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SECTION 2

DESCRIPTION OF ISDNs

Recommendation I.120

INTEGRATED SERVICES DIGITAL NETWORKS (ISDNs)

(Malaga-Torremolinos, 1984)

1 Principles of ISDN

1.1 The main feature of the ISDN concept is the support of a wide range of voice and non-voice applications in the same network. A key element of service integration for an ISDN is the provision of a range of services (see Part II of the I-Series in this Fascicle) using a limited set of connection types and multipurpose user-network interface arrangements (see Parts III and IV of the I-Series in Fascicle III.8).

1.2 ISDNs support a variety of applications including both switched and non-switched connections. Switched connections in an ISDN include both circuit-switched and packet-switched connections and their concatenations.

1.3 As far as practicable, new services introduced into an ISDN should be arranged to be compatible with 64 kbit/s switched digital connections.

1.4 An ISDN will contain intelligence for the purpose of providing service features, maintenance and network management functions. This intelligence may not be sufficient for some new services and may have to be supplemented by either additional intelligence within the network, or possibly compatible intelligence in the user terminals.

1.5 A layered protocol structure should be used for the specification of the access to an ISDN. Access from a user to ISDN resources may vary depending upon the service required and upon the status of implementation of national ISDNs.

1.6 It is recognized that ISDNs may be implemented in a variety of configurations according to specific national situations.

2 Evolution of ISDNs

2.1 ISDNs will be based on the concepts developed for telephone IDNs and may evolve by progressively incorporating additional functions and network features including those of any other dedicated networks such as circuit-switching and packet-switching for data so as to provide for existing and new services.

2.2 The transition from an existing network to a comprehensive ISDN may require a period of time extending over one or more decades. During this period arrangements must be developed for the interworking of services on ISDNs and services on other networks (see Part V).

2.3 In the evolution towards an ISDN, digital end-to-end connectivity will be obtained via plant and equipment used in existing networks, such as digital transmission, time-division multiplex switching and/or space-division multiplex switching. Existing relevant Recommendations for these constituent elements of an ISDN are contained in the appropriate series of Recommendations of CCITT and of CCIR.

2.4 In the early stages of the evolution of ISDNs, some interim user-network arrangements may need to be adopted in certain countries to facilitate early penetration of digital service capabilities. Arrangements corresponding to national variants may comply partly or wholly with I-Series Recommendations. However, the intention is that they not be specifically included in the I-Series.

2.5 An evolving ISDN may also include at later stages switched connections at bit rates higher and lower than 64 kbit/s.

Recommendation I.121

BROADBAND ASPECTS OF ISDN

(Melbourne, 1988)

Foreword

This Recommendation should be interpreted as a guideline to the objective of providing more detailed Recommendations on all broadband aspects of ISDN (B-ISDN) during the next Study Period (1989-1992).

The Recommendation was elaborated taking into account the following:

— the emerging demand for broadband services;

— the availability of high speed transmission, switching and signal processing technologies;

— the need for covering broadband aspects of ISDN, in CCITT Recommendations,

— the need to integrate both interactive and distribution services;

— the need to integrate both circuit and packet transfer modes into one universal broadband network;

— the need to provide flexibility to both user and operator.

1 Principles and concept

1.1 *Principles of B-ISDN*

The main feature of the ISDN concept is the support of a wide range of audio, video and data applications in the same network. A key element of service integration for an ISDN is the provision of a range of services using a limited set of connection types and multipurpose user-network interfaces.

In the context of this Recommendation, the term B-ISDN is used for convenience in order to refer to and emphasize the broadband aspects of ISDN. The intent, however, is that there be one comprehensive notion of an ISDN which provides broadband and other ISDN services.

B-ISDNs support both switched and non-switched connections. Connections in a B-ISDN support both circuit-mode and packet-mode services.

A B-ISDN will contain intelligence for the purpose of providing service features, maintenance and network management functions. This intelligence may not be sufficient for some new services and may have to be supplemented

by either additional intelligence within the network, or possibly compatible intelligence in user terminals.

A layered structure should be used for the specification of the access protocol to a B-ISDN.

It is recognized that ISDNs may be implemented in a variety of configurations according to specific national situations.

1.2 *Evolution of B-ISDN*

1.2.1 *Target transfer mode*

Asynchronous transfer mode (ATM) is the target transfer mode solution for implementing a B-ISDN. It will influence the standardization of digital hierarchies and multiplexing structures, switching and interfaces for broadband signals.

ATM as used in this Recommendation concerns a specific packet-oriented transfer mode using the asynchronous time division multiplexing technique: the multiplexed information flow is organized in fixed size blocks, called cells. A cell consists of a user information field and a header; the primary role of the header is to identify cells belonging to the same virtual channel on an asynchronous time division multiplex. Cells are assigned on demand, depending on the source activity and the available resources. Cell sequence integrity on a virtual channel is preserved by the ATM layer

ATM is a connection-oriented technique. Header values are assigned to each section of a connection when required and released when no longer needed. The connections identified by the headers remain unchanged during the lifetime of a call. Signalling and user information are carried on separate virtual channels.

ATM will offer a flexible transfer capability common to all services, including connectionless services.

1.2.2 *Evolution steps*

B-ISDN will be based on the concepts developed for ISDN and may evolve by progressively incorporating additional functions and services (e.g. high quality video applications).

The deployment of B-ISDN may require a period of time extending over one or more decades. Thus, arrangements must be developed for the interworking of services on B-ISDN and services on other networks.

In the evolution towards a B-ISDN, digital end-to-end connectivity will be obtained in part via plant and equipment used in existing and planned networks, such as digital transmission and switching. Relevant Recommendations for these constituent elements of a B-ISDN are contained in the appropriate series of Recommendations of CCITT and of CCIR.

In the early stages of the evolution of B-ISDN, some interim user-network arrangements [e.g. combinations of synchronous transfer mode (STM) and ATM techniques] may need to be adopted in certain countries to facilitate early penetration of digital service capabilities.

2 Service aspects of B-ISDN

2.1 *General*

The principles of services supported by an ISDN are described in the I.200-Series Recommendations. The description of B-ISDN services is based on the principles of the existing I-Series Recommendations.

This section describes the classification of broadband services, the definition of those service classes, and gives examples of services in each service class proposed to be supported by the ISDN.

This classification does not take into account the location of the implementation of the functions either in the network or in the terminals. This classification is primarily from the point of view of the network and not from the user point of view.

