ETSI TECHNICAL REPORT

ETR 282

August 1996

Source: ETSI TC-SPS

Reference: DTR/SPS-03042

ICS: 33.080

Key words: B-ISDN, interaction, multimedia, video

Broadband Integrated Services Digital Network (B-ISDN); Signalling requirements for Video On Demand (VOD) and multimedia interactive services

ETSI

European Telecommunications Standards Institute

ETSI Secretariat

Postal address: F-06921 Sophia Antipolis CEDEX - FRANCE
Office address: 650 Route des Lucioles - Sophia Antipolis - Valbonne - FRANCE
X.400: c=fr, a=atlas, p=etsi, s=secretariat - **Internet:** secretariat@etsi.fr

Tel.: +33 92 94 42 00 - Fax: +33 93 65 47 16

Contents

Foreword

This ETSI Technical Report (ETR) has been produced by the Signalling Protocols and Switching (SPS) Technical Committee of the European Telecommunications Standards Institute (ETSI).

ETRs are informative documents resulting from ETSI studies which are not appropriate for European Telecommunication Standard (ETS) or Interim European Telecommunication Standard (I-ETS) status. An ETR may be used to publish material which is either of an informative nature, relating to the use or the application of ETSs or I-ETSs, or which is immature and not yet suitable for formal adoption as an ETS or an I-ETS.

Blank page

1 Scope

This ETSI Technical Report (ETR) defines the signalling requirements for provisioning of Video On Demand (VOD) over an ATM switched network taking into account a potential need for further Multi-Media Interactive (MMI) services. Signalling scenarios are developed showing the applicability of signalling capabilities from ITU-T and ETSI CS2 step 1 and, as appropriate, from other groups (e.g. ATM Forum).

This ETR is mainly based on network reference configuration as identified by ETSI STC NA5; inputs from other bodies are also taken into consideration. The use of signalling functionality which are under specification is also considered, as well as the definition of additional signalling capabilities if required.

2 References

For the purposes of this ETR, the following references apply:

[1] ETR 262 (1996): "Video on Demand (VOD) network aspects".

[2] Draft The ATM Forum (1996): "ATM UNI 4.0 Specification".

3 Abbreviations

For the purposes of this ETR, the following abbreviations apply:

AAL	ATM Adaptation Layer
ATC	ATM Transfer Capabilities
ATM	Asynchronous Transfer Mode
B-ISDN	Broadband ISDN
BHLI	Broadband Higher Layer Information
CBR	Constant Bit Rate
COBI	Connection Oriented Bearer Independent
CPE	Customer Premises Equipment
CS1	Capability Set 1
CS2 step 1	Capability Set 2 step 1
DAVIC	Digital Audio Video Council
DSM-CC	Digital Media Storage Command & Control
EII	European Information Infrastructure
ETSI	European Telecommunications Standards Institute
GW1	GateWay level 1
GW2	GateWay level 2
IN	Intelligent Network
IP	Intelligent Peripherals
LAN	Local Area Network
LEX	Local Exchange
MBS	Maximum Burst Size
MMI	Multi-Media Interactive
NNI	Network Node Interface
ONP	Open Network Provision
PCR	Peak Cell Rate
PSA	Proxy Server Agent
QoS	Quality of Service
S-AAL	Signalling ATM Adaptation Layer
SAP	Service Access Point
SCF	Service Control Function
SCP	Service Control Point
SCR	Sustainable Cell Rate
SDF	Service Data Function
SRF	Specialized Resources Function
TCAP	Transaction Capabilities
TEX	Transit Exchange
UNI	User Network Interface

VBR	Variable Bit Rate
VC	Virtual Connection
VOD	Video On Demand
VP	Virtual Path

4 VOD and interactive service assumptions

The following discussion is based on the VOD service, but the roles described, especially for the Broker and the Service Provider are common to all the interactive services. Referring to the VOD attention is drawn to the interactive versions of this service, usually named interactive VOD and Quasi Interactive VOD. This discussion is not fully pertinent to the Near VOD, which is closer to a distributive service.

4.1 Functional roles and network entities

Considering a general functional model for the provision of the VOD (and more generally of the MMI services) there are four general functional roles which are relevant for the description of the use of the signalling functionality in the provision of these services:

User: It is the user of the services, potentially every subscriber of the network.

Broker: It is the broker of the service; it re-sells the service giving to the User some added values, such as a better selection of the Service Provider or of the film. The presence in the network of few (one?) brokers is foreseen.

Service Provider: It is the entity that supports the real provision of the service. More than one Service Provider is foreseen in the network.

Content Provider: It is the provider of the video images, it could be a big film house or distributor. More than one Content Provider is foreseen in the network.

On the basis of the reference architecture for the provision of VOD on ATM switched network a one-to-one mapping between the first three functional roles previously identified and the network entities in this network reference architecture can be done:

CPE: It is the equipment located at the User premises and allows the User to access to the service. It can also allow the share of the local loop, for example between the video transmission and the normal telephone line.

service gateway: It is the entity which supports the brokering functions; it allows the User to make the related selection by using mechanisms of navigation between menus, previews, hypertexts, etc.

program server: It supports the selection of the film by using mechanisms of navigation between menus, previews, hypertexts, etc.; it contains a Video Server that supports the interactive control of the video data flow, (forward, rewind, pause, still advance, etc.). In order to simplify the description of the use of the different signalling capabilities, the functions of the Program server and of the Service Operation are both allocated to this entity. Obviously these functions could be allocated to different physical entities.

The fourth functional role is not explicitly identified by the VOD architecture, because it is not strictly related with the VOD service provision. In fact the updating of the contents of the Program Server is not part of the VOD service, but it is considered as a sort a different service related to the provision of the VOD one.

This role is considered in the rest of this ETR due to its impact in terms of signalling requirements and for this reason another network entity is considered:

Content Server: It is the entity which supports the functions performed by the Content Provider, for example to update the content of the Video Servers.

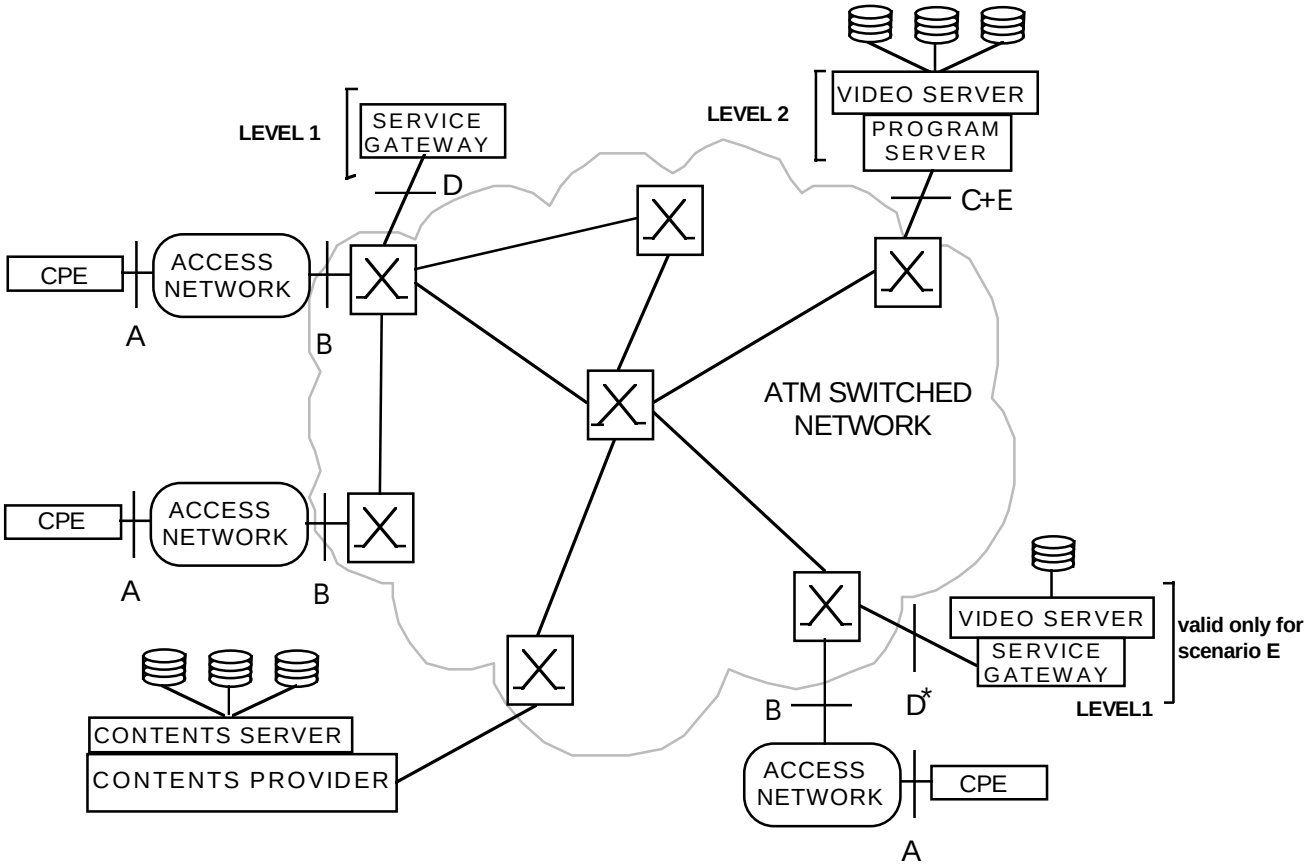
4.2 Mapping to entities as defined by other bodies

In order to give the opportunity of a better understanding of the content of this ETR a simple mapping among the entities described in the previous subclause and the elements present in different network reference architecture for the VOD provisioning is given in this subclause. In particular inputs from DAVIC and ATM Forum are considered:

- The **Customer Premises Equipment** comprises the **Set Top Unit** and it is the **Client** in the service provisioning.

- The **Service Gateway** is similar to the **Gateway level 1**; it is the sum of the **Service Related Control** and the **Network Related Connection Control.** It may include the function of the so called **"Access Network Controller".**

- The **Program Server** is similar to the combination of the **Video Server** and the **Gateway Level 2**. It is the **Server** in the service provisioning.



