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SECTION 3

BEARER SERVICES SUPPORTED BY AN ISDN

Recommendation I.230

DEFINITION OF BEARER SERVICE CATEGORIES

(Melbourne, 1988)

1 General

Recommendation I.210 describes the principles for defining telecommunication services supported by an ISDN, including the concept of bearer services, bearer capabilities and teleservices. It also provides the tools for the definition and description of such services.

The purpose of this Recommendation is to define a recommended set of bearer service categories that may be supported by an ISDN together with their overall provision. These definitions form the basis for detailed descriptions of circuit mode bearer services as given in Recommendation I.231 and packet-mode bearer services as given in Recommendation I.232 and their associated bearer capabilities, which are used to define the network capabilities required.

Bearer services are fully described by prose definitions and descriptions, by attributes and by dynamic descriptions, which altogether define the service characteristics as they apply at a given reference point where the customer accesses the service. Recommendation I.140 and Recommendation I.210, Annex B describe the use of attributes for this purpose.

2 Definition of bearer services

This section identifies several bearer services accessed via the standard network access provided by an ISDN. The identification of possible additional services such as subrate services is left for further study.

These possible additional services would not lead to any additional requirements to those already identified for physical characteristics of interfaces to be applied at reference points S and/or T (see Recommendation I.411).

The definition of bearer services is based upon the list of attributes as given in Table B-1/I.210. The information transfer attributes Nos. 1-4 are called ‘‘ dominant attributes bearer service category. Information transfer attributes Nos. 5-7 are called ‘‘secondary attributes services within one category. ‘‘Access attributes’’ as well as ‘‘general attributes’’ are used to further specify an individual bearer service. They are called ‘‘ qualifying attributes 1/I.230.

2.1 *Circuit-mode bearer service categories*

These bearer service categories are typically characterized by the provision of user information over one type of channel and signalling over another type of channel.

The use of the channel which conveys signalling information also to provide user-to-user information transfer is described in the user-to-user signalling supplementary service as given in Recommendation I.257.

Figure 1/I.230 [T1.230], p. (a traiter comme tableau MEP)

The following circuit-mode bearer service categories have been identified so far:

I.231.1 64 kbit/s unrestricted, 8 kHz structured

I.231.2 64 kbit/s, 8 kHz structured, usable for speech information transfer

I.231.3 64 kbit/s, 8 kHz structured, usable for 3.1 kHz audio information transfer

I.231.4 Alternate speech | | 4 kbit/s unrestricted, 8 kHz structured

I.231.5 2 × 64 kbit/s unrestricted, 8 kHz structured

I.231.6 384 kbit/s unrestricted, 8 kHz structured

I.231.7 1536 kbit/s unrestricted, 8 kHz structured

I.231.8 1920 kbit/s unrestricted, 8 kHz structured

The prose descriptions (step 1.1) and static descriptions (step 1.2) of these services are given in Recommendation I.231. A common dynamic description (step 1.3) for I.231.1, I.231.2, and I.231.3 is given in Recommendation I.220 for demand services only.

2.2 *Packet-mode bearer service categories*

These bearer services involve packet handling functions.

The following packet-mode bearer service categories have been identified so far and are described in Recommendation I.232:

I.232.1 Virtual call and permanent virtual circuit

I.232.2 Connectionless (Note)

I.232.3 User signalling (Note)

Note — These services require further study and their descriptions are not yet included.

3 Recommended provision of bearer services

In order to facilitate the development of compatible ISDNs and related user equipment, Recommendations I.231 and I.232 outline the recommended provision of bearer services defined in this Recommendation. This consists of three parts:

a) description of the service category by the dominant attributes, i.e., information transfer mode, information transfer rate, type of information transfer capability and structure attributes. The recommended provision of services of the overall bearer service category is described as:

E an essential bearer service category to be made available internationally

A an additional bearer service category which may be available in some ISDNs and which may also be available internationally

FS the recommended provision of this bearer service category is for further study.

b) within each bearer service category, a description of the agreed secondary attributes, i.e. establishment of communication, symmetry and information transfer configuration attributes. If an ISDN supports the bearer service category, the recommended provision of these secondary attribute combinations within this category are described as:

E an essential combination of attributes to be made available internationally (when an ISDN supports the particular overall bearer service category).

A an additional combination of attributes which may be available in some ISDNs and which may also be available internationally (when an ISDN supports the particular overall bearer service category).

FS the recommended provision of this combination of attributes is for further study.

c) within each bearer service category a description of the agreed qualifying attributes, e.g. channel/rate and protocol access attributes for user information and for signalling OAM information. If an ISDN supports the bearer service category, the recommended provision of these qualifying attributes within this category are described as:

E an essential access arrangement to be made available (when an ISDN supports the particular overall bearer service category)

A an additional access arrangement which may be available in some ISDNs (when an ISDN supports the particular overall bearer service category)

FS the recommended provision of this access arrangement is for further study.

Note 1 — During an evolutionary period, not all items marked ‘‘E’’ will be provided in all networks.

Note 2 — Attributes 10-13 are for further study.

The recommended overall provision of bearer service categories, as given in Recommendations I.231 and I.232, is summarized in Table 1/I.230.

4 Prose definitions of bearer service categories

In order to give an overview of the bearer service categories identified, their definitions as given in Recommendations I.231 and I.232 are reproduced in this section.

4.1 *Circuit-mode bearer service categories*

I.231.1 **Circuit-mode, 64 kbit/s unrestricted, 8 kHz structured bearer service category**

This bearer service category provides unrestricted information transfer between S/T reference points. It may, therefore, be used to support various user applications. Examples include:

— speech;

— 3.1 kHz audio;

— multiple subrate information streams multiplexed into 64 kbit/s by the user;

— transparent access to an X.25 public network [I.462 case a)].

User information is transferred over a B-channel, signalling is provided over a D-channel.

