

- The Service Specific Co-ordination Function (SSCF) within the SAAL used for AINI is defined in ITU-T Recommendation Q.2130 [9]. The SAAL shall use the assured mode of transfer (see ITU-T Recommendation Q.2110 [22]). Unacknowledged mode may only be used with bilateral agreement.

The following capabilities, which are optional in the AINI specification, shall be considered mandatory in the present document:

- Point-to-multipoint calls;
- ABR Signalling for point-to-point calls.

The appropriate one of the following capabilities, which are optional in the AINI specification, shall be implemented in the case where the network is running B-ISUP internally or PNNI internally:

- AINI/B-ISUP interworking;
- AINI/PNNI interworking.

Where other options exist in the AINI and associated specifications, these options should be decided with bilateral agreement between operators.

NOTE: Part of the ATM Forum AINI ATM Forum AF-CS-0125.000 [16] specification is a Delta to the ATM Forum P-NNI specification (AF-PNNI-0055.000 [15]). Subclause 6.1.2 of the PNNI specification describes the protocol model control plane. It is important to note that in the context of AINI/PNNI, the SSCF part of the SAAL can only use UNI (not NNI [for B-ISUP] as in EASI phase 1).

Figure 3 shows the protocol stack at the NNI.easi interface using the AINI protocol:

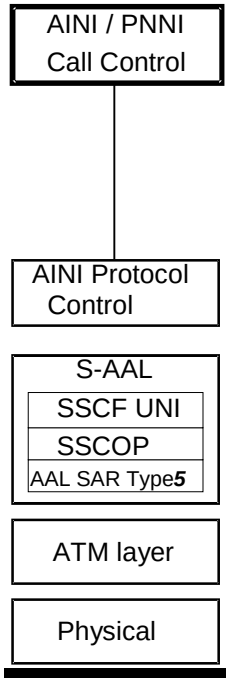


Figure 3: Protocol stack at the NNI.easi interface using AINI specification

5.2.3 ATM Transfer Capability of Signalling Channels

No additions to subclause 5.2.3 of ETSI TS 101 674-1 [2].

5.2.4 Support of Supplementary Services Across the NNI.easi Interface

5.2.4.1 Support of Supplementary services when ITU-T SS7 is used

The additional calling party number (in the context of the CLIP supplementary service) and the additional connected party number (in the context of the COLP supplementary service) shall be transported across the NNI.easi interface. These numbers will have the AESA format. This implies that the support of COLP supplementary service, which was optional in the phase 1 specification, is mandatory at the NNI.easi phase 2 interface.

5.2.4.2 Support of Supplementary services when ATM Forum AINI is used

The following Supplementary services shall be supported across the AINI interface.

Direct Dialling In (DDI), Multiple Subscriber Number (MSN), Calling Line Identification Presentation (CLIP), Calling Line Identification Restriction (CLIR), Connected Line Identification Presentation (COLP), Connected Line Identification Restriction (COLR) and Subaddressing (SUB).

The additional procedures required by these supplementary services are given in ATM Forum UNI 4.0 specification, annex 4 (af-sig-0061.000 [19]) which refers to the ITU-T broadband UNI protocol recommendations, but makes a few restrictions for numbering and addressing, for some of these services.

5.3 Network Requirements

5.3.1 Multiplexing of VCCs into a VPC

No additions to subclause 5.3.1 of ETSI TS 101 674-1 [2].

5.3.2 Technical Capabilities to Support Services

No changes concerning the transmission level and the direction of transmission (see ETSI TS 101 674-1 [2]).

- **the connection type.** In addition to the connection types supported in Phase 1, in Phase 2 switched virtual connections will also be supported on a virtual path connection level.
- **the connection configuration.** Support of point-to-multipoint switched virtual channel connections shall be as specified in ITU-T Recommendation Q.2722.1 [7]. This recommendation restricts point-to-multipoint to unidirectional (forward) transmission.

5.4 Security of User and Control Plane

No additions to subclause 5.4 of ETSI TS 101 674-1 [2].

5.5 Resilience Requirements

No additions to subclause 5.5 of ETSI TS 101 674-1 [2].

6 Usage Metering Functionalities

No additions to clause 6 of ETSI TS 101 674-1 [2].

7 Testing and Conformance

No additions to clause 7 of ETSI TS 101 674-1 [2].

Annex A (informative): Examples of Services supported at the NNI.easi Interface

A.1 B-ISDN Services and ATM Transfer Capabilities

No additions to clause A.1 of ETSI TS 101 674-1 [2].

A.2 Connection Oriented Services

No additions to clause A.2 of ETSI TS 101 674-1 [2].

A.2.1 Examples of Constant Bit Rate Services

No additions to subclause A.2.1 of ETSI TS 101 674-1 [2].

A.2.2 Examples of Real-time Variable Bit Rate Services

No additions to subclause A.2.2 of ETSI TS 101 674-1 [2].

A.2.3 Examples of Non-Realtime Variable Bit Rate Services

No additions to subclause A.2.3 of ETSI TS 101 674-1 [2].

A.3 Connectionless services

A.3.1 Connectionless Broadband Data Service, CBDS

No additions to subclause A.3.1 of ETSI TS 101 674-1 [2].

A.3.2 Switched Multimegabit Data Service, SMDS

No additions to subclause A.3.2 of ETSI TS 101 674-1 [2].