NOTE: A, B, C, D, E are reference point as described in ETR 262 [1].
D* indicates that some functions performed at the reference point E may also be required.

Figure 1: Network elements in a scenario for VOD provision

5 Signalling capabilities

5.1 Signalling capabilities identification and relation with the standards

The most important support that the B-ISDN network can give to the interactive services is the control of switched ATM connection. Furthermore, the availability of other signalling capabilities allows more flexibility and efficiency in the realization of the services. In the following tables the signalling functionality which should be useful for this purpose are listed. A short description of each capability follows.

This first table refers to the ITU-T CS2 step 1. Most of these functions are also present in the specifications of ATM Forum Phase 2.

Table 1

SIGNALLING FUNCTIONALITY RELEVANT TO THE VOD SERVICE (CS2 step 1)	
B-ISDN COMMUNICATION CONFIGURATIONS	CONTROL OF SWITCHED ATM CONNECTIONS
	POINT-TO-POINT uni and bi-directional
	POINT-TO-MULTIPOINT unidirectional
ATM TRANSFER CLASSES	DETERMINISTIC BIT RATE
	STATISTICAL BIT RATE
	ATM BLOCK TRANSFER
	AVAILABLE BIT RATE
SIGNALLING CAPABILITIES	SYMMETRIC AND ASYMMETRIC BANDWIDTH
	MODIFICATION OF THE CONNECTION CHARACTERISTICS DURING THE ACTIVE PHASE OF THE CALL Point-to-point only
	NEGOTIATION OF THE CONNECTION CHARACTERISTICS DURING THE CALL ESTABLISHMENT Point-to-point only
	USER-TO-USER SIGNALLING

Other signalling functionality which are not included in ITU-T CS2 step 1 are potentially relevant for VOD. Some of them will be included in the ATM Forum UNI 4.0 [2].

Table 2

OTHER SIGNALLING FUNCTIONALITY RELEVANT TO THE VOD SERVICE	
INTEGRATION	INTEGRATION WITH IN
SIGNALLING CAPABILITIES	MULTICONNECTION Point-to-point only
	THIRD PARTY CALL CONTROL
	PROXY SIGNALLING
	TRANSPORT OF NEW IDENTIFIERS
	EXPLICIT BEARER TRANSFER
	EXPLICIT CALL TRANSFER
	SUPPORT CONNECTION ORIENTED BEARER INDEPENDENT SIGNALLING COMMUNICATION Non-local information exchange

5.2 Signalling functionality description

This subclause contains a short description of signalling functionality mentioned above. For more details see the correspondent reference in clause 2.

5.2.1 Control of switched ATM connections

The control of switched ATM connection is performed by B-ISDN Signalling protocols on UNI and NNI interfaces.

5.2.2 Point-to-point communication configuration

A point-to-point communication configuration (unidirectional or bi-directional) uses a point-to-point ATM Virtual Channel (VC) or Virtual Path (VP) connection between two Users.

5.2.3 Point-to-multipoint communication configuration

A point-to-multipoint communication configuration (unidirectional), uses a point-to-multipoint ATM virtual channel (VC) or virtual path (VP).connection between one User (root) which is the source of the information flow and one or more other Users (leaves) which are the receiver. The communication is supported only as unidirectional flow from the root to the leaves.

5.2.4 Deterministic Bit Rate

This ATC allows the User to ask for the reservation of network resources based on *peak cell rate* and the *cell delay variation tolerance*. It implies that the User can transmit at the declared rate at every time. This class should be used for isochronous services.

5.2.5 Statistical Bit Rate

This ATC allows the User to ask for the reservation of network resources based on the *peak cell rate*, *cell delay variation tolerance, sustainable cell rate*, *maximum burst size*, etc. It implies that the allocation of the bandwidth is based on these parameters and could allow a better use of the ATM network resources. This class should be used for services characterized by a variable bit rate.

5.2.6 Available Bit Rate

This ATC allows the User to use the maximum of resources that the network can give at each time, adapting its transmission rate to the indications of the network. This ATC foresees the indication from the User of the maximum transmission rate (peak cell rate) and of the minimum transmission rate (minimum cell rate). Depending on the status of the network the User can use any cell rate between these two values.

5.2.7 ATM Block Transfer

The Block Transfer Capability is used to deliver blocks with a low cell loss ratio (typically 10^{-10}). A block is defined as a group of cells delineated by two Resource Management (RM) cells. This transport class allows the user to use the maximum of resources that the network can give at each time, adapting its transmission rate to the indications of the network. The connection characteristics are negotiated for each block of cells to be transmitted. For each block the network will allocate the resources to obtain a quality of service equivalent to one of a DBR connection with a bandwidth value equal to the one negotiated for the block (Peak Renegociation Rate).

5.2.8 Modification of the connection characteristics during the active phase of the call

The bandwidth of a point-to-point connection can be modified during the active phase of the connection itself. It permits to adapt the characteristics of the connection to the needs that could rise during the lifetime of the call.

5.2.9 Negotiation of the connection characteristics during call establishment

The bandwidth and the QoS of a point-to-point connection can be negotiated during the establishment phase of the call. It permits to meet the characteristics of the terminal and the applications.

5.2.10 User-to-user Signalling

This capability gives to the User application a mechanism for the exchange of short messages, which are transported end-to-end by way of the signalling network. The use of this capability, which is in principle very powerful, shall be very carefully evaluated, in order to avoid the risk of overloading the signalling network. Depending on the characteristics of the information to be exchanged the use of user-to-user bearer service or supplementary service could be foreseen.

5.2.11 IN/B-ISDN integration

The integration between IN and the signalling B-ISDN network gives great flexibility in the provision of multimedia interactive services. New aspects and new feature are allowed to IN while collaborating with B-ISDN and its new advanced services.

The following non-exhaustive list gives some possible uses of IN feature in the context of the provision of MMI services:

- the Navigation function of the Service gateway could be provided by means of the pear SCF-SRF into an Intelligent Peripheral;

- using SDF and SCF IN functions the access to the service could be provided for the following feature: validations, User profiles, 800 like numbers, efficient selection of the Service Provider and of the Program Server, etc.;

- considering IN CS3, direct communication is allowed between User equipment and SCF, it allows the SCF to act directly as Service Gateway and to request the network to provide the right network resources.

5.2.12 Multiconnection

Multiple connections can be established inside a single point-to-point communication.

5.2.13 Third party call control

Third party control is a signalling capability which allows a generic User A to set up a connection between two other Users B and C. This capability is currently under discussion in both ITU-T and ATM Forum. Depending on the future discussion the party A could only set up the call/connection between the other two Users (Third Party Call Setup or B-ISDN equivalent capability) or fully control it during all the lifetime of the call (Third Party Call Control).

NOTE: Third Party Call Setup is a signalling capability under definition in the ATM Forum.

5.2.14 Proxy signalling

The proxy signalling permits to connect to a switched network terminal which do not implement B-ISDN (or equivalent) signalling facilities. The set up, the modification and the release of the calls related to these terminals are performed by a Proxy Signalling Agent which is an entity connected to the same exchange of the served Users.

Figure 2 describes this capability.

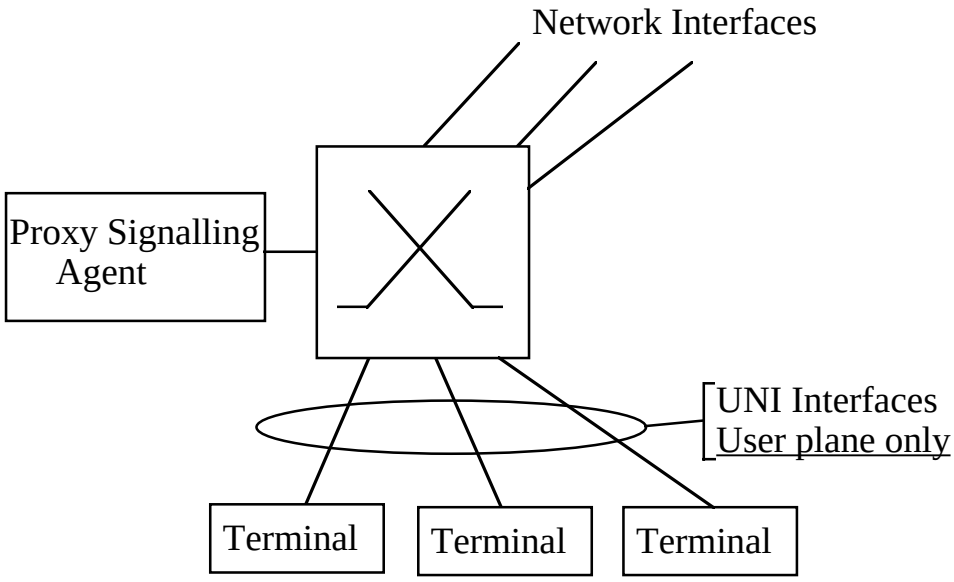


Figure 2: Proxy Signalling

The switch knows that the signalling functions for some of its terminals are performed by the PSA. For every call from or to one of these terminals the control flow is exchanged between the switch and the PSA. The User data flow follows the normal path to the User terminal. How the communication between the terminal and the PSA takes place is outside of the scope of this capability.

5.2.15 New identifiers

Some end-to-end identifiers could be transported by the signalling messages to meet the needs of the new interactive services (details are for further study). Whether some of these identifier have to be interpreted or not by the network has to be decided.

5.2.16 Explicit Call Transfer

The Explicit Call Transfer is a capability that transfers an active call and any associated bearer connection to the addressed party contained in the action request to network by the requesting party. The requesting party is no longer associated with that. Call and connection characteristics, including the ownership status, are transferred to the addressed party.

5.2.17 Explicit Bearer Transfer

The Explicit Bearer Transfer is a capability that transfers one or more bearer connection to the addressed party contained in the action request to network by the requesting party. The requesting party remains associated to the call. Connection characteristics, including the ownership status, are transferred to the addressed party.