H.T. [T2.230]

TABLE 1/I.230

Recommended overall provision of bearer service categories

{ *Circuit-mode bearer service categories* }	
1) 64 kbit/s unrestricted	E
2) Speech	E
3) 3.1 kHz audio	E
{ 4) Alternate speech | | 4 kbit/s unrestricted }	A
{ 5) 2×64 kbit/s unrestricted }	A
6) 384 kbit/s unrestricted	A
7) 1536 kbit/s unrestricted	A
8) 1920 kbit/s unrestricted	A
{ *Packet-mode bearer service categories* }	
{ 1) Virtual call and permanent virtual circuit }	E
2) Connectionless	FS
3) User signalling	FS

Table 1/I.230 [T2.230], p.

I.231.2 **Circuit-mode 64 kbit/s, 8 kHz structured bearer service category usable for speech information transfer**

This bearer service category is intended to support speech.

The digital signal at the S/T reference point shall conform to Recommendation G.711 (A-law or μ-law). The network may use processing techniques appropriate for speech such as analogue transmission, echo cancellation and low-bit rate voice encoding. Hence, bit integrity is not assured. This bearer service category is not intended to support modem derived voice-band data.

All Recommendations for the transfer of speech information in the network apply to this bearer service category.

I.231.3 **Circuit-mode 64 kbit/s, 8 kHz structured bearer service category usable for 3.1 kHz audio information transfer**

This bearer service category corresponds to the service which is currently offered in the PSTN. This bearer service category provides for the transfer of speech and of 3.1 kHz bandwidth audio information suh as voice-band data via modems and facsimile group 1, 2 and 3 information. The digital signal at the S/T reference point shall conform to Recommendation G.711 (A-law or μ-law).

Connections provided for these services should offer the transfer capability for the information indicated above. (This means that the network may include speech processing techniques provided they are appropriately modified or functionally removed prior to non-speech information transfer.) The control of echo control devices, speech processing devices, etc., is only made by use of disabling tones (see Recommendation V.25). Bit integrity is not assured. The network may use analogue transmission.

All Recommendations for the transfer of speech information in the network apply to this bearer service category.

I.231.4 **Circuit-mode, alternate speech/64 kbit/s unrestricted, 8 kHz structured bearer service category**

This bearer service category provides the alternate transfer of either speech or 64 kbit/s unrestricted digital information within the same call.

The request for this alternate capability and the intial mode desired by the user must be identified at call set-up time.

This bearer service category is provided for the support of multiple capability terminals or single capability terminals.

For the speech mode of this bearer service, the same applies as for the speech bearer service category. For the unrestricted mode of this bearer service category, the same applies as for the unrestricted bearer service category.

I.231.5 **Circuit-mode 2 × 64 kbit/s unrestricted, 8 kHz structured bearer service category**

This bearer service category provides the unrestricted transfer of two 64 kbit/s user information flows over two B-channels at the user network interface.

I.231.6 **Circuit-mode 384 kbit/s unrestricted, 8 kHz structured bearer service category**

This bearer service category provides the unrestricted transfer of 384 kbit/s user information over a H_0channel at the S/T reference point. The transfer of OAM information for reserved and permanent services may be provided over a D-channel in the same or in another interface structure.

I.231.7 **Circuit-mode 1536 kbit/s unrestricted, 8 kHz structured bearer service category**

This bearer service category provides the unrestricted transfer of 1536 kbit/s user information over a $H_{1\backslash d1}$channel at the *S* /*T* reference point. The transfer of OAM information for reserved and permanent services may be provided via a D-channel in another interface structure.

I.231.8 **Circuit-mode 1920 kbit/s unrestricted, 8 kHz structured bearer service category**

This bearer service category provides the unrestricted transfer of 1920 kbit/s user information over a $H_{1\backslash d2}$channel at the S/T reference point. The transfer of OAM information for reserved and permanent services may be provided over a D-channel.

4.2 *Packet mode bearer service categories*

I.232.1 **Virtual call and permanent virtual circuit bearer service category**

This bearer service category provides the unrestricted transfer of user information in a packetized manner over a virtual circuit within a B- or D-channel at the S/T reference point. Signalling information for virtual call and/or possibly OAM information for permanent virtual circuit services are transferred via a D- or B-channel as described in Recommendation I.462 (X.31).

I.232.2 **Connectionless packet-bearer service category**

The defintion of services in this bearer service category is for further study.

I.232.3 **User signalling bearer service category**

The definition of services in this bearer service category is for further study.

Recommendation I.231

CIRCUIT-MODE BEARER SERVICE CATEGORIES

(Melbourne, 1988)

Recommendation I.210 describes the principles for defining telecommunication services supported by an ISDN including the concept of bearer services, teleservices and supplementary services. It also provides the means for the definition and description of such services. A recommended set of circuit-mode bearer services categories is defined in Recommendation I.230.

The purpose of this Recommendation is to describe circuit-mode bearer service categories, to describe individual circuit-mode bearer services, and to recommend their provision in ISDN. The definitions and descriptions form the basis to define the network capabilities required for the support of the services in ISDN.

Bearer service categories are described by prose definitions and descriptions, by attributes and their values and by dynamic descriptions following the description method given in Recommendation I.130. The application of the attribute technique and the definitions of these attributes and attribute values is given in Recommendation I.140.

The following set of bearer service categories is currently identified and more may be identified in the future.

I.231.1 Circuit-mode 64 kbit/s unrestricted, 8 kHz structured bearer service category

I.231.2 Circuit-mode 64 kbit/s, 8 kHz structured bearer service category usable for speech information transfer

I.231.3 Circuit-mode 64 kbit/s, 8 kHz structured bearer service category usable for 3.1 kHz audio information transfer

I.231.4 Circuit-mode, alternate speech / 64 kbit/s unrestricted, 8 kHz structured bearer service category

I.231.5 Circuit-mode 2 × 64 kbit/s unrestricted, 8 kHz structured bearer service category

I.231.6 Circuit-mode 384 kbit/s unrestricted, 8 kHz structured bearer service category

I.231.7 Circuit-mode 1536 kbit/s unrestricted, 8 kHz structured bearer service category

I.231.8 Circuit-mode 1920 kbit/s unrestricted, 8 kHz structured bearer service category

1 I.231.1 — **Circuit-mode 64 kbit/s unrestricted, 8 kHz structured bearer service category** (Note 1)

1.1 *Definition*

This bearer service category provides unrestricted information transfer between SB/FT reference points, it may, therefore, be used to support various user applications. Examples include:

— speech (Note 2);

— 3.1 kHz audio (Note 2);

— multiple subrate information streams multiplexed into 64 kbit/s by the user;

— transparent access to an X.25 public network [Recommendation I.462 case a)].