Depending on their communication functions and applications, the services to be supported by the B-ISDN may be internationally standardized and offered by the Administration as bearer services or teleservices.

2.2 *Service classes*

Depending on the different forms of the broadband communication and their applications, two main service categories have been identified: interactive services and distribution services. The interactive services are subdivided into three classes of services, viz., the conversational services, the messaging services, and the retrieval services. The distribution services are represented by the class of distribution services without user individual presentation control and the class of distribution services with user individual presentation control (see Figure 1/I.121).

Figure 1/I.121, (N), p.

2.3 *Definition of service classes*

2.3.1 **Conversational services**

Conversational services in general provide the means for bidirectional dialogue communication with real-time (no store-and-forward) end-to-end information transfer from user to user or between user and host (e.g. for data processing). The flow of the user information may be bidirectional symmetric, bidirectional asymmetric and in some specific cases (e.g. such as video surveillance), the flow of information may be unidirectional. The information is generated by the sending user or users, and is dedicated to one or more individual communication partners at the receiving site.

Examples of broadband conversational services are videotelephony, video conference and high speed data transmission.

2.3.2 **Messaging services**

Messaging services offer user-to-user communication between individual users via storage units with store-and-forward, mailbox and/or message handling (e.g. information editing, processing and conversion) functions.

Examples of broadband messaging services are message handling services and mail services for moving pictures (films), high resolution images and audio information.

2.3.3 **Retrieval services**

The user of retrieval services can retrieve information stored in information centres and in general provided for public use. This information will be sent to the user on his demand only. The information can be retrieved on an individual basis. Moreover, the time at which an information sequence is to start is under the control of the user.

Examples are broadband retrieval services for film, high resolution image, audio information, and archive information.

2.3.4 **Distribution services without user individual presentation control**

These services include broadcast services. They provide a continuous flow of information which is distributed from a central source to an unlimited number of authorized receivers connected to the network. The user can access this flow of information *without* the ability to determine at which instant the distribution of a string of information will be started. The user cannot control the start and order of the presentation of the broadcast information. Depending on the point of time of the user's access, the information will not be presented from its beginning.

Examples are broadcast services for television and audio-programmes.

2.3.5 **Distribution services with user individual presentation control**

Services of this class also distribute information from a central source to a large number of users. However, the information is provided as a sequence of information entities (e.g. frames) with cyclical repetition. So, the user has the ability of individual access to the cyclical distributed information and can control the start and order of presentation. Due to the cyclical repetition, the information entities selected by the user will always be presented from its beginning.

One example of such a service is full channel broadcast videography.

2.4 *Examples of broadband services*

Table A-1/I.121 contains examples of possible services, their applications and some possible attribute values describing the main characteristics of the services.

Guideline prose definitions, service attributes and attribute values for describing a number of possible broadband services are presented in Annex B. Services described include:

— broadband unrestricted bearer services;

— high quality broadband video telephony:

— high quality broadband video conference;

— existing quality and high definition TV distribution;

— broadband Videotex.

2.5 *User-network interface from the service point of view*

2.5.1 *Need for simultaneous services*

The user-network interface will be required to support a varying mixture of services to broadband network users. The simultaneous services required at the interface will vary between customers, e.g. the requirements for residential customers may differ from those business customers. The capacity of the interface, the mix of simultaneous services, and the bit rate required for each service are all interrelated.

The user-network interface must be able to accommodate at least an $_4$user rate (see Note), (or an equivalent mix of services whose aggregate bit rate may be up to that of an H_4user rate), plus some additional narrow-band services and signalling. Moreover, there may be a need to carry a greater volume of services and to provide the capability of supporting services whose rates exceed the H_4user rate.

The study of simultaneous service requirements is important and will impact broadband aspects of ISDN such as bit rates, user interfaces, protocol processing, etc.

Note — The term H_4 user rate is used here to give an indication of the range of bit rates available to the user (see § 5). No implications for channel provision are intended.

2.5.2 *Flexibility of the user-network interface*

Not only will ISDNs in different environments need to support a large variety of customer requirements for different services, but also the access requirements of a given customer may often change from time to time.

For these reasons, it is necessary that the user network interface be flexible and capable of offering dynamic allocation of resources to services.

3 Architecture models

3.1 *Functional architecture*

The general architecture of the ISDN from the functional point of view is described in Recommendation I.324.

3.2 *Basic architectural model*

Figure 2/I.121 shows the main information transfer and signalling functional components of ISDN including broadband aspects:

— local functional capabilities (LFC), i.e. local exchange functions and possibly including remote switching cross-connect muldexes, etc.;

— inter-exchange signalling functional entities;

— 64 kbit/s based functional entities;

— broadband functional entities.

These components need not be provided by distinct networks but may be combined as appropriate for a particular implementation.

Figure 2/I.121, (N), p.

3.3 *Reference configurations*

3.3.1 *Reference configuration for the user-network interface*

The reference configuration defined in Figure 1/I.411 and shown here as Figure 3/I.121 is considered sufficiently general to be applicable not only for a basic access and a primary rate access but also to a broadband access. Both reference points S and T are valid for broadband accesses.

The functions of the NT1 are, in principle, identical for 64 kbit/s based ISDN and B-ISDN. The same applies to the NT2.

Figure 3/I.121, (N), p.

3.3.2 *Physical realization of reference configurations and user-network interfaces*

In order to clearly illustrate the broadband aspects, the notations for reference points and for functional groupings with broadband capabilities are appended with the letter B (e.g. B-NT1, T_B).

Interfaces at reference points S_B and T_B will be standardized. These interfaces will support all ISDN services.

Figure 4/I.121 gives examples of physical configurations illustrating combinations of physical interfaces at various reference points. The examples cover configurations that could possibly the supported by standardized interfaces and reference points S_B and T_B. Other configurations may also be supported.

Configurations *j)* | and *k* | in Figure 4/I.121 require that the interface specifications for S_B and for T_B have a high degree of commonality. Such commonality is highly desirable. The feasibility of achieving the needed commonality requires further study.

One objective in designing interfaces is to support multiple terminals simultaneously via simplified B-NT2 (e.g. a B-NT2 consisting solely of physical connections).

3.4 *B-ISDN protocol model for ATM*

The B-ISDN protocol model for ATM is shown in Figure 5/I.121. Two specific layers related to the ATM functions are:

— an ATM layer that is common to all services and provides cell transfer capabilities; and

— an adaptation layer that is service dependent.

3.4.1 *ATM layer*

The boundary between the ATM layer and the service adaptation layer corresponds to the boundary between functions devoted to the header and functions devoted to the information field.