5.2.18 Support of Connection Oriented Bearer Independent signalling communication for non-local information exchange (COBI)

A COBI communication is a signalling communication that is not associated to the presence of a call/connection signalling relation. The capabilities contained in CS2 step 1 are able to support this type of communication on both UNI and the NNI side, but the mechanism on the UNI side is only able to support a local information exchange.

NOTE: The involved protocols are the Transaction CAPability (TCAP) at the NNI and the Generic Functional Protocol part 1 on the UNI (Q2932.1). The support of non-local information exchange is foreseen in the part 2 of the specification (Q2932.2).

6 Signalling scenarios

This clause explains the use of the Signalling functionality in the provision of MMI services describing their use in the VOD case.

Subclause 6.1 describes the possible use of these signalling functionality. Subclause 6.2 describes a scenario for the case of the provision of VOD on a hybrid network: Access Network not based on switched ATM and core network based on switched ATM. Subclause 6.3 describes some scenarios for the case of provision on a network based on end-to-end switched ATM.

6.1 Applicability of signalling capabilities to the VOD and the interactive service.

This subclause describes some possible applications of the signalling functionality identified in the previous chapter for the VOD service. The following consideration could easily be generalized to a generic multimedia interactive service.

6.1.1 Control of switched ATM connections

It is the most important feature, since it allows broadband connections to support the transport of video data. The film could be stored as ATM cells directly in the Video Servers.

6.1.2 Point-to-point communication configuration

The basic B-ISDN call is relevant for the provision of the VOD service, because the communications are essentially related to a pair of functional entities. In particular it is remarkable that the communications between User and the Broker and the User and the Service Provider are intrinsically point-to-point.

6.1.3 Point-to-multipoint communication configuration

This capability is unidirectional from the calling User to the called Users. It could be used to keep up-to-date the contents of the Program Servers.

A distribution/production centre (Contents Provider) could send the new films to the Program Servers using a point-to-multipoint communication, possibly during the time of lower load of the network.

It is evident that the rate of data flow is not limited like in the case of communication involving the CPE. The data connection is not related to the speed of a video transmission.

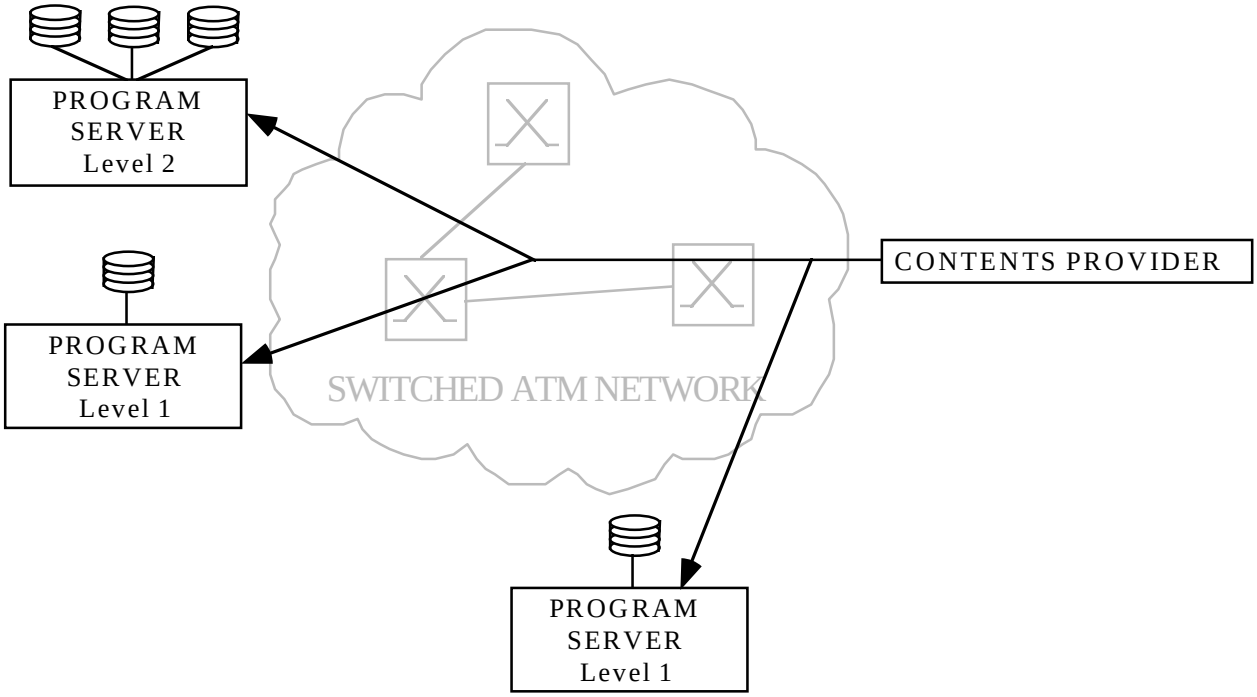


Figure 3: Use of point-to-multipoint configuration

6.1.4 Connection using symmetric and asymmetric bandwidth

The VOD service requires an asymmetric bandwidth because the flow between the Video Server to the User is a video information (for MPEG is now 2 Mb/s, in future 6 Mb/s). The data flow from the User to the Video server is smaller, because it is only related to the User remote control.

NOTE: A point-to-point configuration can have an asymmetric bandwidth, with different traffic characteristics in terms of ATM parameters, but can not be characterized by different traffic types in the two directions (i.e. the connection can not be VBR in one direction and CBR in the other). This is because the type of AAL is different, and only one AAL could be specified for each connection. This could add some requirements to use different connections for the video data and the remote control data.

6.1.5 Deterministic bit rate

The transport of the video coded flow could require this kind of transport. For the MPEG there is a preference for the Deterministic Bit Rate, but a definitive decision is not taken (see also subclause 6.1.6).

6.1.6 Statistical Bit Rate

The transport of bursted data as the ones related to the User remote control could use the Statistical Bit Rate. Also the transport of the video coded flow could require this kind of transport.

This capability could be useful to update the content of the Video Servers in both point-to-point and point-to-multipoint communication configuration, because it is an application that does not require tightly constrained delay and delay variation.

6.1.7 Available bit rate and ATM block transfer

This ETR does not concentrate the attention on the details of these particular capabilities, but on the possibility of having connections with bandwidth dynamically allocated by the network control (available bit rate, ATM block transfer, etc.). This capability could be useful to update the content of the Video Servers in a point-to-point communication configuration, because it is an application that does not require tightly constrained delay and delay variation. It could also be useful for extensions of the VOD services that foreseen the possibility to send data from the Users to the Video Servers.

6.1.8 Modification of the connection characteristics during the active phase of the call

This capability allows the optimization of the allocation of bandwidth. For example the menu selection could use less bandwidth than the full video signal. In this case the full allocation could be delayed. Considering that the film selection could take a long time, especially if realized as a complex multimedia service, this capability could be very useful. In addition it could be useful when the User requires the transmission of additional information, for example a second audio channel.

6.1.9 Negotiation of the connection characteristics during call establishment

If different releases of terminals are present in the network, the use of multistandard gateways and video servers could be foreseen. Negotiation procedures for bandwidth and QoS could be very useful in this case (for example in the case of presence in the network of terminals using different standards).

6.1.10 User-to-user signalling

The use of this capability for the transport of remote control information from the User to the gateway (or the Video Server) is not feasible due the amount of traffic that could be potentially generated on the signalling network. However, it could be useful in the exchange of information related to the authentication of the User identity, or for the retrieval of the User profile.

6.1.11 IN/B-ISDN integration

The integration between IN and B-ISDN means to share services and resources between the two networks. This allows efficiency and fast introduction of new services and introduces flexibility in their realization, both from the provision and the architecture view points.

Regarding to the VOD services, the possibility to see the gateways and the Video Servers as SRF (Specialized Resource Function) and to make temporary connections to it, can allow great flexibility and efficiency, especially in the construction of the different connections.

6.1.12 Multiconnection

This capability allows the servers to use different connections for the different components of the service (e.g. one connection for the audio/video MPEG stream and another one for the exchange of the remote control information). This fact permits to avoid functions for the multiplexing of the different VOD components (for example MPEG multiplexers) in the servers.

Furthermore, the use of this capability for the VOD service allows a great flexibility, especially if considering the VOD service in the wider context of multimedia interactive services. If multiple audio or subtitle channels, or multiple TV channels (for example a picture in picture vision) are allowed, this capability could be very useful. Also other services functionally similar to the VOD, such as the teleshopping, could require this capability.

Some requirements for this capability could be generated by the type of transport used (see note in subclause 6.1.4).

6.1.13 Third party control

This capability is useful to allow an easier procedure to switch the connection from the Broker to the Service Provider and vice versa.

6.1.14 Proxy signalling

The proxy signalling permits to connect to a switched network terminals which do not implement B-ISDN signalling protocol (for instance terminals which implement different or limited signalling facilities. The set-up, the modification and the release of the connections are performed by the proxy agent which is an entity connected to the same local exchange of the served Users.

6.1.15 New identifiers

Some identifiers related to the VOD service could be required in both the UNI and NNI protocols. Presently the following information is considered:

- session ID (It is used to correlate the different components and resources inside a single access to the service);

- movie and service selection request correlation ID (It is used to correlate the movie transmission with the service instance which asked for its transmission).

6.1.16 Explicit Call Transfer and Explicit Bearer Transfer

These capabilities allow the transfer of the call and the connections between the Service Gateway and the Program Server and vice-versa. In other words these capabilities are useful to switch the call and/or the bearer connection(s) between Broker and Service Provider.

6.1.17 Support of Connection Oriented Bearer Independent signalling communication for non-local information exchange

The use of this capability is essentially related to the IN/B-ISDN integration. It allows a direct dialogue between the SCP and the CPE which is known in the IN world as "USER TO SERVICE" communication. It allows more flexible organization of the service logic and, under some condition, it allows to place the Service Gateway in the SCP, removing the use the IP in the scenario F depicted in subclause 6.3.3.1.