User information is transferred over a B-channel, signalling is provided over a D-channel.

Note 1 — During an interim period some networks may only support restricted 64 kbit/s digital information transfer capability, i.e. information transfer capability solely restricted by the requirement that the all-zero octet is not allowed. For interworking the rules given in Appendix I of Recommendation I.520 should apply. The interworking functions have to be provided in the network with restricted 64 kbit/s capability. The ISDN with 64 kbit/s transfer capabilities will not be affected by this interworking other than by conveying the appropriate signalling message to and from the ISDN terminal.

Note 2 — Whilst speech and 3.1 kHz audio have been given as applications for this bearer service category, it is recognized that it is the responsibility of the customers to ensure that a compatible encoding scheme is in operation. Customers should also recognize that no network provision can be made for the control of such items as echo and loss, as the network is unaware of the application in use. Furthermore, the Quality of Service attribute value for information transfer delay will indicate the suitability of a particular version of this bearer service for speech.

1.2 *Description*

1.2.1 *General description*

This circuit-mode bearer service category allows:

— two users (e.g. terminals, PABXs) in a point-to-point configuration to communicate via the ISDN using 64 kbit/s digital signals over the B-channel, in both directions continuously and simultaneously for the duration of call;

— three or more users in a multipoint configuration (refer to Recommendation I.254 for the supplementary service description on Three-Party Service and Conference Calling).

1.2.2 *Specific terminology*

Retention timer : this timer specifies the amount of time that the network retains the call information of the original call upon encountering busy or being released. It is a network provider option. The value for this timer is greater than 15 seconds.

1.3 *Procedures*

1.3.1 *Provision/withdrawal*

1.3.1.1 Provision of this service will be by pre-arrangement with the Administration.

1.3.1.2 This bearer service is offered with several subscription options which apply separately to each ISDN number or group of ISDN numbers on the interface. For each subscription option, only one value can be selected. Subscription options for the interface are summarized below:

Subscription option Value Maximum number of information channels available at user B — *m* , | where *m* is not greater than the number of information channels on the interface Maximum number of total calls present at user B — *n* , | where *n* is not greater than the number of information channels on the interface

User B can be an ISDN number or group of ISDN numbers on the interface.

Note — More than one ISDN number can be associated with the serviceB/Finterface only as a part of a supplementary service such as multiple subscriber number. In the case of one ISDN number, the option given above for the number of calls can only exceed the number of information channels in association with a supplementary service (e.g. call waiting). As a network provider option, separate values may be specified for incoming and for outgoing calls for either or both of the limits.

1.3.2 *Normal procedures*

All user-network signalling is done on the D-channel.

a) *Originating the service (call set-up)*

The call is originated by the user requesting from the network the required bearer service; the request includes a number identifying the called user. Other information, as required, for the bearer service and for use by the network in supplementary services provided to the called user (e.g. calling line identity) may also be included. This request may be given to the network either *en bloc* , containing all the required information, or not *en bloc* .

b) Indications during call set-up

After initiating a call the calling user will receive an acknowledgement that the network is able to process the call. The called user will receive an indication of the arrival of an incoming call of this bearer service.

The calling user shall also be given an indication that the incoming call is being offered to the called user, when an indication is received by the network that the called user is being informed of this call. When the call reaches the called user and the connection is established, an indication of this is sent to the calling user.

The called user may also provide other information for use by the network in supplementary services provided to other users (e.g. connected line identity). The relationship of a connected user with the called user requires further study.

Once established, the B-channel is then available for the transmission of 64 kbit/s digital signals in both directions continuously and simultaneously, without alteration by the network. No restriction is placed by the network on the content of the digital signals (see Note 1 of § 1.1).

c) *Terminating the call*

The call may be terminated by either or both of the users by indicating this to the network. If one user terminates the call, an appropriate indication is sent to the other user.

1.3.3 *Exceptional procedures*

a) *Failure situations due to user error*

i) A user inputting a network-identifiable, improper service request will be given an appropriate failure indication by the network and the call set-up will be ceased.

ii) A user inputting a non-valid network number will be given an appropriate failure indication by the network and the call set-up will be ceased.

b) *Failure situations due to called user state*

i) A calling user attempting to establish a call to a user who is identified by the network to be busy (either network-determined user busy or user-determined user busy) will be given an appropriate failure indication by the network.

ii) A user attempting to establish a call to a user whose terminal equipment fails to respond will be given an appropriate failure indication by the network and the call set-up will be ceased.

iii) On a call to a user whose terminal equipment has responded that the called user is being informed of the call but has failed to answer within a defined period of time, the calling user attempting to establish the call will be given an appropriate failure indication by the network and the call set-up will be ceased.

c) *Failure situations due to network conditions*

A user attempting to establish a call but meeting call failure situations due to network conditions (e.g. congestion) will be given an appropriate failure indication by the network.

d) *Failure situations due to called user state and/or network conditions*

A user attempting to establish a call but meeting call failure situations due to network conditions (e.g. congestion) or called user state (e.g. busy) can have service data retained for a specified period of time, i.e. retention timer.

1.3.4 *Alternative procedures*

1.3.4.1 *Reserved service procedures*

For further study.

1.3.4.2 *Permanent service procedures*

For further study.

1.4 *Network capabilities for charging*

This Recommendation does not cover charging principles. Future Recommendations in the D-Series are expected to contain that information.