3.4.2 *Adaptation layer*

The adaptation layer supports higher layer functions of the user and control planes and supports connections between ATM and non-ATM interfaces. Information is mapped by the adaptation layer into ATM cells. At the transmitting end, information units (e.g. LAPD frames) are segmented or information units (e.g. PCM voice samples) are collected to be inserted into ATM cells. At the receiving end the information units are reassembled (e.g. LAPD frames) or

read-out (e.g. PCM voice samples) from ATM cells. Any adaptation layer specific information (e.g. data field length, time stamps, sequence number) that must be passed between peer adaptation layers is contained in the information field of the ATM cell.

The adaptation layer could be terminated in a Network Termination (NT), Network Adapter (NA), Terminal Adapters (TA), Terminal Equipment (TE) and Exchange Termination (ET) (see Figure 6/I.121). Network adapter functions include those adaptation functions that are necessary between ATM and non-ATM parts of ISDN.

Figure 4/I.121, (N), p. 4

Figure 5/I.121, (N), p. 5

Figure 6/I.121, (N), p. 6

3.4.3 *Adaptation layer functions*

Examples of adaptation functions include Continuous Bit Stream Oriented (CBO) services adaptation functions, existing packet mode services adaptation functions and connectionless services adaptation functions:

— CBO adaptation functions

CBO oriented services are those which involve an uninterrupted flow of digital information; for example; 64 kbit/s PCM voice. The CBO adaptation functions support these services over an ATM network. Within the adaptation layer the following functions may be performed:

1) cell assembly and disassembly;

2) compensation for the variable delay of the ATM network;

3) handling of lost cell conditions;

4) clock recovery. Some alternatives are to synchronize the output bit stream to the network clock or to the source bit stream;

5) mapping of the control signal (e.g. V.35) into the ATM cell stream.

— Existing packet mode services adaptation functions

Existing packet mode services (e.g. LAPD) can be supported by the CBO adaptation functions. This does not take advantage of the idle periods between data transmission. The packet mode adaptation layer provides bandwidth savings by taking advantage of the bursty nature of packet services. Operations that may be carried out by the packet mode adaptation functions include:

1) detection of information blocks from the higher layer;

2) dividing information blocks into ATM cells;

3) handling of partially filled cells;

4) reassembling information blocks from received ATM cells;

5) sending information blocks to the higher layer;

6) rate adaptation;

7) action on loss of cells.

— Adaptation functions may be defined for connectionless services.

4 Asynchronous transfer mode characteristics

4.1 *General considerations*

The information field is transported transparently by the ATM layer; no processing (e.g. error control) is performed on the information field at the ATM layer.

The header and the information field each consist of a fixed integer number of octets at a given reference point. The information field length is the same for all connections at all reference points where the ATM technique is applied.

4.2 *Header functions*

The header contains just the information required to transfer the information field through the ATM network. Application-oriented or service-oriented information does not appear inside the header.

The three following functions are mandatory:

— virtual channel identification (VCI);

— error detection on the header;

— unassigned cell indication.

The need for additional functions supported by the header is for further study. The following candidates have been identified:

— error correction on the header;

— Quality of Service identification (e.g. delay or loss priority);

— payload type (e.g. virtual circuit test cells);

— cell loss detection;

— access control at the user-network interface (UNI);

— cell sequence numbering;

— terminal identifier;

— virtual path identification;

— line equipment identification.

4.3 *Header format*

VCI and error control are supported by explicit fields. Whether identified functions are explicitly (by fields) or implicitly (by VCI) supported is for further study.

4.4 *Header size*

The size of the header should be chosen in the range of 3 to 8 octets. To determine the appropriate size, urgent study on the header functions mentioned in § 4.2 and on the capacity for future and additional uses is recommended. As an objective, the header size should be the same at all reference points. The feasibility of this is for further study.

4.5 *Information field size*

The size of the information field should be chosen in the range of 32 to 120 octets. To determine the appropriate size, the two following items need urgent study:

— end-to-end Quality of Service covering acceptable end-to-end delay and loss of information;

— transmission efficiency: the information field size-to-header size ratio should allow all existing and envisaged services to be efficiently supported on the transmission media.

5 Broadband channel rates

In this section channels refer to virtual channels with appropriate transmission channel bit rates. In addition to B, H_o and H_1 channels, B-ISDN will support broadband channels H_2 and H_4 having the following bit rates:

1) $H_{2\backslash d1}$ broadband channel : 32 | 68 kbit/s;

2) $H_{2\backslash d2}$ broadband channel :

— in the approximate range of 43 to 45 Mbit/s;

— an integer multiple of 64 kbit/s;

— not greater than the payload of existing third level asynchronous transmission systems of the 1.5 Mbit/s based hierarchy.

Consistent with these three requirements, one objective is to maximize the bit rate of the $H_{2\backslash d2}$ broadband channel.

3) H_4 broadband channel :

— in the range of 132 to 138.240 Mbit/s;

— an integer multiple of 64 kbit/s.

When subsequently defining the exact bit rate, the following factors will be taken into account:

— the ATM basis of the 150 Mbit/s user network interface;

— the possible need, during an interim period, to use STM techniques to carry the bit stream of this channel in transmission systems based on the existing and the new digital hierarchy;

— the possible need to support a television signal multiplex as specified by the CMTT.

The final specification of $H_{2\d2}$ and H_4 broadband channel rates should be such that:

$$4 \times H_{2\d1} \text{ rate } H_4 \text{ rate}$$

$$3 \times H_{2\d2} \text{ rate } H_4 \text{ rate}$$

Additional broadband channels may be defined if necessary.

6 User-network interface (UNI)

6.1 *General*

This section defines some structural, physical and functional characteristics of broadband user-network interfaces characteristics discussed apply to interfaces at the T_B and at the S_B reference points. The commonality between the interface of T_B and at S_B reference points is a matter of further study.

B-ISDN user-network interfaces will be standardized at two bit rates. One of these will be at approximately 150 Mbit/s and the other will be at approximately 600 Mbit/s. The broadband UNI need not be symmetrical. Each of these interfaces must be capable of supporting broadband services as well as 64 kbit/s based ISDN services.

As an objective, the target solution for both B-ISDN user-network interfaces is based on ATM.

Other interface capabilities such as maintenance are not considered in this section.