6.2 Scenarios for the introduction of interactive services on switched ATM networks (Access Non-switched ATM)

For this case only one scenario relevant signalling aspects has been identified.

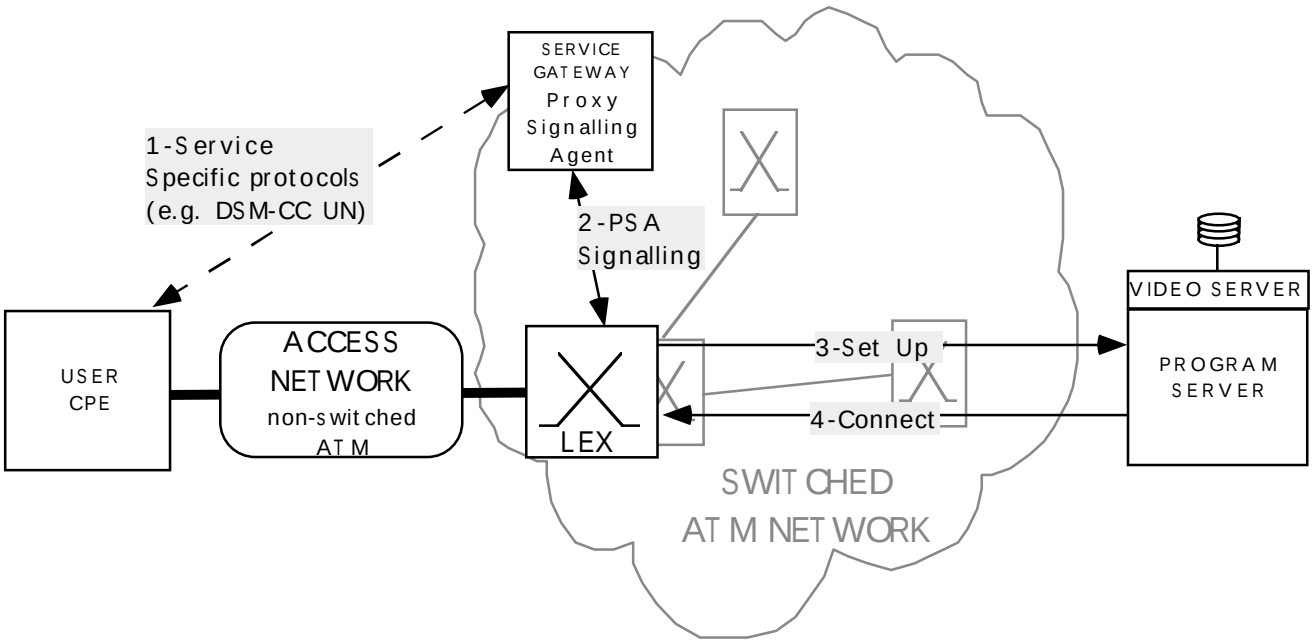


Figure 4

Table 3

SIGNALLING CHARACTERISTICS	
Point-to-point Single Connection Constant Bit Rate Asymmetric Bandwidth	CAPABILITY SET 1
Proxy Signalling	

The User starts the service calling a Service Gateway (Broker) which, in this example, also implements the function of Proxy Signalling Agent. This relation uses channels which are allocated depending on the kind of Access Network, eventually on permanent basis. Service specific protocols are used for this information exchange (e.g. DSM-CC UN could be used).

The User makes his selections in terms of films and/or Service Provider. On the basis of these selections and considerations about the available resources a Programs Server (Service Provider) is selected. The Service Gateway asks to the network the establishment of new call between the User and the Service Provider. It is done using the PSA functionality.

The bandwidth of this call is asymmetric because the communication from the CPE to the Program Server should support only the information related to the User remote control. The communication in the reverse direction should support the large bandwidth required by the video transmission.

If a need for multiple channels is identified, multiple connections can be established requiring multiple calls. It remains a task of the Program Server and the User CPE (and possibly the Service Gateway) to correlate them.

In this scenario it must be noted that the use of protocols like the DSM-CC UN at the UNI interface, combined with CS1 signalling and Proxy Signalling, is acceptable. For scenarios using switched ATM end-to-end, the use of the extended functionality of CS2 step 1 (and in particular of the multiconnection) is the most feasible. In this case the use of a service specific protocol at the access is inefficient and useless.

6.3 Scenarios for the introduction of interactive services on switched ATM networks (end-to-end ATM switched)

The scenarios presented in the following subclauses foresee the implementation of B-ISDN protocol in the User CPE.

6.3.1 Scenarios for the very short term

These scenarios are characterized by the need of CS1 only.

6.3.1.1 Scenario A

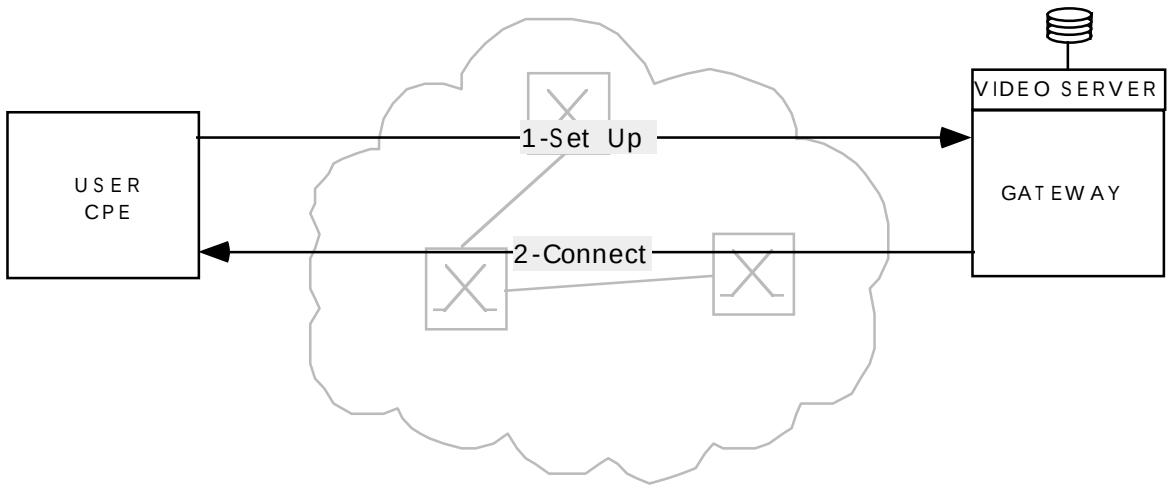


Figure 5

Table 4

SIGNALLING CHARACTERISTICS	
Point-to-point Single Connection Constant Bit Rate Asymmetric Bandwidth User-to-user Signalling	CAPABILITY SET 1

In this scenario, both the Broker and the Service Provider are located in the only level of Gateway and Video Server. The selection of the gateway could be performed by the User using different numeric selections, or could be intrinsically related to the access procedures to the service.

Only one point-to-point call is present. The bandwidth is asymmetric because the communication from the CPE to the Video Server should support only the information related to the User remote control. The communication in the reverse direction should support the large bandwidth required by the video transmission.

Procedures for the authentication of the User identity could be performed at the beginning of the call. User-to-user signalling could be used for this purpose (see subclause 6.1.10).

If a need for multiple channels is identified, multiple connections can be established requiring multiple calls. It remains a task of the gateway and the User CPE to correlate them.

6.3.1.2 Scenario B

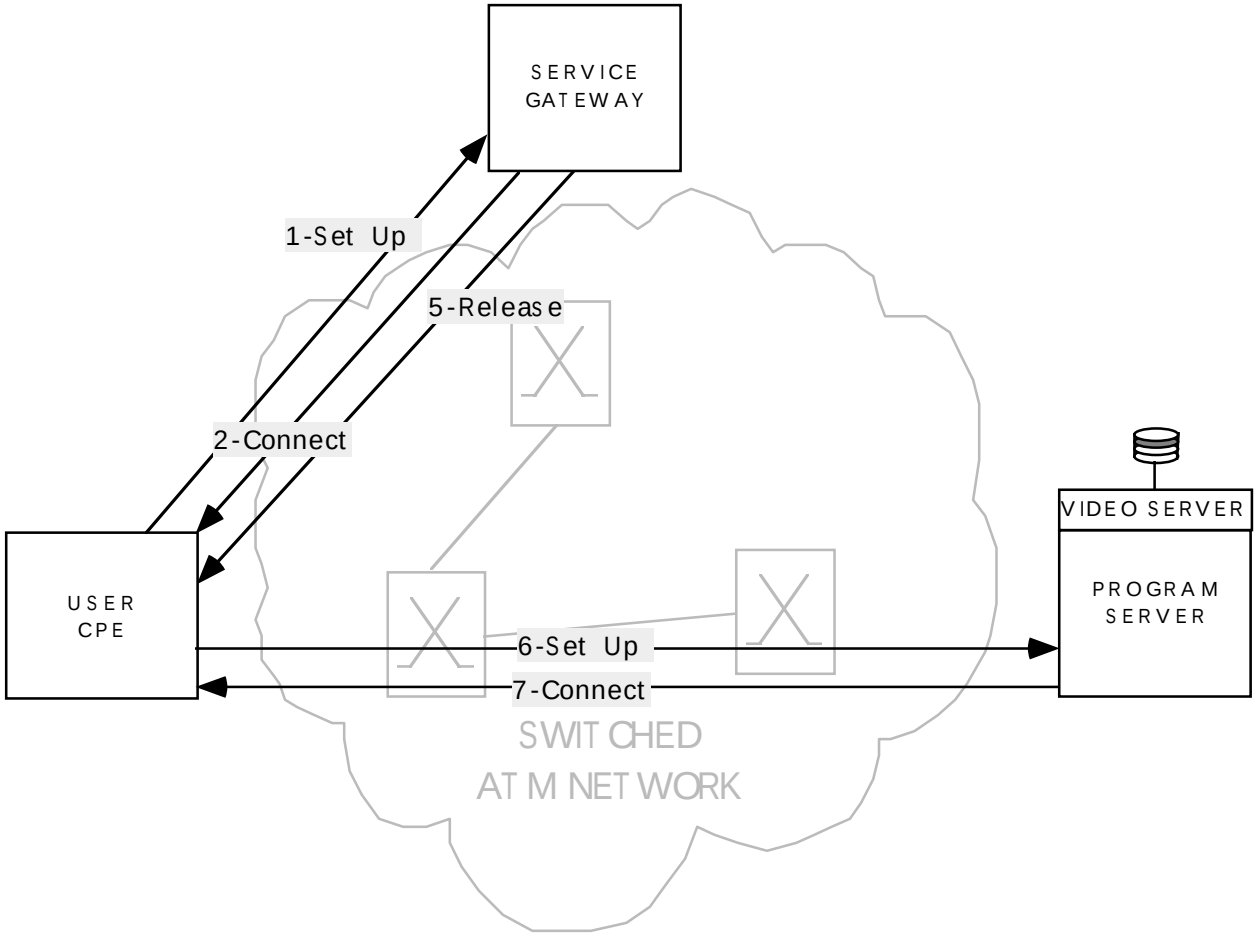


Figure 6

Table 5

SIGNALLING CHARACTERISTICS	
Point-to-point Single Connection Constant Bit Rate Asymmetric Bandwidth User-to-user Signalling	CAPABILITY SET 1