1.4.1 *Demand service charging*

It shall be possible to charge the subscriber accurately for the demand service.

1.4.2 *Reserved service charging*

It shall be possible to charge the subscriber accurately for the reserved service.

1.4.3 *Permanent service charging*

It shall be possible to charge the subscriber accurately for the permanent service.

1.5 *Interworking requirements*

Interworking between the ISDN and networks referred to as ‘‘digital PSTNs’’, pre-ISDNs, pilot ISDNs or extended IDNs as well as between the ISDN and PSTNs may be required for this bearer service category.

In advance of the provision of the ISDN, similar services supported by 64 kbit/s connectivity will be available to customers by RPOAs/network operators on what may be described as ‘‘digital PSTNs’’, pre ISDNs, pilot ISDNs or extended IDNs. Interworking with ISDN customers will therefore be required. To effect this, as a broad guideline, RPOAs/network operators need to ensure these networks have the necessary functionality at the interworking point to provide service connectivity with the ISDN.

A V-Series terminal connected to the ISDN via a terminal adaptor and using the 64 kbitB/Fs unrestricted bearer service requires the use of an IWF (including a modem) in the network for calls to PSTN users. To effect the connection, a 64 kbitB/Fs connection would need to be used to the IWF (interworking function) and a 3.1 kHz audio or equivalent connection would then need to be used to the PSTN user.

1.6 *Interaction with supplementary services*

Not applicable. Each supplementary service description identifies the applicability to this bearer service category.

1.7 *Attributes and values of attributes of the circuit-mode 64 kbit/s unrestricted, 8 kHz structured bearer service category*

Information transfer attributes

1. Information transfer mode: circuit
2. Information transfer rate: 64 kbit/s
3. Information transfer capability: unrestricted
4. Structure: 8 kHz integrity
5. Establishment of communication: demand/reserved/permanent
6. Symmetry: bidirectional symmetric/unidirectional
7. Communication configuration: point-to-point/multipoint

Access attributes

8. Access channel: B for user information,

D for signalling (Note)

9. Access protocol: I-Series for D-channel

General attributes

10. Supplementary services provided — Refer to Recommendation I.250

11. Quality of Service ?04 12. Interworking possibilities ?05 for further study
13. Operational and commercial aspects

Note — For reservedB/Fpermanent service the operational administrative and maintenance (OAM) messages related to these services may be conveyed over the D-channel.

1.8 *Provision of individual circuit-mode 64 kbit/s unrestricted, 8 kHz structured bearer services*

The definition of E (essential) and A (additional) can be found in Recommendation I.230

a) Overall provision : | E

b) Variations of secondary attributes:

Establishment Symmetry Communication Provision of communication configuration Provision

I.231.1/1	demand		pt-pt	E
I.231.1/2	reserved	bidirectional	pt-pt	A
I.231.1/3	permanent		pt-pt	E
I.231.1/4	demand		pt-pt	A
I.231.1/5	reserved	unidirectional	pt-pt	A
I.231.1/6	permanent		pt-pt	A
I.231.1/7	demand		multipt	A
I.231.1/8	reserved	bidirectional	multipt	A
I.231.1/9	permanent		multipt	A
I.231.1/10	demand		multipt	A
I.231.1/11	reserved	unidirectional	multipt	A
I.231.1/12	permanent		multipt	A

c) Access

H.T. [T1.231]

lw(42p) | lw(54p) | lw(42p) | lw(48p) | lw(42p) .

Table [T1.231], p.

1.9 *Dynamic description*

The dynamic description for this service on a demand basis is identical for a number of circuit-mode services and is therefore collectively given in Recommentation I.220.

2 I.231.2 — Circuit-mode 64 kbit/s, 8 kHz structured bearer service category usable for speech information transfer

2.1 *Definition*

This bearer service category is intended to support speech.

The digital signal at the S/T reference point shall conform to Recommendation G.711 (A-law or µ-law). The network may use processing techniques appropriate for speech such as analogue transmission, echo cancellation and low bit-rate voice encoding. Hence, bit integrity is not assured. This bearer service is not intended to support modem derived voice-band data.

All Recommendations for the transfer of speech information in the network apply to this bearer service category.

2.2 *Description*

2.2.1 *General description*

This circuit-mode bearer service category allows:

— two users (e.g. terminals, PABXs) in a point-to-point configuration to communicate via the ISDN using speech encoding into 64 kbitB/Fs digital signals over the B-channel, in both directions continuously and simultaneously for the duration of a call;

— three or more users in a multipoint configuration (refer to Recommendation I.254 for the supplementary service description for Three-Party Service and Conference Calling).

Tones andB/For announcements to indicate the progress or otherwise of a call, are provided by the network.

2.2.2 *Specific terminology*

Retention timer: this timer specifies the amount of time that the network retains the call information of the original call upon encountering busy or being released. It is a network provider option. The value for this timer is greater than 15 seconds.

2.3 *Procedures*

2.3.1 *Provision/withdrawal*

2.3.1.1 Provision of this service will be by pre-arrangement with the Administration.

2.3.1.2 This bearer service is offered with several subscription options which apply separately to each ISDN number or group of ISDN numbers on the interface. For each subscription option, only one value can be selected. Subscription options for the interface are summarized below:

Subscription option Value Maximum number of information channels available at user B — *m* , | where *m* is not greater than the number of information channels on the interface Maximum number of total calls present at user B — *n* , | where *n* is not greater than the number of information channels on the interface

User B can be an ISDN number or group of ISDN numbers on the interface.

Note — More than one ISDN number can be associated with the serviceB/Finterface only as a part of a supplementary service such as multiple subscriber number. In the case of one ISDN number, the option given above for the number of calls can only exceed the number of information channels in association with a supplementary service (e.g. call waiting). As a network provider option, separate values may be specified for incoming and for outgoing calls for either or both of the limits.