6.2 *Structure of 150 Mbit/s UNI*

The structure of 150 Mbit/s UNI will be unique and will be based on one of the following alternatives:

1) ATM

This structure shown in case *a)* | and case *b)* | of Figure 7/I.121 uses only labelled multiplexing with cell interleaving alternatives:

a) no frame structure is imposed on this interface;

b) all cells are aligned in a frame structure constructed by periodically located synchronization cells.

2) ATM within a non-ATM frame

This structure, shown in case *c)* | of Figure 7/I.121, places ATM cells in the payload of a frame constructed by using overhead not based on ATM cells.

Note — In the evolution to B-ISDN, a frame structure similar to case *e)* | of Figure 8/I.121 may also be considered as one alternative.

Figure 7/I.121, (N), p. 7

Figure 8/I.121, (N), p. 8

6.3 *Structure of 600 Mbit/s UNI*

Five candidate structures as shown in Figure 8/I.121 have been identified for the 600 Mbit/s UNI. Structures shown in cases *a)* , *b)* and *c)* of Figure 8/I.121 are identical to cases *a)* , *b)* and *c)* of Figure 7/I.121. Structures shown in cases *d)* and *e)* of Figure 8/I.121 have the payload partitioned into payload modules , where case *e)* shows some of these in STM, for possible use in an interim period.

The 600 Mbit/s UNI may be constructed as if derived by (bit, byte, cell) interleaving of four 150 Mbit/s structures and in this case, the gross bit rate of the 600 Mbit/s UNI will be four times the gross bit rate of the 150 Mbit/s UNI.

The structure of the 600 Mbit/s interface may need to provide for the capability of supporting services whose rates exceed the rate of the H_4 broadband channel. This item requires further study.

6.4 *Physical and functional characteristics*

6.4.1 *Physical characteristics*

Layer 1 of the broadband UNI requires electrical or optical transmission capable of supporting the requisite rate.

As an objective, the interfaces should allow for the support of point-to-multipoint configurations.

6.4.2 *Functional characteristics*

The channel mix need not be the same in both directions of transmission.

6.4.3 *Timing characteristics*

The NT1 will derive bit timing information from the aggregate bit stream received from the network.

In case *a)* | of Figure 7/I.121 and of Figure 8/I.121, no frame timing is provided. Only cell delineation is provided using randomly located synchronization cells.

In case *b)* | of Figure 7/I.121 and of Figure 8/I.121, frame timing is provided using periodically located synchronization cells.

In case *c)* | of Figure 7/I.121 and cases *c)* , *d)* | and *e)* | of Figure 8/I.121, frame timing is provided from the overhead information i.e. cells are delineated by inserting synchronization cells randomly or periodically. Alternatively, cell delineation can be achieved by using the periodic structure of the payload.

In all cases the exact method for cell delineation is for further study.

7 Network aspects

7.1 *Generalities*

UNI will be defined according to user needs. Maximum commonality between UNI and the network node interfaces is aimed for.

7.2 *Transmission of ATM*

ATM can be supported by any digital transmission hierarchy or system (e.g. existing hierarchies of Rec. G.702, the proposed synchronous hierarchy of Rec. G.707, G.708, G.709 and any future hierarchy that may be defined). The transfer of information by means of a stream of cells is the basic concept of ATM. It is desirable to be able to perform this process at the highest practical bit rate. Standardization of a broadband digital transmission hierarchy has to accommodate these principles.

7.3 *Synchronization*

The need for synchronization in the ATM network requires further study.

7.4 *Signalling*

In B-ISDN, signalling and user information are carried on separate ATM virtual channels connected to the network connection control management via separate ATM virtual channels. Enhanced or extended I.441 and I.451 access protocols will be used in B-ISDN to accommodate the additional B-ISDN capabilities.

7.5 *Traffic management and usage monitoring*

7.5.1 *Source characterization*

Two types of service sources can be classified according to the traffic patterns they produce:

— constant traffic sources produce a fixed rate of information, e.g. PCM encoded speech;

— variable traffic sources produce a variable rate of information, e.g. bursty data sources.

7.5.2 *Source indication at call establishment*

The signalling messages sent by a user to establish a call may include the following type of information:

— source traffic characteristics, e.g. burstiness;

— required network transport capabilities, e.g. Quality of Service parameters.

7.5.3 *Network resource management at call establishment*

In response to the source indication the network may manage resources in several ways, such as:

— dedicate resources to a given connection;

— share resources among multiple connections;

— share resources among a class of connections (e.g. connections supporting bursty data sources).

For each of the above-mentioned alternatives, networks may manage resources according to the following examples:

— *Case A*

In this case sufficient resources are provided to accommodate the expected maximum source bit rate. It could be used for continuous bit stream oriented services, as well as other services.

— *Case B*

In this case resources are provided at a level somewhere between the expected peak and average source bit rate. This strategy could be applied to bursty sources.

Other ways of managing resources may also be envisaged.

7.5.4 *Usage monitoring*

In ATM a user could attempt to send traffic exceeding the characteristic negotiated at call establishment. ATM networks will provide usage monitoring to detect such situations. When the negotiated capacity is being exceeded, appropriate action is taken by the network to protect the Quality of Service provided to other network users.

7.5.5 *Flow control*

For further study.

7.5.6 *Congestion handling*

For further study.

8 Adaptation between ATM and non-ATM parts of the ISDN

Interworking is envisaged between ATM based and 64 kbit/s based networks and terminals. For that purpose, network adaptations and terminal adaptations will be defined, for example:

— to connect a terminal according to standardized interfaces (I-Series Recommendations) to the ATM network;

— to provide internetworking between ATM and 64 kbit/s based parts of the ISDN.

This item requires further study.

ANNEX A
(to Recommendation I.121)

Examples of broadband services

Table A-1/I.121 contains examples of possible services, their applications and some possible attribute values describing the main characteristics of the services.