Two different point-to-point calls are present. The User starts the service by calling the Service Gateway (the Broker). The User makes his selections in terms of films and/or Service Provider. On the basis of these selections and considerations about the available resources a Program Server (Service Provider) is selected. The Service Gateway transmits the address of the Program Server to the User CPE.

The first call is released and a new call from the User to the Service Provider is established.

The first call requires a small amount of bandwidth to support the selection procedures (If the capability to show film preview is foresee the bandwidth could be larger). The second call requires a bandwidth able to transport the video transmission (presently 2 Mb).

The bandwidth of this second call is asymmetric because the communication from the CPE to the Program Server should support only the information related to the User remote control. The communication in the reverse direction should support the bandwidth required by the video transmission.

If a need for multiple channels is identified, multiple connections can be established requiring multiple calls. It remains a task of the CPE and the Program Server (and possibly to the Service Gateway) to correlate them.

Procedures for the authentication of the User identity could be performed at the beginning of the call. User-to-user signalling could be used for this purpose (see subclause 6.1.10).

6.3.1.3 Scenario C

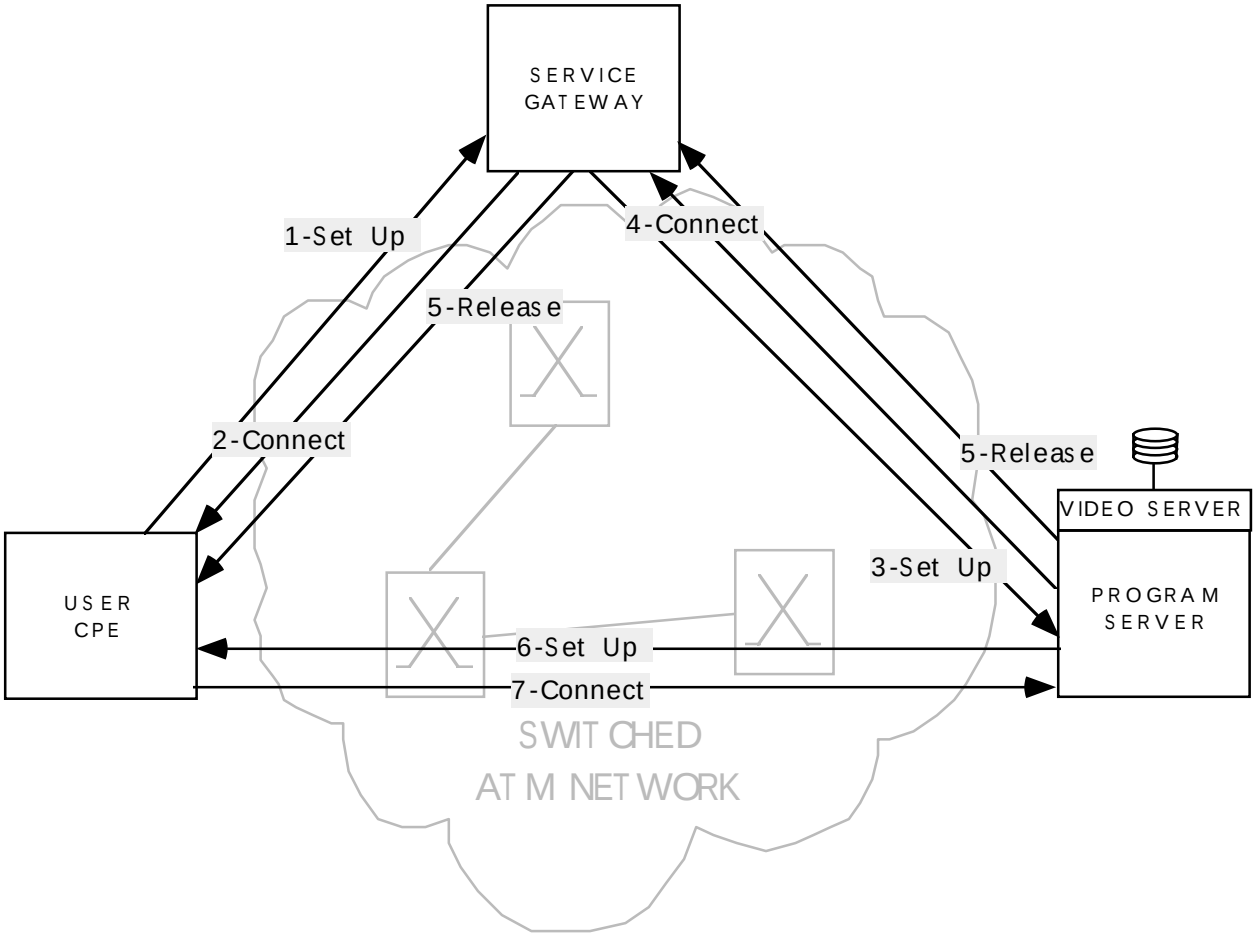


Figure 7

Table 6

SIGNALLING CHARACTERISTICS	
Point-to-point Single Connection Constant Bit Rate Asymmetric Bandwidth User-to-user Signalling	CAPABILITY SET 1

Three different point-to-point calls are present. The User starts the service by calling the Service Gateway (the Broker). The User makes his selections in terms of films and/or Service Provider. On the basis of these selections and considerations about the available resources a Program Server (Service Provider) is selected. The Service Gateway establishes a new call to Program Server and transmits to it the User address and information about the movie selection made by the User.

The two calls are released and a new call from the Service Provider to the User is established (the first two calls could be maintained on duty if the User is allowed to perform other selection at the Service Gateway).

The first call requires a small amount of bandwidth to support the selection procedures (if the capability to show film previews is foreseen the bandwidth could be larger). The third call requires a bandwidth able to transport the video transmission (presently 2 Mbit/s).

The bandwidth of this third call is asymmetric because the communication from the CPE to the Program Server should support only the information related to the User remote control. The communication in the reverse direction should support the large bandwidth required by the video transmission.

If a need for multiple channels is identified, multiple connections can be established requiring multiple calls. It remains a task of the CPE and the Program Server (and possibly to the Service Gateway) to correlate them.

Procedures for the authentication of the User identity could be performed at the beginning of the call. User-to-user signalling could be used for this purpose (see subclause 6.1.10).

6.3.2 Scenarios for the short term

These scenarios require capabilities which are not included in the CS1 but are included in the ITU-T Recommendation CS2 step 1.

6.3.2.1 Scenario D

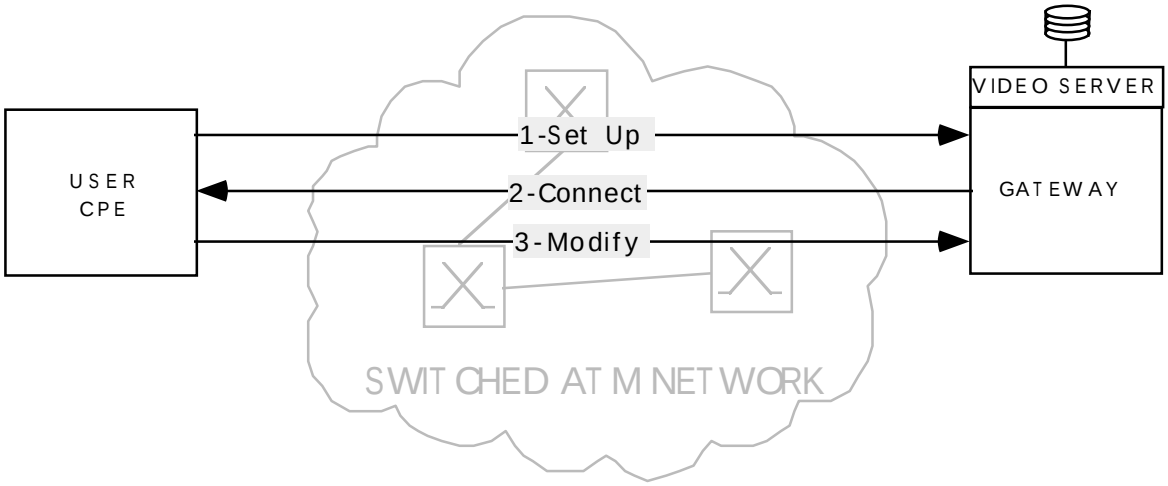


Figure 8

Table 7

SIGNALLING CHARACTERISTICS	
Point-to-point Single Connection Constant Bit Rate Asymmetric Bandwidth User-to-user Signalling	CAPABILITY SET 1
Modification of the Connection Characteristics Negotiation of the Connection Characteristics Variable Bit Rate	CAPABILITY SET 2

This scenario is functionally similar to the one proposed in subclause 6.3.1.1 (scenario A)

The CS2 step 1 signalling allows the capability to modify an existing connection, and it allows a better use of the network resources. The bandwidth of the connection initially supports only the transmission rate for the User selections. After this phase, the bandwidth is extended to support the movie transmission.