2.3.2 *Normal procedures*

Out-of-band messages shall always be provided to indicate call progress, etc. However, network-generated in-band tones and announcements shall always be provided for this bearer service category.

a) *Originating the service (call set-up)*

The call is originated by the user requesting the required bearer service; the request includes a number identifying the called user. Other

information, as required, for the bearer service and for use by the network in supplementary services provided to the called user (e.g. calling line identity) may also be included. This request may be given to the network either *en bloc* , containing all the required information, or not *en bloc* .

b) Indications during call set-up

All indications entail signalling messages and shall include, where appropriate, in-band tones or announcements.

After initiating a call the calling user will receive an acknowledgement that the network is able to process the call. The called user will receive an indication of the arrival of an incoming call of this bearer service.

The calling user shall also be given an indication that the incoming call is being offered to the called user, when an indication is received by the network that the called user is being informed of this call. When the call reaches the called user and the connection is established, an indication of this is sent to the calling user.

The called user may also provide other information for use by the network in supplementary services provided to other users (e.g. connected line identity). The relationship of a connected user with a called user requires further study.

Once established, the B-channel is then available for the transmission of speech signals in both directions continuously and simultaneously

c) Terminating the call

The call may be terminated by either or both of the users by indicating this to the network. If one user terminates the call, an appropriate indication is sent to the other user.

2.3.3 *Exceptional procedures*

a) *Failure situations due to user error*

i) A user inputting a network-identifiable, improper service request will be given an appropriate failure indication by the network and the call set-up will be ceased.

ii) A user inputting a non-valid network number will be given an appropriate failure indication by the network and the call set-up will be ceased.

b) *Failure situations due to called user state*

i) A calling user attempting to establish a call to a user who is identified by the network to be busy (either network-determined user busy or user-determined user busy) will be given an appropriate failure indication by the network.

ii) A user attempting to establish a call to a user whose terminal equipment fails to respond will be given an appropriate failure indication by the network and the call set-up will be ceased.

iii) On a call to a user whose terminal equipment has responded that the called user is being informed of the call but has failed to answer within a defined period of time, the calling user attempting to establish the call will be given an appropriate failure indication by the network and the call-set up will be ceased.

c) *Failure situations due to network conditions*

A user attempting to establish a call but meeting call failure situations due to network conditions (e.g., congestion) will be given an appropriate failure indication by the network.

d) *Failure situations due to called user state andB/For network conditions*

A user attempting to establish a call but meeting call failure situations due to network conditions (e.g. congestion) or called user state (e.g. busy) can have service data retained for a specified period of time, i.e. retention timer.

2.3.4 *Alternative procedures*

2.3.4.1 *Reserved service procedures*

For further study.

2.3.4.2 *Permanent service procedures*

For further study.

2.4 *Network capabilities for charging*

This Recommendation does not cover charging principles. Future Recommendations in the D-Series are expected to contain that information.

2.4.1 *Demand service charging*

It shall be possible to charge the subscriber accurately for the demand service.

2.4.2 *Reserved service charging*

It shall be possible to charge the subscriber accurately for the reserved service.

2.4.3 *Permanent service charging*

It shall be possible to charge the subscriber accurately for the permanent service.

2.5 *Interworking requirements*

Interworking is required between the ISDN and the PSTN for this bearer service category.

2.6 *Interaction with supplementary services*

Not applicable. Each supplementary service description indentifies the applicability with this bearer service category.

2.7 *Attributes and values of attributes of the circuit-mode 64 kbit/s, 8 kHz structured bearer service category usable for speech information transfer*

Information transfer attributes

1. Information transfer mode: circuit
2. Information transfer rate: 64 kbit/s
3. Information transfer capability: speech (encoded according to Recommendation G.711 A-law, μ-law) (Note 1)
4. Structure: 8 kHz integrity
5. Establishment of communication: demand/reserved/permanent
6. Symmetry: bidirectional symmetric/unidirectional
7. Communication configuration: point-to-point/multipoint

Access attributes

8. Access channel: B for user information,

D for signalling (Note 2)

9. Access protocol: I-Series for D-channel, Rec. G.711 for B-channel

General attributes

10. Supplementary services provided — Refer to Recommendation I.250

11. Quality of Service

12. Interworking possibilities

13. Operation and commercial aspects

–v’2P’ –v’1p’ for further study (may be

different from I.231.1)

Note 1 — When crossing an international boundary between Administrations which employ different encoding laws, the network shall perform the necessary A-µ law conversion (see Recommendation G.711).

Note 2 — For reservedB/Fpermanent service the operational administrative and maintenance (OAM) messages related to these services may be conveyed over the D-channel.

2.8 *Provision of individual circuit-mode 64 kbit/s, 8 kHz structured bearer services usable for speech information transfer*

a) Overall provision : | E

Note — Some networks will offer this service in a manner identical to the 3.1 kHz audio service.

b) Variations of secondary attributes:

Establishment *Symmetry* *Communication* *Provision* *of communication of configuration* *Provision*

I.231.2/1 demand pt-pt E

I.231.2/2 reserved bidirectional pt-pt A

I.231.2/3 permanent pt-pt E

I.231.2/4 demand pt-pt A

I.231.2/5 reserved unidirectional pt-pt A

I.231.2/6 permanent pt-pt A

I.231.2/7 demand multipt A

I.231.2/8 reserved bidirectional multipt A

I.231.2/9 permanent multipt A

I.231.2/10 demand multipt A

I.231.2/11 reserved unidirectional multipt A

I.231.2/12 permanent multipt A

c) Access

H.T. [T2.231]

lw(42p) | lw(54p) | lw(42p) | lw(48p) | lw(42p) .

Table [T2.231], p.

2.9 *Dynamic description*

The dynamic description for this service on a demand basis is identical for a number of circuit mode services and is therefore collectively given in Recommentation I.220.