H.T. [1T1.121]

TABLE A-1/I.121

Possible broadband services in ISDN

| ua)

Service classes Examples of broadband services } Some possible attribute values | ug), h) }	Type of information	{
	Applications	{
Conversational services Moving pictures (video) and sound }	{	
Broadband | ub), c) video-telephony }	{	
Communication for the transfer of voice (sound), moving pictures, and video scanned still images and documents between two locations (person-to-person) | uc) — Tele-education — Tele-shopping — Tele-advertising }	{	
— Demand/reserved/permanent — Point-to-point/multipoint — Bidirectional symmetric/bidirectional asymmetric — (Value for information transfer rate is under study) }		
		{
Broadband | ub), c) videoconference }	{	
Multipoint communication for the transfer of voice (sound), moving pictures, and video scanned still images and documents between two or more locations (personne-to-group, group-to-group | uc) — Tele-education — Tele-shopping — Tele-advertising }	{	
— Demand/reserved/permanent — Point-to-point/multipoint — Bidirectional symmetric/bidirectional asymmetric }		
	Video-surveillance	{

—
Building security
—
Traffic monitoring
}
{
—
Demand/reserved/per
ma
nent
—
Point-to-point/multipoint
—
Bidirectional symmetric/unidirectional
}

{
Video/audio information transmission service
}
{
—
TV signal transfer
—
Video/audio dialogue
—
Contribution of information
}
{
—
Demand/reserved/per
ma
nent
—
Point-to-point/multipoint
—
Bidirectional symmetric/bidirectional asymmetric
}

Sound
{
Multiple sound- programme signals
}
{
—
Multilingual commentary channels
—
Multiple programme transfers
}
{
—
Demand/reserved/per
ma
nent
—
Point-to-point/multipoint
—
Bidirectional symmetric/bidirectional asymmetric
}

Data
{
High speed unrestricted digital information transmission
service
}
{
—
High speed data transfer
—
LAN (local area network) interconnection
—
Computer-computer interconnection

— Transfer of video and other information types — Still image transfer — Multi-site interactive CAD/CAM }	{			
— Demand/reserved/per ma nent — Point-to-point/multipoint — Bidirectional symmetric/bidirectional asymmetric }				
		{ High volume file transfer service		
}	— Data file transfer	{		
— Demand — Point-to-point/multipoint — Bidirectional symmetric/bidirectional asymmetric }				

Tableau A-1/I.121, [1T1.121], p. 9

H.T. [2T1.121]
TABLE A-1/I.121 *(continued)*

Service classes Examples of broadband services } Some possible attribute values | ug), h) }	Type of information	Applications	{

{
Conversational services *(continued)*
}
	Data *(continued)*	High speed teleaction	{

— Realtime control — Telemetry — Alarms }			
	Document	High speed Telefax	{
User-to-user transfer of text, images, drawings, etc. }	{		
— Demand — Point-to-point/multipoint — Bidirectional symmetric/bidirectional asymmetric }			
			{
High resolution image communication service }	{		
— Professional images — Medical images — Remote games and game networks }			
			{
Document communication service }	{		
User-to-user transfer of mixed documents | ud) }	{		
— Demand — Point-to-point/multipoint — Bidirectional symmetric/bidirectional asymmetric }			
Messaging services Moving pictures (video) and sound }	{		
Electronic mailbox service for the transfer of moving pictures and accompanying sound }	Video mail service		{
— Demand —	{		

Point-to-point/multipoint
—
Bidirectional symmetric/uni
directional (for further
study)
}

	Document	Document mail service	{
Electronic mailbox service for mixed documents | ud)			
}	{		
—			
Demand			
—			
Point-to-point/multipoint			
—			
Bidirectional symmetric/uni directional (for further study)			
}			
Retrieval services	{		
Text, data, graphics, sound, still images, moving pictures			
}	Broadband videotex	{	
—			
Videotex including moving pictures			
—			
Remote education and train ing			
—			
Telesoftware			
—			
Tele-shopping			
—			
Tele-advertising			
—			
News retrieval			
}	{		
—			
Demand			
—			
Point-to-point			
—			
Bidirectional asymmetric			
}			
		Video retrieval service	{
—			
Entertainment purposes			
—			
Remote education and train ing			
}	{		
—			
Demand/reserved			
—			
Point-to-point/multipoint | uf)			
—			
Bidirectional asymmetric			
}			
		{	
High resolution image retrieval service			

} — Entertainment purposes — Remote education and train-ing — Professional image communications — Medical image communications	{			
} — Demand/reserved — Point-to-point/multipoint | uf) — Bidirectional asymmetric }	{			
‘‘Mixed documents’’ retrieval from information centres, archives, etc. | ud), e)		Document retrieval service	{	
} — Demand — Point-to-point/multipoint | uf) — Bidirectional asymmetric }	{			
		Data retrieval service	Telesoftware	

Tableau A-1/I.121, [2T1.121], p. 10

H.T. [3T1.121]
TABLE A-1/I.121 *(continued)*

Service classes Examples of broadband services } Some possible attribute values | ug), h) }	Type of information	{
	Applications	{

{
Distribution services without user individual presentation control
}
	Video	{

Existing quality TV distribution service (PAL, SECAM, NTSC) }	TV programme distribution	{
— Demand (selection)/per ma nent — Broadcast — Bidirectional asymmetric/unidirectional }		
		{
Extended quality TV distribution service — Enchanced definition TV distribution service — High quality TV }	TV programme distribution	{
— Demand (selection)/per ma nent — Broadcast — Bidirectional asymmetric/unidirectional }		
		{
High definition TV distribution service }	TV programme distribution	{
— Demand (selection)/per ma nent — Broadcast — Bidirectional asymmetric/unidirectional }		
		{
Pay-TV (pay-per-view, pay-per-channel) }	TV programme distribution	{
— Demand (selection)/per ma nent — Broadcast/multipoint		

—
Bidirectional asymmetric/unidirectional
}

Text, graphics, still images Document distribution service {
—
Electronic newspaper
—
Electronic publishing
} {
—
Demand (selection/per
ma
nent
—
Broadcast/multipoint | uf
)
—
Bidirectional asymmetric/unidirectional
}

Data {
High speed unrestricted digital information distribution
service
} {
—
Distribution of unrestricted data
} {
—
Permanent
—
Broadcast
—
Unidirectional
}

Moving pictures and sound {
Video information distribution service
} {
—
Distribution of video/audio signals
} {
—
Permanent
—
Broadcast
—
Unidirectional
}

{
Distribution services with user individual presentation control
} {
Text, graphics, sound, still images
} {
Full channel broadcast videography
} {
—
Remote education and train
ing
—
Tele-advertising
—

News retrieval — Telesoftware } — Permanent — Broadcast — Unidirectional }	{			

Tableau A-1/I.121, [3T1.121], p. 11

H.T. [4T1.121]

Notes to Table A-1/I.121:

a) In this table only those broadband services are considered which may require higher transfer capacity than that of the H 1 capacity. Services for sound retrieval, main sound applications and visual services with reduced or highly reduced resolutions are not listed.

b) This terminology indicates that a re-definition regarding existing terms has taken place. The new terms may or may not exist for a transition period.

c) The realization of the different applications may require the definition of different quality classes.

d) ‘‘Mixed document’’ means that a document may contain text, graphic, still and moving picture information as well as voice annotation.

e) Special high layer functions are necessary if post-processing after retrieval is required.

f) Further study is required to indicate whether the point-to-multipoint connection represents in this case a main application.

g) At present, the packet mode is dedicated to non-realtime applications. Depending on the final definition of the packet transfer mode, further applications may appear. The application of this attribute value requires further study.

h) For the moment this column merely highlights some possible attribute values to give a general indication of the characteristics of these services. The full specification of these services will require a listing of all values which will be defined for broadband services in Recommendations of the I.200-Series.