If a need for multiple channels is identified, multiple connections can be established requiring multiple calls. It remains a task of the CPE and the Program Server (and possibly to the Service Gateway) to correlate them.

Considerations about user-to-user signalling and point-to-multipoint configurations apply as described in subclause 6.1.

6.3.2.2 Scenario E

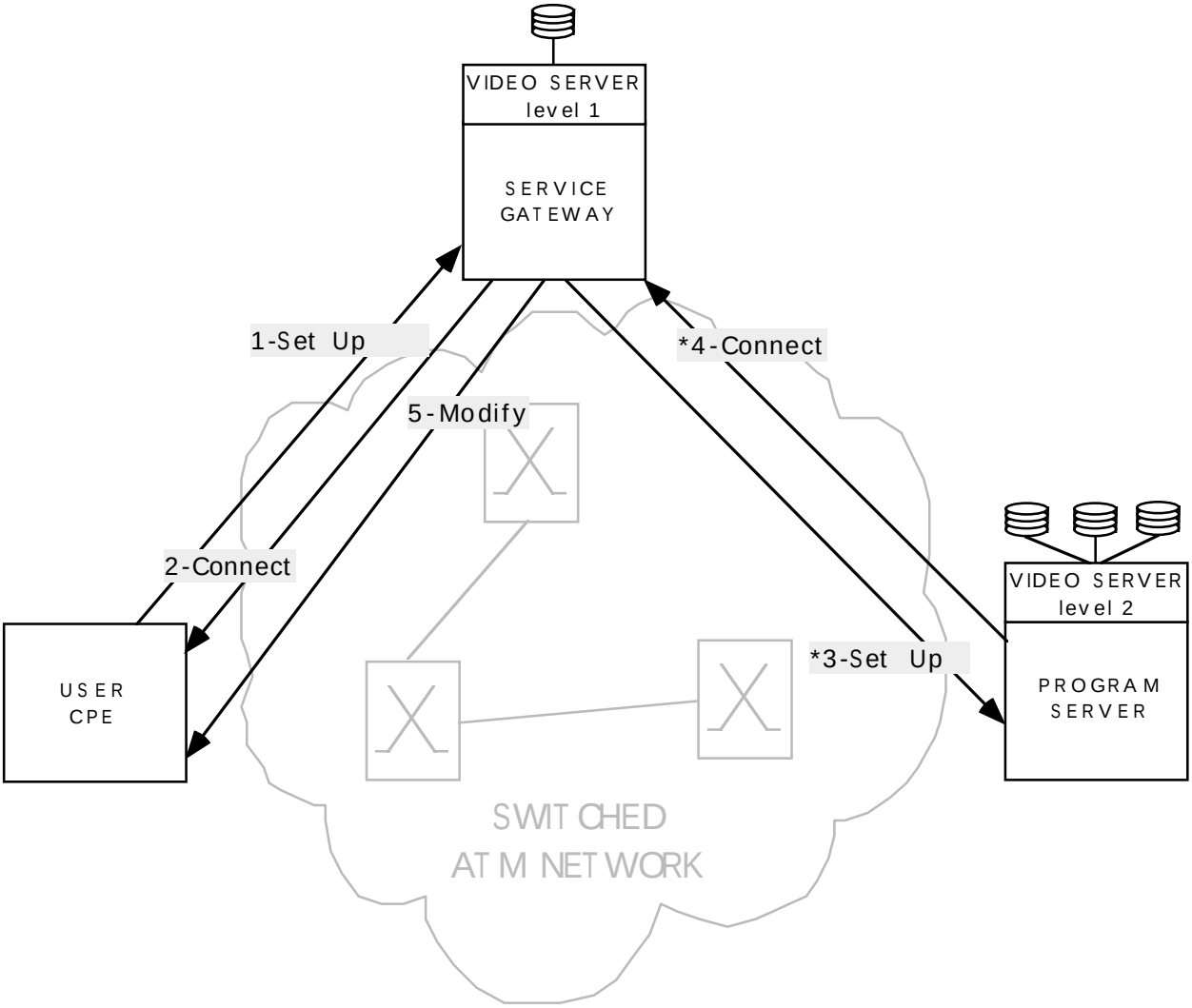


Figure 9

Table 8

SIGNALLING CHARACTERISTICS	
Point-to-point Single Connection Constant Bit Rate Asymmetric Bandwidth User-to-user Signalling	CAPABILITY SET 1
Modification of the Connection Characteristics Negotiation of the Connection Characteristics Variable Bit Rate Available Bit Rate (or ATM Block Transfer)	CAPABILITY SET 2 STEP 1

Two levels of Gateways/Program Servers and two levels of Video Servers are present in this scenario. Two point-to-point calls could be established, and the second one is not established for all cases of access to the service (the messages related to this second call are marked with a *).

The User makes access to the service by calling a Service Gateway. This gateway allows the User to select the film/Service Provider. After this selection, the Service Gateway checks its Video Server (level 1). If the film is present it is sent to the User, if the film is not present, the correct Program Server is identified and called by the Service Gateway. The movie is downloaded to the Service Gateway and it is transmitted to the User.

The connection between the Video Servers is a general data connection and it has not to respect the constrains of a movie transmission.

The Service Gateway and its server operate with a sort of working set of films. Films of different Service Providers could share the level 1 Video Server. The Program Server and its server could be considered as a video library and could be coincident with the Service Provider, because it is the owner of the films and it could maintain a decision power on the contents of the Video Server level 1 (compatibly with the amount of resources negotiated with the Service Gateway owner).

For having a large number of subscribers, and having the level 1 Video Servers located at the LEX level, this solution could be very efficient, especially in the case of an elevate number of Service Providers.

If a need for multiple channels is identified, multiple connections can be established requiring multiple calls. It remains a task of the CPE and the Program Server (and possibly to the Service Gateway) to correlate them.

Point-to-multipoint calls could be used to keep the contents of the Video Servers up to date.

Considerations about user-to-user signalling and point-to-multipoint configurations apply as described in subclause 6.1 and in the previous scenarios.

6.3.3 Scenarios for the medium-long term

These scenarios require functionality which are beyond CS2 step 1.

6.3.3.1 Scenario F

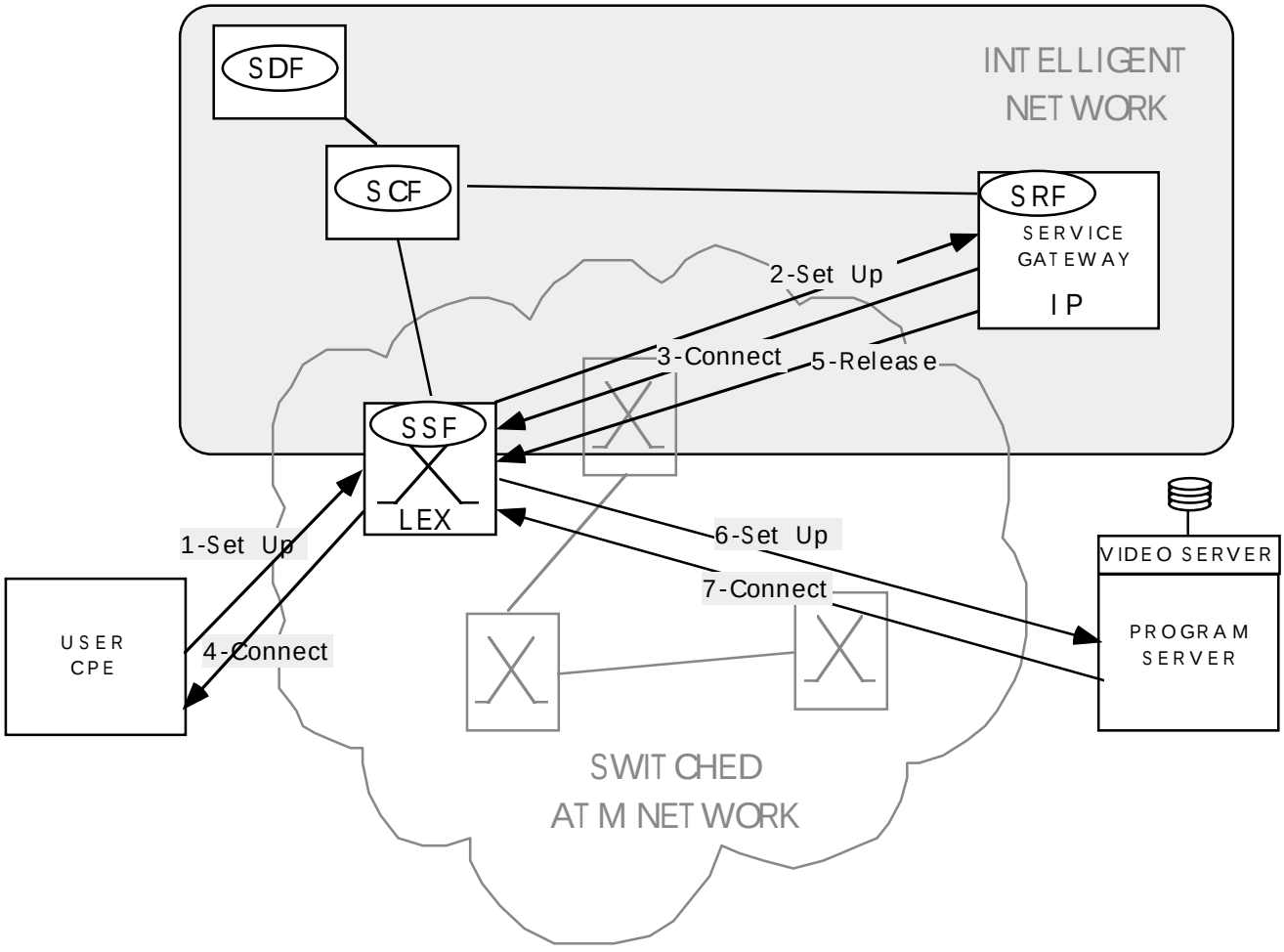


Figure 10

Table 9

SIGNALLING CHARACTERISTICS	
Constant Bit Rate Asymmetric Bandwidth User-to-user Signalling	CAPABILITY SET 1
Modification of the Connection Characteristics Negotiation of the Connection Characteristics Variable Bit Rate	CAPABILITY SET 2 STEP 1
IN / B-ISDN Integration Point-to-point Multiconnection Connection Oriented Bearer Independent Signalling Communication (non-local information exchange)	

This is only one of the possible scenarios including IN/B-ISDN integration. The flexibility allowed by this integration allows different versions of the VOD service and, more generally, of every interactive service.