3 I.231.3 — **Circuit-mode 64 kbit/s, 8 kHz structured bearer service category usable for 3.1 kHz audio information transfer**

3.1 *Definition*

This bearer service category corresponds to the service which is currently offered in the PSTN. It provides for the transfer of speech and of 3.1 kHz bandwidth audio information such as voice-band data via modems and facsimile group 1, 2 and 3 information (Note). The digital signal at the S/T reference point shall conform to Recommendation G.711 (A-law or μ-law).

Connections provided for these services should offer the transfer capability for the information indicated above. (This means that the network may include speech processing techniques provided they are appropriately modified or functionally removed prior to non-speech information transfer.) The control of echo control devices, speech processing devices, etc., is only made by use of disabling tones (see Recommendation V.25). Bit integrity is not assured. The network may use analogue transmission.

All Recommendations for the transfer of speech information in the network apply to this bearer service category.

Note — The maximum modem bit rate that can be used by users in applications of this bearer service category depends on the modulation standard employed by the user and on the transmission performance within an Administration or between different Administrations. The extent of support is a matter concerning the network or agreed to bilaterally.

3.2 *Description*

3.2.1 *General description*

This circuit-mode bearer service category allows:

— two users (e.g. terminals, PABXs) in a point-to-point configuration to communicate via the ISDN using 3.1 kHz audio information encoding into 64 kbitB/Fs digital signals over the B-channel, in both directions continuously and simultaneously for the duration of a call;

— three or more users in a multipoint configuration (refer to Recommendation I.254 for the supplementary service descriptions on Three-party Service and Conference Calling).

Tones andB/For announcements to indicate the progress or otherwise of a call, are provided by the network.

3.2.2 *Specific terminology*

Retention timer: this timer specifies the amount of time that the network retains the call information of the original call upon encountering busy or being released. It is a network provider option. The value for this timer is greater than 15 seconds.

3.3 *Procedures*

3.3.1 *ProvisionB/Fwithdrawal*

3.3.1.1 Provision of this service will be by pre-arrangement with the Administration.

3.3.1.2 This bearer service is offered with several subscription options which apply separately to each ISDN number or group of ISDN numbers on the interface. For each subscription option, only one value can be selected. Subscription options for the interface are summarized below:

Subscription option Value Maximum number of information channels available at user B — *m* , | where *m* is not greater than the number of information channels on the interface Maximum number of total calls present at user B — *n* , | where *n* is not greater than the number of information channels on the interface

User B can be an ISDN number or group of ISDN numbers on the interface.

Note — More than one ISDN number can be associated with the serviceB/Finterface only as a part of a supplementary service such as multiple subscriber number. In the case of one ISDN number, the option given above for the number of calls can only exceed the number of information channels in association with a supplementary service (e.g. call waiting). As a network provider option, separate values may be specified for incoming and for outgoing calls for either or both of the limits.

3.3.2 *Normal procedures*

Out-of-band messages shall always be provided to indicate call progress, etc. However, network-generated in-band tones and announcements shall always be provided for this bearer service.

a) *Originating the service (call set-up)*

The call is originated by the user requesting the required bearer service; the request includes a number identifying the called user. Other information, as required, for the bearer service and for use by the network in supplementary services provided to the called user (e.g. calling line identity) may also be included. This request may be given to the network either *en bloc* , containing all the required information, or not *en bloc* .

b) *Indications during call set-up*

All indications entail signalling messages and may also include in-band tones or announcements.

After initiating a call the calling user will receive an acknowledgement that the network is able to process the call. The called user will receive an indication of the arrival of an incoming call of this bearer service.

The calling user shall also be given an indication that the incoming call is being offered to the called user, when an indication is received by the network that the called user is being informed of this call. When the call reaches the called user and the connection is established, an indication of this is sent to the calling user.

The called user may also provide other information for use by the network in supplementary services provided to other users (e.g. connected line identity). The relationship of a connected user with a called user requires further study.

Once established, the B-channel is then available for the transmission of the requested (i.e. speech or 3.1 kHz audio information) signals in both directions continuously and simultaneously.

c) *Terminating the call*

The call may be terminated by either or both of the users by indicating this to the network. If one user terminates the call, an appropriate indication is sent to the other user.

3.3.3 *Exceptional procedures*

a) *Failure situations due to user error*

i) A user inputting a network-identifiable, improper service request will be given an appropriate failure indication by the network and the call set-up will be ceased.

ii) A user inputting a non-valid network number will be given an appropriate failure indication by the network and the call set-up will be ceased.

b) *Failure situations due to called user state*

i) A calling user attempting to establish a call to a user who is identified by the network to be busy (either network-determined user busy or user-determined user busy) will be given an appropriate failure indication by the network.

ii) A user attempting to establish a call to a user whose terminal equipment fails to respond will be given an appropriate failure indication by the network and the call set-up will be ceased.

iii) On a call to a user whose terminal equipment has responded that the called user is being informed of the call but has failed to answer within a defined period of time, the calling user attempting to establish the call will be given an appropriate failure indication by the network and the call set-up will be ceased.

c) *Failure situations due to network conditions*

A user attempting to establish a call but meeting call failure situations due to network conditions (e.g. congestion) will be given an appropriate failure indication by the network.

d) *Failure situations due to called user state andB/For network conditions*

A user attempting to establish a call but meeting call failure situations due to network conditions (e.g., congestion) or called user state (e.g. busy) can have service data retained for a specified period of time, i.e. retention timer.

3.3.4 *Alternative procedures*

3.3.4.1 *Reserved service procedures*

For further study.

3.3.4.2 *Permanent service procedures*

For further study.

3.4 *Network capabilities for charging*

This Recommendation does not cover charging principles. Future Recommendations in the D-Series are expected to contain that information.

3.4.1 *Demand service charging*

It shall be possible to charge the subscriber accurately for the demand service.

3.4.2 *Reserved service charging*

It shall be possible to charge the subscriber accurately for the reserved service.

3.4.3 *Permanent service charging*

It shall be possible to charge the subscriber accurately for the permanent service.

3.5 *Interworking requirements*

Interworking is required between the ISDN and the PSTN for this bearer service category.