H.T. [1T2.121]

TABLE B-1/I.121

Broadband unrestricted bearer services

Attributes	Values		
{			
{			

{
2.
Information transfer rate (Mbit/s)
}
H
2
1, H
2
2 or H
4 channel bit-rate
}
	{		

{
2.1
Peak bit rate (throughput)
}
H
2
1, H
2
2 or H
4 channel or
other bit rate
}
	{	{	

H 2 1, H 2 2 or H 4 channel or other bit rate }	{		

{
2.2
Average bit rate | uc)
}
		As peak bit rate	Under study

{
3.
Information transfer capability
}
	Unrestricted	Unrestricted	

4. Structure Unstructured or 8 kHz integrity | ud) }	{ For further study		

{
5.
Etablishment of communication
}
	Demand/reserved/permanent	Demand/reserved/permanent	

{
6.
Communication configuration
}
	{	

Point-to-point/multipoint/broadcast }	{	
Point-to-point/multipoint/broadcast }		
7. Symmetry Bidirectional symmetric/bidirectional asymmetric/unidirectional }	{ {	
Bidirectional symmetric/bidirectional asymmetric/unidirectional }		

Access attributes
{
8.
Access channel and rate (kbit/s)
8.1 User information
}
	{	

H 2 1, H 2 2 or H 4 for user information }	{	
Virtual channel with H 2 1, H 2 2 or H 4 channel or other bit rates }		
8.2 Signalling/selecting Signalling channel for signalling and OAM | ue) — under study }	{ {	
Signalling channel for signalling and OAM | ue) — under study }		
9. Access protocols Signalling access Protocols 9.1 Layer 1 I.440/441 I.450/451 Need additions for broadband communication }	To be defined {	To be defined
I.440/441 I.450/451 Need additions for broadband communication }		
Information access protocols 9.4 Layer 1 9.5 Layer 2 9.6 Layer 3	To be defined — f) — f)	To be defined — f) — f)

General attributes
{
10.
Supplementary services provided
}
	For further study	For further study

{
11.
Quality of service
—
End-to-end transfer delay
—
Delay jitter
(cell jitter)
—
Error characteristics
—
Information loss probability
}
	For further study	For further study

Notes du Tableau A-1/I.121, [4T1.121], p. 12

ANNEX B
(to Recommendation I.121)

Definitions of possible broadband service

families and their attribute values

B.1 **broadband unrestricted bearer services**

B.1.1 *Definition*

Bearer services which provide unrestricted end-to-end transfer of digital information without alteration between S_B/T_B reference points and require broadband channel rates. User information is transferred over standardized broadband channels for STM (circuit) services or a virtual channel of defined capacity for ATM based services; signalling is provided over a signalling channel.

B.1.2 *Attribute description*

See Table B-1/I.121.

B.2 **high quality broadband videotelephony services**

B.2.1 *Definition*

High quality broadband videotelephony services are symmetrical real-time, bi-directional audio-visual services which provide person-to-person communication for the transfer of high quality voice (sound), moving pictures, and optionally video-scanned still images between two locations.

B.2.2 *Attribute description*

See Table B-2/I.121.

H.T. [1T2.121]
TABLE B-1/I.121
Broadband unrestricted bearer services

Attributes	Values		
{			
{			

{
2.
Information transfer rate (Mbit/s)
}
H
2
1, H
2
2 or H
4 channel bit-rate
}
	{		

{
2.1
Peak bit rate (throughput)
}
H
2
1, H
2
2 or H
4 channel or
other bit rate
}
	{	{	

H 2 1, H 2 2 or H 4 channel or other bit rate }			

{
2.2
Average bit rate | uc)
}
		As peak bit rate	Under study

{
3.
Information transfer capability
}
	Unrestricted	Unrestricted	

4. Structure Unstructured or 8 kHz integrity | ud) }	{ For further study		

{
5.
Etablishment of communication
}
	Demand/reserved/permanent	Demand/reserved/permanent	

{
6.
Communication configuration
}
Point-to-point/multipoint/broadcast
}
Point-to-point/multipoint/broadcast
}
	{
	{	

7. Symmetry Bidirectional symmetric/bidirectional asymmetric/unidirectional } Bidirectional symmetric/bidirectional asymmetric/unidirectional }	{ {	

Access attributes
{
8.
Access channel and rate (kbit/s)
8.1
User information
}
H
2
1, H
2
2 or
H
4 for user information
}
Virtual channel with H
2
1, H
2
2 or H
4
channel or other bit rates
}
	{
	{	

8.2 Signalling/selecting Signalling channel for signalling and OAM | ue) — under study } Signalling channel for signalling and OAM | ue) — under study }	{ {	
9. Access protocols Signalling access Protocols 9.1 Layer 1 I.440/441 I.450/451 Need additions for broadband communication } I.440/441 I.450/451 Need additions for broadband communication } Information access protocols 9.4 Layer 1 9.5 Layer 2 9.6 Layer 3	 To be defined { To be defined — f) — f)	 To be defined To be defined — f) — f)
General attributes { 10. Supplementary services provided		

}	For further study	For further study
{ 11. Quality of service — End-to-end transfer delay — Delay jitter (cell jitter) — Error characteristics — Information loss probability		
}	For further study	For further study

Tableau B-1/I.121, [1T2.121], p. 13

H.T. [2T2.121]
TABLE B-1/I.121*(continued)*

Attributes	Values	

{
12.
Interworking possibilities
}
	For further study	For further study

{
13.
Operational and commercial
}
For further study. This study should include maintenance facilities.
}
For further study. This study should include maintenance facilities.
}
	{
	
	{	

Tableau B-1/I.121, [2T2.121], p. 14

Blanc

H.T. [1T3.121]

TABLE B-2/I.121

High quality broadband videotelephony services

| ua)

Attributes	Values		
{			
{			

{
2.
Information transfer rate | ud) (Mbit/s)
}
H
2
1, H
2
2 or H
4 channel bit-rate
}
	{		