Only one call is present in this scenario.

After the User has made his attempt to access the service at the LEX, the call is recognized as an Intelligent Network service. The connection is temporary extended to the Service Gateway (Broker), which could be probably identified as an SRF. At this level the User makes his selections. The LEX is instructed, through Intelligent Network, by the Service Control Functions to release the temporary connection and to extend the call to the proper Program Server (Service Provider). This Program Server could be an independent entity or an SRF. In this second case the update of the information of the Service Gateway about the movie and the Service Providers could be performed via IN.

The decision of going back to the Service Gateway can easily be managed by the Intelligent Network.

Procedures for the authentication of the User identity could be performed at the beginning of the call, using User profiles stored in the IN databases (SDF).

Due to the presence of the multiconnection capability, if the need for multiple channels is identified, it may be the task of the network to correlate them within a single call request

Considerations about COBI signalling communication (for the realization of User-to-service communications) and point-to-multipoint configurations apply as described in subclause 6.1.

6.3.3.2 Scenario G

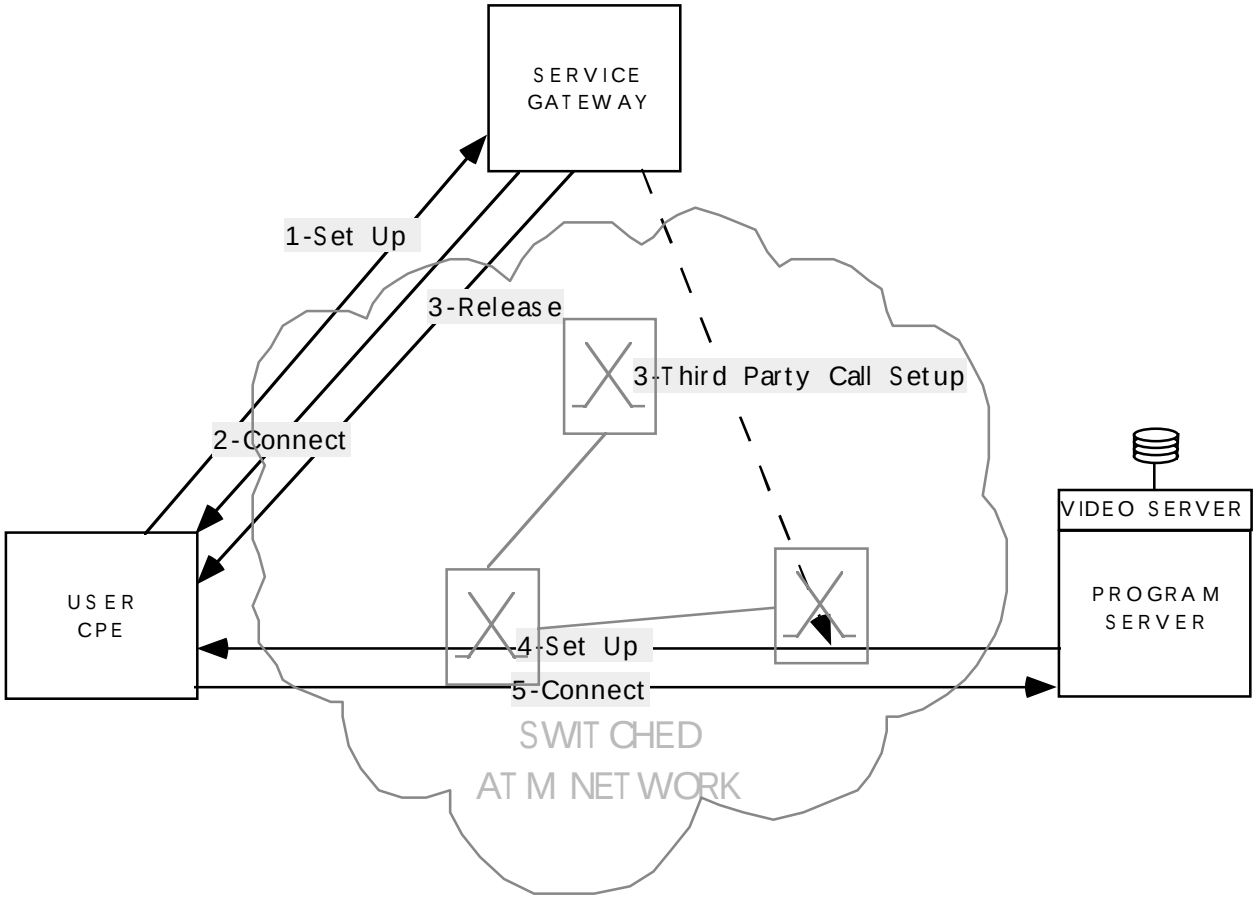


Figure 11

Table 10

SIGNALLING CHARACTERISTICS	
Constant Bit Rate Asymmetric Bandwidth User-to-user Signalling	CAPABILITY SET 1
Modification of the Connection Characteristics Negotiation of the Connection Characteristics Variable Bit Rate	CAPABILITY SET 2 STEP 1
Third Party Call Setup Point-to-point Multiconnection	

Two different point-to-point calls are present, and the second one is established via third party call setup. The User starts the service by calling the Service Gateway (the Broker). The User makes his selections in terms of films and/or Service Provider. On the basis of these selections and considerations about the available resources a Program Server (Service Provider) is selected. The Service Gateway (using the third party call setup capability) asks to the network to establish a new call between the User and the Program Server, then the first call is released.

The first call requires a small amount of bandwidth to support the selection procedures (if the capability to show film preview is foreseen the bandwidth could be larger). The second call requires a bandwidth able to transport the video transmission. The bandwidth of this second call is asymmetric.

At the end of the transmission of the movie, or if requested by the User, the Program Server could reconnect the User to the Service Gateway using again the third party call setup.

Considerations about user-to-user signalling, multiconnection and point-to-multipoint configurations apply as described in subclause 6.1 and in the previous scenarios.

6.3.3.3 Scenario H

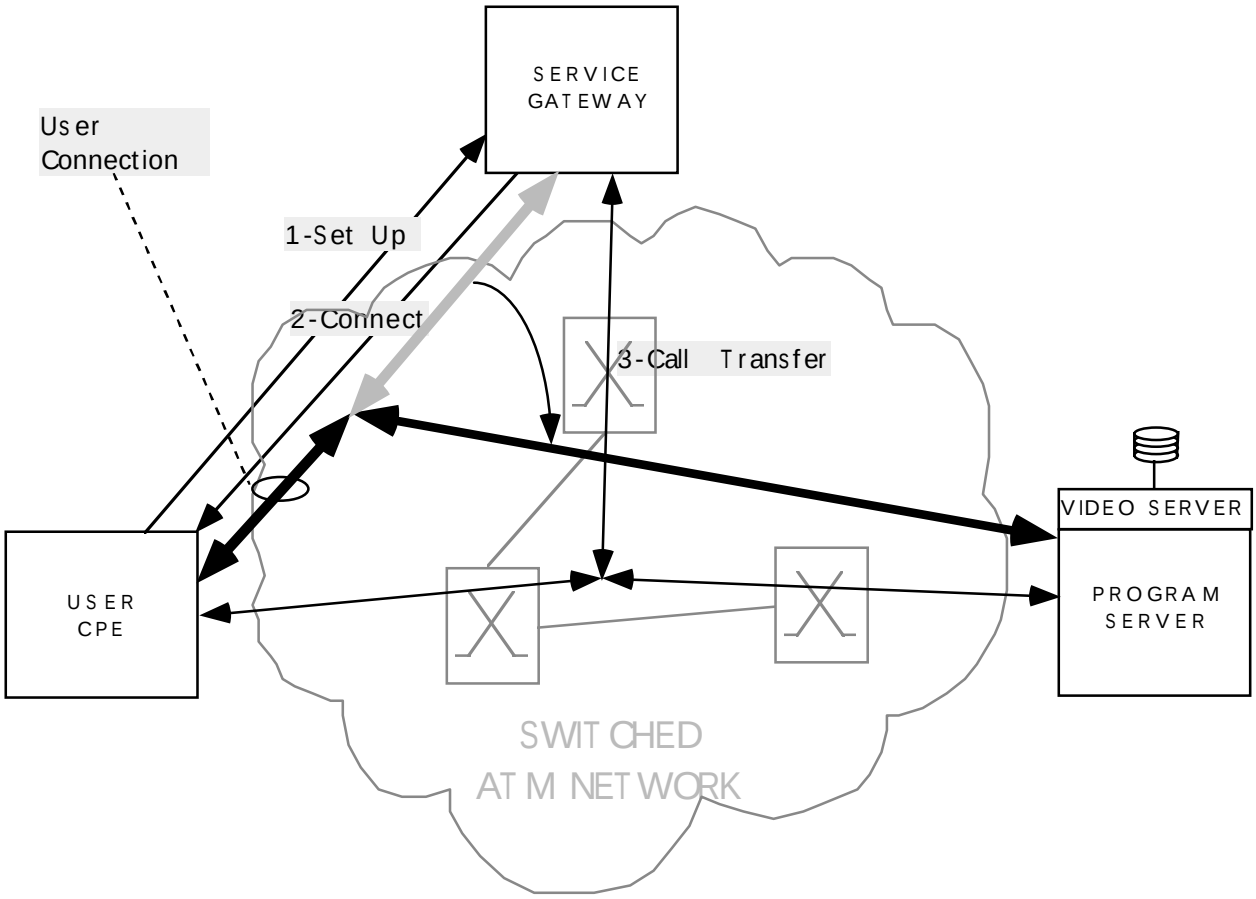


Figure 12

Table 11

SIGNALLING CHARACTERISTICS	
Constant Bit Rate Asymmetric Bandwidth User-to-user Signalling	CAPABILITY SET 1
Negotiation of the Connection Characteristics Modification of the Connection Characteristics Variable Bit Rate	CAPABILITY SET 2 STEP 1
Explicit Call Transfer Point-to-point Multiconnection	

One single point-to-point call is present. The User starts the service by calling the Service Gateway (the Broker). The User makes his selections in terms of films and/or Service Provider. On the basis of these selections and considerations about the available resources a Program Server (Service Provider) is selected. The Service Gateway (using the Explicit Call Transfer capability) asks to the network to switch the call (including the Bearer Connection(s)) towards the Program Server. The Service Gateway is not longer part of the call.