3.6 *Interaction with supplementary services*

Not applicable. Each supplementary service description identifies the applicability to this bearer service category.

3.7 *Attributes and values of attributes of the circuit-mode 64 kbit/s, 8 kHz structured bearer service category usable for 3.1 kHz audio information transfer*

Information transfer attributes

1. Information transfer mode: circuit
2. Information transfer rate: 64 kbit/s
3. Information transfer capability: 3.1 kHz audio (Note)
4. Structure: 8 kHz integrity
5. Establishment of communication: demand/reserved/permanent
6. Symmetry: bidirectional symmetric/unidirectional
7. Communication configuration: point-to-pointB/Fmultipoint

Access attributes

8. Access channel: B for user information, D for signalling and/or operational, administrative and maintenance (OAM) messages
9. Access protocol: Recommendation G.711 for B-channel, I-Series for D-channel

General attributes

10. Supplementary services provided — Refer to Recommendation I.250
11. Quality of Service ?04 12. Interworking possibilities ?05 for further study
13. Operation and commercial aspects ⎭

Note — When crossing an international boundary between Administrations which employ different encoding laws the network shall perform the necessary A-μ law conversion (see Recommendation G.711).

3.8 *Provision of individual circuit-mode 64 kbitB/Fs, 8 kHz structured bearer services usable for 3.1 kHz audio information transfer*

a) Overall provision : | E

b) Variations of secondary attributes:

	Establishment of communication	*Symmetry*	*Communication configuration*	*Provision*
I.231.3/1	demand		pt-pt	E
I.231.3/2	reserved	bidirectional	pt-pt	A

I.231.3/3	permanent		pt-pt	E
I.231.3/4	demand		pt-pt	A
I.231.3/5	reserved	unidirectional	pt-pt	A
I.231.3/6	permanent		pt-pt	A
I.231.3/7	demand		multipt	A
I.231.3/8	reserved	bidirectional	multipt	A
I.231.3/9	permanent		multipt	A
I.231.3/10	demand		multipt	A
I.231.3/11	reserved	unidirectional	multipt	A
I.231.3/12	permanent		multipt	A

c) Access

H.T. [T3.231]

lw(42p) | lw(54p) | lw(42p) | lw(48p) | lw(42p) .

Tableau [T3.231], p.

3.9 *Dynamic description*

The dynamic description for this service on a demand basis is identical for a number of circuit mode services and is therefore collectively given in Recommendation I.220.

4 I.231.4 — Circuit-mode, alternate speech / 64 kbit/s unrestricted, 8 kHz structured bearer service category

4.1 *Definition*

This bearer service category provides the alternate transfer of speech or 64 kbit/s unrestricted digital information within the same call.

The request for this alternate capability and the initial mode desired by the user must be identified at call set-up time.

This bearer service category is provided for the support of multiple capability terminals or single capability terminals (Note 1).

For the speech mode of this bearer service category, the same applies as for the speech bearer service category. For the unrestricted mode of this bearer service category, the same applies as for the unrestricted (Note 2) bearer service category.

Note 1 — Initially, this service will only be applicable to multiple capability terminals. The use of this service by, and the network support of, single capability terminals is for further study, (e.g. how does a user change terminals). All references to single capability terminals reflect possible future enhancements and are subject to change and have only been included for information.

Note 2 — During an interim period some networks may only support restricted 64 kbit/s digital information transfer capability, i.e. information transfer capability solely restricted by the requirement that the all-zero octet is not allowed. For interworking, the rules given in the Appendix I of Recommendation I.520 should apply. The interworking functions have to be provided in the network with restricted capability. The ISDN with 64 kbit/s transfer capabilities will not be affected by this interworking, other than by conveying the appropriate signalling message to or from the ISDN terminal.

4.2. *Description*

4.2.1 *General description*

Once the connection is established, the user may repeatedly request via appropriate signalling messages, to alternate from speech mode to 64 kbit/s unrestricted digital mode, or vice versa. The in-call modification shall be provided on a per call basis.

4.2.2 *Specific terminology*

None identified.

4.2.3 *Qualifications on the applicability to telecommunications services*

None identified.

4.3 *Procedures*

4.3.1 *Provision/withdrawal*

This service shall be provided by pre-arrangement with the Administration.

4.3.2 *Normal procedures*

4.3.2.1 *ActivationB/FdeactivationB/Fregistration*

Not applicable.

4.3.2.2 *Invocation and operation*

At the start of the call the request for an alternate speech/64 kbit/s unrestricted call and the initial mode of either speech or 64 kbit/s unrestricted call must be identified. Following call set-up, the calling or called party may choose to modify the characteristics of the call during the conversationB/Fdata phase. During call establishment, the network shall choose a suitable route according to the information included in the set-up message.

Depending on the terminal capability type the following procedures will apply:

a) For multiple capability terminals the requesting user will send an *invoke in-call modification request* to the network.

b) For single capability terminals the requesting user will change over the connection from the first terminal to the second terminal before sending an *invoke in-call modification request* to the network.

The network will, on receipt of the *in-call modification request* from the callingB/Fcalled party, check if that call modification is allowed and if the necessary resources are available.

If acceptable, the resources are reserved and an *invoke in-call modification request* is sent to the distant end. A timer will be started to supervise that the in-call modification is received successfully.

Depending on the terminal configuration at the destination end, the procedures will be the following:

a) For multiple capability terminals the distant user, if agreeing with the service changeover, will transmit a *return result indication* while the resources in the network are switched in, if reserved previously and the *call modification indication* will be sent to the initiating party.

b) For single capability terminals a call changeover will be performed from the first terminal to the second terminal. An *in-call modification return result* will be sent to the network which will switch in the resources, if reserved previously.

4.3.3 *Exceptional procedures*

4.3.3.1 *ActivationB/FdeactivationB/Fregistration*

Not applicable.

4.3.3.2 *Invocation and operation*

If the network fails to change resources on receipt of the *in-call modification return result* , the connection will be cleared with a cause indication ‘‘temporary failure’’.