{
2.1
Peak bit rate (throughput)
}
H
2
1, H
2
2 or H
4
channel or other bit rate
}
	{	{	

{
2.2
Average bit rate | ue)
}
		As peak bit rate	Under study

{
3.
Information transfer capability
}
	{
	High quality video + 15 kHz
	audio + user-to-user messages
	}
	{
	High quality video + 15 kHz audio + User-to-user
	messages
	}		

4. Structure	Unstructured	For further study	

{
5.
Establishment of communication
}
	Demand/reserved/permanent	Demand/reserved/permanent

{
6.
Communication configuration
}
	{
	Point-to-point/multipoint
	}
		{
		Point-to-point/multipoint
		}

7. Symmetry	Bidirectional symmetric	Bidirectional symmetric

Access attributes
8. Access channel and rate
	{
	H
	2 or H
	4 (bit rates under study) for user information
	}	

8.1 User information		{
		Virtual channel with H
		2
		1, H
		2
		2 or H
		4
		channel or other bit rate
		}

	{
	Virtual channel with H
	2
	1, H
	2
	2 or H
	4
	channel or other bit rate
	}	

8.2 Signalling	{
	Signalling channel for signalling and OAM-under study
	}	

	{
	Signalling channel under study
	}	

9. Access protocols Signalling access protocols 9.1 Layer 1	To be defined	To be defined
I.440/441 I.450/451 Need additions for broadband communication		

}	{
	I.440/441
	I.450/451
	Need additions for broadband communication
	}	

Information access protocols	To be defined	To be defined
{ 9.4 Layer 1 9.5		

Layer 2 9.6 Layer 3 }	Under study	Under study

{
High layer attributes
}
10. Type of user information
Moving pictures + sound + user-to-user messages
}
	{	

{
11.
Transport (layer 4) functions/protocol
}
	Under study	

{
12.
Session (layer 5) functions/protocol
}
	Under study	

Tableau B-2/I.121, [1T3.121], p. 15

H.T. [2T3.121]
TABLE B-2/I.121 *(continued)*

Attributes	Values	

{
13.
Presentation (layer 6) functions/protocol
}
{
13.1
Video
13.2
Audio
13.3
Auxiliary
13.4
User-to-user messages
}
	{
	Under study. This study should include video, sound, auxiliary information such as text, facsimile, etc., and user-to-user control messages
	}	

{
14.
Application (layer 7) function/protocol
}
{
14.1
Video
14.2
Audio
14.3
Auxiliary
14.4
User-to-user messages
}
	Under study	

General attributes
{
15.
Supplementary services provided
}
	{
	As for telephony; others under study
	}	

16. Quality of service
16.1 Video
	{
	Equal to or higher than existing TV
	}	

16.2 Audio	15 kHz stereo | uf)	

{
—
End-to-end transfer delay
—
Delay jitter
(call jitter)
—
Error characteristics
—
Information loss probability
}
	Under study	Under study

{
17.
Interworking possibilities
}
	{
	With other videotelephone, telephone, and video-conference	

services }	

{
18.
Operational and commercial
}
For further study. This study should include maintenance facilities
}
	{

Tableau B-2/I.121, [2T3.121], p. 16

B.3 **high quality broadband videoconference services**

B.3.1 *Definition*

High Quality Broadband Videoconference services provide person-to-person or group-to-group capability for the transfer of different high quality information types primarily including voice (sound), full motion video, moving pictures, and, optionally, video-scanned still images, documents and other video information, to support conferencing between two or more locations.

B.3.2 *Attribute description*

See Table B-3/I.121.

B.4 **high definition TV and existing quality TV distribution services**

B.4.1 *Definition*

High definition TV (HDTV)/existing quality TV distribution services provide the capability of distributing TV programmes with the quality of HDTV/existing quality TV as appropriate.

B.4.2 *Attribute description*

See Table B-4/I.121.

B.5 **broadband videotex services**

B.5.1 *Definition*

Broadband Videotex services are interactive services which provide, through appropriate access by standardized procedures, for users of broadband videotex terminals to communicate with data bases via telecommunications networks.

Blanc

H.T. [1T4.121]

TABLE B-3/I.121

High quality broadband videoconference services

| ua)

Attributes	Values		
{			
{			

{
2.
Information transfer rate | ud)
(Mbit/s)
}
H
2
1, H
2
2 or H
4 channel bit-rate
}
	{		

{
2.1
Peak bit rate (throughput)
}
H
2
1, H
2
2 or H
4 channel or
other bit rate
}
H
2
1, H
2
2 or H
4 channel or
other bit rate
}
	{	{	

{
2.2
average bit rate | ue)
}
		As peak bit rate	Under study

{
3.
Information transfer capability
}
	{		

High quality video + 15 kHz audio + user-to-user messages }	{		
High quality video + 15 kHz audio stereo + user-to-user messages }			

4. Structure	Unstructured	For further study

{
5.
Establishment of communication
}
	Demand/reserved/permanent	Demand/reserved/permanent

{
6.
Communication configuration
}
	{
	Multipoint/point-to-point
	}	

	{
	Multipoint/point-to-point
	}	

7. Symmetry
Bidirectional symmetric/bidirectional asymmetric/others for further study
}
	{
	Bidirectional symmetric/bidirectional asymmetric/others for further study
	}	

Access attributes 8. Access channel and rate H 2 or H 4 for user information (multipoint communication) }	{	

8.1 User information
Virtual channel with
H
2 or H
4 channel bit rate
}
	{
	Virtual channel with H
	4 channel bit rate
	}	

8.2 Signalling
Signalling channel for signalling and OAM — under study
}
	{
	Signalling channel under study
	}	

9. Access protocols
Signalling access protocols
9.1 Layer 1
I.440/441
I.450/451
Need supplements for broadband communication
}
	To be defined
	{
	I.440/441
	I.450/451
	Need supplements for broadband communication
	}
		To be defined

Information access protocols { 9.4 Layer 1 9.5 Layer 2	To be defined	To be defined

9.6 Layer 3 }	Under study	Under study

{
High layer attributes
}
10. Type of user information
Moving pictures + sound + user-to-user messages
}
	{	