A.3.3 IP over ATM

A.3.3.1 Examples

The following are methods to provide IP services over ATM NNI

- **Classical IP over ATM**

Classical IP over ATM has been specified to emulate a unicast IP subnetwork over ATM. IP hosts/routers belonging to a virtual IP subnetwork (called Logical IP Subnet, LIS) may be located at different places on the ATM network and communicate using ATM PVCs or SVCs. Multicasting and broadcasting are not supported. The mechanisms to support Classical IP over ATM SVCs are described in IETF RFC2225 [10] and IETF RFC1755 [11].

- **Multicast Address Resolution Server (MARS) over ATM**

MARS has been specified to emulate a multicast and broadcast IP sub-network. Such a network supports multicasting and broadcasting, as defined in IETF RFC2149 [23].

- **IP over LANE (LAN Emulation)**

LAN emulation (LANE) allows emulating IEEE 802.3 [24] and IEEE 802.5 [25] LANs over ATM, as defined in ATM Forum specification AF-LANE-0112.000.

- **NBMA Next Hop Resolution Protocol (NHRP) over ATM**

NHRP allows bypassing the traditional forwarding from IP routers to IP routers, if these routers are connected over ATM, by opening a shortcut between a source and a destination, as defined in IETF RFC2332 [26].

- **Multi-Protocol over ATM (MPOA)**

This variant is characterized by IP hosts belonging to an Inter Address Sub-Group (IASG), which are connected via LANE, directly or through LAN based devices. Shortcuts inside the ATM network are provided by NHRP. Multicast, Unicast and Anycast are supported, as defined in ATM Forum specification AF-MPOA-0114.000.

- **IP Resource Reservation Protocol (RSVP) over ATM**

RSVP is a protocol, which allows an end device and a network to negotiate specific QoS characteristics and is a key component of the IntServ architecture, which enhances IP to support transmission of real-time data. Using RSVP, an application signals a request to reserve resources from source to destination whereupon RSVP-enabled routers schedule and prioritize packets and allow or deny the required bandwidth, as defined in IETF RFC2380 [27].

- **IP Differentiated Services (DiffServ) over ATM**

DiffServ provides a simple and coarse method of classifying services of various applications and prioritizing the traffic. DiffServ is based on using a small bit-pattern in each packet to mark the packet to receive a particular forwarding treatment, or per-hop behaviour, at each network node, as defined in IETF RFC2474 [28].

- **Multi-Protocol Label Switching (MPLS) over ATM**

With MPLS it is possible to set-up an explicit route from ingress to egress node, a so-called Label Switched Path (LSP). At the ingress edge of a MPLS network the header of an IP-packet is analysed and a label is applied. After this no further analysis of the header is done by subsequent routers; all forwarding is driven by the label. At the egress edge the label is stripped and the packet is forwarded to the final destination, see current work in progress in the IETF MPLS working group: http://www.ietf.org/html.charters/mpls-charter.html.

A.3.3.2 IP over ATM using SVC

The use of a permanent virtual channel (PVC) based architecture provides permanent connections of a fixed bandwidth between routers. This can lead to the waste of bandwidth (when there is no or only little IP traffic), or to restricted performance (when the amount of offered IP traffic exceeds the PVC bandwidth).

- **The use of switched virtual channels (SVCs) allows bandwidth to be allocated on demand to the IP traffic-based architecture.**

In the case of classical IP over ATM, RFC 2225 [10] describes how ATM-attached IP end-systems (such as routers) on the same logical IP subnet (LIS) can communicate via ATM SVCs. ATM-attached end-systems on different LISs cannot communicate directly over ATM SVCs but have to send IP traffic via an intermediate router. Within a LIS, the IP to ATM address translation is performed by an ATMARP server. Each IP end-system in the LIS has to register its address with the ATM ARP server. The failure of an ATMARP server (or of connections to it) will prevent new SVCs from being set up between the members of a LIS.

When a router sets up an SVC connection to another router, it needs to specify the ATM traffic parameters for that call. Until protocols such as RSVP are used, there will be no indication as to how much bandwidth is required for the IP traffic. There are four options in ETSI ETS 300 301 [3] and ETSI EN 300 301-1 [4]:

- **DBR/QoS class U (UBR.1, UBR.2)**

The UBR ATC would allow the router to use the maximum bandwidth available. But then many cells could be lost if there is high traffic load on the network.

- **SBR/QoS class 2,3 (nrt-VBR)**

A SBR connection could be set-up with a PCR and a SCR parameter. This would result in the IP traffic being passed through the SBR queue of ATM switches, where overbooking can apply. The allocation of the PCR and SCR values to a given connection is for further study.

- **DBR/QoS class 1 (CBR)**

If the ATC DBR is used for the connection, a guaranteed bandwidth would be provided for the IP traffic. However, it may be unwise to send non-real-time data traffic through the (expensive) DBR queue of ATM switches.

- **ABR**

The ATC ABR allows the modification of the bandwidth depending on the availability of resources during the lifetime of the connection. A minimum cell rate (MCR) is always guaranteed.

Bibliography

The following material, though not specifically referenced in the body of the present document (or not publicly available), gives supporting information.

- ITU-T Recommendation Q.2210 (1996): "Message transfer part level 3 functions and messages using the services of ITU-T Recommendation Q.2140 [8]".

- ETSI TR 123 925: "UMTS: Core Network based ATM transport".

History

Document history		
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