The call requires at the beginning a small amount of the bandwidth to support the selection procedures (if the Service Gateway foresees the ability to show previews, a larger bandwidth is required). After the call transfer a bandwidth able to transport the video transmission is required and bandwidth modification may need to be invoked. In that case the bandwidth is obviously asymmetric.

At the end of the transmission of the movie, or if requested by the User, the Program Server could reconnect the User to the Service Gateway using again the Explicit Call Transfer capability.

Considerations about user-to-user signalling, multiconnection and point-to-multipoint configurations apply as described in subclause 6.1 and in the previous scenarios.

7 Analysis of results

On the basis of the analysis presented in this report, the capabilities contained in the B-ISDN CS1 are in principle sufficient to provide simple MMI services like VOD, but only under some restrictive conditions that are mainly related to reduction of flexibility and efficiency in the provision of the service.

Additional signalling capabilities which are useful for the provision of MMI services are contained in CS2 step 1, but some requirements for this type of services can be satisfied only by the introduction of further relevant capabilities.

Taking into account following criteria:

- the network complexity required;
- the complexity of the CPE and the servers;
- the benefits for multiple MMI services (not only VOD);
- the foreseen schedule for availability of the standards;
- the efficiency of the network in terms of use of resources;
- Open Network Provision (ONP) and the European Information Infrastructure (EII) requirements.

The following table of priority for the specification of new signalling capabilities to improve the support of MMI services has been established.

To support the provision of MultiMedia Interactive Services it is recommended to develop the following B-ISDN signalling capabilities:

Table 12

RECOMMENDED B-ISDN SIGNALLING CAPABILITIES STILL TO BE SPECIFIED FOR MULTIMEDIA INTERACTIVE SERVICES	
MULTICONNECTION (for point-to-point configuration only) THIRD PARTY CALL CONTROL (as minimum performing the functions of Third Party Call Setup)	HIGH priority
CONNECTION ORIENTED BEARER INDEPENDENT COMMUNICATION (Non-Local Information Exchange) IN/B-ISDN INTEGRATION EXPLICIT CALL TRANSFER NEW IDENTIFIERS (for the correlation of call/connections into a single service instance such as the session ID) PROXY SIGNALLING	MEDIUM priority

Annex A: Bibliography

- ETS 300 443-1 (1996): "Broadband Integrated Services Digital Network (B-ISDN); Digital Subscriber Signalling System No. two (DSS2) protocol; B-ISDN user-network interface layer 3 specification for basic call/bearer control; Part 1: Protocol specification [ITU-T Recommendation Q.2931 (1995), modified]".

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

- Draft ITU-T Recommendation I.375 (1995): "Network Capabilities to support Multimedia Services".

- ITU-T Recommendation Q.2650 (1995): "Broadband-ISDN, interworking between Signalling System No. 7 broadband ISDN User Part (B-ISUP) and digital subscriber Signalling System No. 2 (DSS 2)

- Draft ITU-T Recommendation Q.2721 (1996): "Broadband Integrated Services Digital Network (B-ISDN) - B-ISDN User Part (B-ISUP) - NNI: Overview of Capability Set 2 step 1".

- Draft ITU-T Recommendation Q.2722.1 (1996): "Broadband Integrated Services Digital Network (B-ISDN) - B-ISDN User Part (B-ISUP) - NNI Specification for Point-to-Multipoint Call/Connection Control".

- Draft ITU-T Recommendation Q.2722.2 (1996): "Broadband Integrated Services Digital Network (B-ISDN) - B-ISDN User Part (B-ISUP) - Multiconnection Call Procedures".

- Draft ITU-T Recommendation Q.2723.1 (1996): "Broadband Integrated Services Digital Network (B-ISDN) - B-ISDN User Part (B-ISUP) - Support of Additional Traffic Parameters (SBR - Statistical Bit Rate) and Quality of Service (QoS)".

- Draft ITU-T Recommendation Q.2723.2 (1996): "Broadband Integrated Services Digital Network (B-ISDN) - B-ISDN User Part (B-ISUP) - Support of Additional Traffic Parameters (ABR - Available Bit Rate)".

- Draft ITU-T Recommendation Q.2723.3 (1996): "Broadband Integrated Services Digital Network (B-ISDN) - B-ISDN User Part (B-ISUP) - Support of Additional Traffic Parameters (ABT - ATM Block Transfer)".

- Draft ITU-T Recommendation Q.2723.4 (1996): "Broadband Integrated Services Digital Network (B-ISDN) - B-ISDN User Part (B-ISUP) - Support of Additional Traffic Parameters (CDV Tolerance)".

- Draft ITU-T Recommendation Q.2725.1 (1996): "Broadband Integrated Services Digital Network (B-ISDN) - B-ISDN User Part (B-ISUP) - Support of Negotiation during Setup Phase".

- Draft ITU-T Recommendation Q.2725.2(1996): "Broadband Integrated Services Digital Network (B-ISDN) - B-ISDN User Part (B-ISUP) - Modification Procedures".

- Draft ITU-T Recommendation Q.2726.4 (1996): "Broadband Integrated Services Digital Network (B-ISDN) - B-ISDN User Part (B-ISUP) - User generated ID".

- ITU-T Recommendation Q.2761 (1995): "Broadband integrated services digital network (B-ISDN) - Functional description of the B-ISDN user part (B-ISUP) of signalling system No. 7".

- ITU-T Recommendation Q.2762 (1995): "Broadband integrated services digital network (B-ISDN) - General Functions of messages and signals of the B-ISDN user part (B-ISUP) of Signalling System No. 7 "

- ITU-T Recommendation Q.2763 (1995): "Broadband Integrated Services Digital Network (B-ISDN) - Signalling System No. 7 B-ISDN User Part (B-ISUP) - Formats and codes".

- ITU-T Recommendation Q.2764 (1995): "Broadband Integrated Services Digital Network (B-ISDN) - Signalling System No. 7 B-ISDN User Part (B-ISUP) - Basic call procedures".

- Draft ITU-T Recommendation Q.293x (1996): "Broadband Integrated Services Digital Network (B-ISDN) - Digital subscriber signalling system No. 2 (DSS 2) - Generic Concepts for the Support of Multipoint and Multiconnection Calls".

- Draft ITU-T Recommendation Q.2932.1 (1996): "Broadband Integrated Services Digital Network (B-ISDN) - Digital subscriber signalling system No. 2 (DSS 2) - Generic Functional Protocol (Core Functions)".

- ITU-T Recommendation Q.2961 (1995): "Broadband Integrated Services Digital Network (B-ISDN) - Digital subscriber signalling system No. 2 (DSS 2) - Additional traffic parameters ".

- Draft ITU-T Recommendation Q.2961.2 (1996): "Broadband Integrated Services Digital Network (B-ISDN) - Digital subscriber signalling system No. 2 (DSS 2) - Support of ATM Transfer Capabilities (ATC)".

- Draft ITU-T Recommendation Q.2961.3 (1996): "Broadband Integrated Services Digital Network (B-ISDN) - Digital subscriber signalling system No. 2 (DSS 2) - Support of Additional Traffic Parameters (ABT - ATM Block Transfer)".

- Draft ITU-T Recommendation Q.2961.4 (1996): "Broadband Integrated Services Digital Network (B-ISDN) - Digital subscriber signalling system No. 2 (DSS 2) - Support of Additional Traffic Parameters (ABR - Available Bit Rate)".

- Draft ITU-T Recommendation Q.2961.5 (1996): "Broadband Integrated Services Digital Network (B-ISDN) - Digital subscriber signalling system No. 2 (DSS 2) - Support of Additional Traffic Parameters (CDV tolerance).

- Draft ITU-T Recommendation Q.2963.1 (1996): "Broadband Integrated Services Digital Network (B-ISDN) - Digital subscriber signalling system No. 2 (DSS 2) - Connection Characteristics Modification".

- ITU-T Recommendation Q.2971 (1995): "Broadband Integrated Services Digital Network (B-ISDN) - Digital subscriber signalling system No. 2 (DSS 2) - User-network interface layer 3 specification for point-to-multipoint call/connection control".

- Draft ITU-T Recommendation Q.298x (1996): "Broadband Integrated Services Digital Network (B-ISDN) - Digital subscriber signalling system No. 2 (DSS 2) - UNI Point-to-Point Multiconnection Call Control".

- Draft ISO/IEC 13818-6 (1995): "Information technology - Generic coding of moving pictures and associated audio information - MPEG-2 digital storage media command and control".

- The ATM Forum (1994): "ATM UNI 3.1 Specification".

- Draft The ATM Forum (1996): "SAA Audio-visual Multimedia Service (AMS) Version 1".

- Draft The ATM Forum (1995): "Draft text for Third Party Call Setup capability".

- DAVIC (1995): "DAVIC 1.0 Specifications".

History

Document history	
August 1996	First Edition

ISBN 2-7437-0643-0
Dépôt légal : Août 1996