{
11.
Transport (layer 4) functions/protocol
}
	Under study	

{
12.
Session (layer 5) functions/protocol
 	
}
	Under study	

Tableau B-3/I.121, [1T4.121], p. 17

H.T. [2T4.121]
TABLE B-3/I.121 *(continued)*

Attributes	Values	

{
13.
Presentation (layer 6) functions/protocol
}
{
13.1
Video
13.2
Audio
13.3
Auxiliary
13.4
User-to-user messages
}
	{
	Under study. This study should include video, sound auxiliary information such as text, facsimile, etc., and user-to-user control messages
	}	

{
14.
Application (layer 7) function/protocol
}
{
14.1
Video
14.2
Audio
14.3
Auxiliary
14.4
User-to-user messages
}
	Under study	

General attributes
{
15.
Supplementary services provided
}
	{
	As for telephony; others under study
	}	

16. Quality of service
16.1 Video
	{
	Equal to or higher than existing TV
	}	

16.2 Audio	15 kHz stereo | uf)	

{
—
End-to-end transfer delay
—
Delay jitter (cell jitter)
—
Error characteristics
—
Information loss probability
}
	Under study	Under study

{
17.
Interworking possibilities
}
	{
	With other videoconference, videotelephone, and telephone	

services }	

{
18.
Operational and commercial
}
For further study. This study should include maintenance facilities
}
	{

Tableau B-3/I.121, [2T4.121], p. 18

H.T. [1T5.121]

TABLE B-4/I.121
{
High definition TV (HDTV) distribution services and existing quality TV distribution services
}

Attributes	HDTV distribution service { Values	Values

{
Information transfer attributes
}				

{
2.
Information transfer rate (Mbit/s)
}
	{
	H
	2
	1, H
	2
	2 or H
	4-channel bit-rate
	}
			{
			H
			4-channel bit rate or greater
			}	

{
2.1
Peak bit rate (throughput)
}
	{
	H
	2
	1, H
	2
	2 or H
	4 channel or other bit
	rate
	}
		{
		n/a
		{
		H
		4-channel bit rate or greater
		}		

{
2.2
Average bit rate | ue)
}
		As peak bit rate	Under study	n/a

{
3.
Information transfer capability
}
	{
	High quality video + 15 kHz audio stereo
	}
		{
		High quality video + 15 kHz audio stereo
		}
			{
			HDTV quality video + 15 kHz audio
			stereo
			}	

4. Structure	Unstructured	Service data unit integrity	Unstructured	For further st

{
5.
Establishment of communication
}
	Demand/reserved	Demand/reserved	Demand/reserved	Demand/rese

{
6.
Communication configuration
}
Broadcast (other values for further study)
}
Broadcast (other values for further study)
}
Broadcast (other values for further study)
}
Broadcast (other values for further study)
}
	{
	{
	{
	{			

7. Symmetry	Unidirectional	Unidirectional	Unidirectional	Unidirectiona

Access attributes
{
8.
Access channel and rate
8.1
User information
}
H
2 or H
4 (bits rates under study) for user information
}
Virtual channel with H
2
1, H
2
2 or H
4
channel or other bit rate
}
Virtual channel with H
2
1, H
2
2 or H
4
channel or other bit rate
}
Virtual channel dependent on the necessary information transfer rate
}
	{
	{
	{			

8.2 Signalling/selecting D channel or a special channel for distribution service signalling } D channel or special channel (under study) } D channel or special channel (under study) }	{ {	{ 		

Tableau B-4/I.121, [1T5.121], p. 19

H.T. [2T5.121]

{
TABLE B-4/I.121 *(continued)*
}

Attributes	HDTV distribution service Values	Values

9. Access protocols Signalling access protocols 9.1 Layer 1 I.440/441 I.450/451 Need supplements for broadband communication }	To be defined {	To be defined	To be defined
I.440/441 I.450/451 Need supplements for broadband communication }	{		
I.440/441 I.450/451 Need supplements for broadband communication }			

Information access protocols
{
9.4
Layer 1
9.5
Layer 2
9.6
Layer 3
}
	To be defined
	Under study
		To be defined
		Under study
			To be defined
			Under study

{
High layer attributes
}			

10. Type of user information Moving picture + sound + data }	Moving picture + sound + data	Moving picture + sound + data	{

{
11.
Transfer (layer 4) function/protocol
}
	For further study	For further study	For further study

{
12.
Session (layer 5) function/protocol
}
	For further study	For further study	For further study

{
13.
Presentation (layer 6) function/protocol
}			

{
13.1
Video
13.2
Audio
13.3
Auxiliary
13.4
User-to-user messages
}
	{		

For further study, awaiting suitable coding schemes }	{		
For further study, awaiting suitable coding schemes }	{		
For further study, awaiting suitable coding			

schemes }			

{
14.
Application (layer 7) function/protocol
}
{
14.1
Video
14.2
Audio
14.3
Auxiliary
14.4
User-to-user messages
}
	For further study	For further study	For further study

General attributes
{
15.
Supplementary services provided
}
	For further study	For further study	For further study

Tableau B-4/I.121, [2T5.121], p. 20

H.T. [3T5.121]

{
TABLE B-4/I.121 *(continued)*
}

Attributes	{ HDTV distribution service Values	Values		
16. Quality of service 16.1 Video Equal to existing TV (or better) }	Equal to existing TV HDTV quality	{		
16.2 Audio Equal to existing high fidelity stereo standards (or better) } Equal to existing high fidelity stereo standards (or better) } Equal to existing high fidelity stereo standards (or better) }	{ { {			

{
—
End-to-end transfer delay
—
Delay jitter (cell jitter)
—
Error characteristics
—
Information loss probability
}
	Under study	Under study	Under study	Under study

{
17.
Interworking possibilities
}
	For further study	For further study	For further study	For further study

{
18.
Operational and commercial
}
For further study
}
	For further study	For further study	For further study	{

a) The attribute values characterize a TV distribution service providing high video quality equal to, or higher than, existing TV standards. Until now only coding mechanisms for those video qualities have been available which require transfer bit rates equal to, or higher than, the H 2 1-channel bit rate. Due to future development in research of coding algorithms and techniques, the transfer bit rates necessary for those video qualities may decrease.

b) Preliminary name.

c) The values for the information transfer mode attribute need further study. For example, the distinction between the STM (circuit) and the ATM (deterministic) values needs to be investigated.

d) In the ATM deterministic mode a transfer capacity of the peak bit rate will be provided to the user all the time (average bit rate = peak bit rate). In the ATM statistical mode a transfer capacity of only the average gross bit rate (i.e. the average net bit rate plus cell headers) will be provided to the user (depending on the throughput class).

e) Average over, for example, 100 ms.

Tableau B-4/I.121, [3T5.121], p. 21