If on receipt of a *call modification invocation request* an exchange determines that in-call modification is not allowed or not possible a *call modification return error indication* will be sent. Receipt of the *call modification return error indication* will cause the reserved resources to be freed and a *call modification return error indication* to be delivered to the initiating party.

In case of in-call modification failure, the initiating terminal after having received the *in-call modification return error indication* , will resume to transmit and receive the bit stream for the previous service.

4.3.4 *Alternative procedures*

None identified.

4.4 *Network capabilities for charging*

This Recommendation does not cover charging principles. Future Recommendations in the D-Series are expected to contain that information.

It shall be possible to charge the subscriber accurately for the service.

4.5 *Interworking requirements*

For further study.

4.6 *Interactions with supplementary services*

For further study.

4.7 *Attributes and values of attributes of the circuit-mode, alternate speech | | 4 kbit/s unrestricted, 8 kHz structured bearer service category*

Information transfer attributes

1. Information transfer mode: circuit
2. Information transfer rate: 64 kbit/s
3. Information transfer capability: alternately speech (Note 1) or unrestricted digital information
4. Structure: 8 kHz integrity

5. Establishment of communication: demand/reserved/permanent

6. Symmetry: bidirectional symmetric/unidirectional

7. Communication configuration: point-to-point/multipoint

Access attributes

8. Access channel: B for user information,

D for signalling (Note 2)

9. Access protocol: I-Series for D-channel

General attributes

10. Supplementary services provided

11. Quality of Service (Note 3)

12. Interworking possibilities for further study

13. Operation and commercial aspects .bp

Note 1 — When crossing an international boundary between Administrations which employ different encoding laws, the network shall perform the necessary A-μ law conversion (see Recommendation G.711).

Note 2 — For reservedB/Fpermanent service the operational, administrative and maintenance (OAM) messages related to these services may be conveyed over the D-channel.

Note 3 — A short service changeover time (with a high probability of not being exceeded) has been tentatively identified as a requirement.

4.8 *Provision of individual circuit mode, alternate speech/64 kbit/s unrestricted, 8 kHz structured bearer services*

a) Overall provision : | A

Note — Some networks will offer the speech phase of these services in a manner identical to the 3.1 kHz audio service.

b) Variations of secondary attributes:

Establishment Symmetry Communication Provision of communication of configuration Provision

I.231.4/1	demand	pt-pt	E
I.231.4/2	reserved	pt-pt	A
I.231.4/3	permanent	pt-pt	E

bidirectional

I.231.4/4	demand	multipt	A
I.231.4/5	reserved	multipt	A
I.231.4/6	permanent	multipt	A

c) Access

H.T. [T4.231]

lw(42p) | lw(54p) | lw(42p) | lw(48p) | lw(42p) .

Table [T4.231], p.

4.9 *Dynamic description*

The dynamic description for this service needs further study and is not yet available.

5 I.231.5 — **Circuit-mode 2 × 64 kbit/s unrestricted, 8 kHz structured bearer service category**

5.1 *Definition*

This bearer service category provides the unrestricted transfer of two 64 kbitB/Fs user information flows over two B-channels at the user network interface.

5.2 *Description*

For further study.

5.3 *Procedures*

For further study.

5.4 *Network capabilities for charging*

This Recommendation does not cover charging principles. Future Recommendations in the D-Series are expected to contain that information.

It shall be possible to charge the subscriber accurately for the service.

5.5 *Interworking requirements*

For further study.

5.6 *Interaction with supplementary services*

For further study.

5.7 *Attributes and values of attributes of the circuit mode 2 × 64 kbit/s unrestricted, 8 kHz structured bearer service category*

Information transfer attributes

1. Information transfer mode: circuit
2. Information transfer rate: 2 × 64 kbit/s
3. Information transfer capability: unrestricted (Note)
4. Structure: 8 kHz integrity with restricted differential time delay (RDTD)

5. Establishment of communication: demand/reserved/permanent

6. Symmetry: bidirectional symmetric/bidirectional asymmetric/unidirectional

7. Communication configuration: point-to-point/multipoint

Access attributes

8. Access channel: two B(64) for user information

9. Access protocol: I-Series for D-channel

General attributes

10. Supplementary services provided

11. Quality of Service

12. Interworking possibilities for further study

13. Operation and commercial aspects

Note — Digit sequence integrity (DSI) is ensured for each elementary 64 kbit/s information.

5.8 *Provision for individual circuit-mode 2 × 64 kbitB/Fs, unrestricted, 8 kHz structured bearer services*

a) Overall provision : | A

b) Variations of secondary attributes :

Etablishment	*Symmetry*	*Communication*	*Provision*	*of communication of configuration*	*Provision*
I.231.5/1	demand	pt-pt	E		
I.231.5/2	reserved	pt-pt	A	bidirectional	
I.231.5/3	permanent	pt-pt	E		
Other combinations		A			

c) Access

H.T. [T5.231]

lw(42p) | lw(54p) | lw(42p) | lw(48p) | lw(42p) .

Table [T5.231], p.

5.9 *Dynamic description*

The dynamic description for this service needs further study and is not yet available.

6 I.231.6 — Circuit-mode 384 kbit/s unrestricted, 8 kHz structured bearer service category

6.1 *Definition*

This bearer service category provides the unrestricted transfer of 384 kbitB/Fs user information over a H_0 channel at the S/T reference point. The transfer of OAM information for reserved and permanent services may be provided over a D-channel in the same or in another interface structure.

6.2 *Description*

For further study.

6.3 *Procedures*

For further study.

6.4 *Network capabilities for charging*

This Recommendation does not cover charging principles. Future Recommendations in the D-Series are expected to contain that information.

It shall be possible to charge the subscriber accurately for the service.

6.5 *Interworking requirements*

For further study.

6.6 *Interaction with supplementary services*

For further study.

6.7 *Attributes and values of attributes of the circuit-mode 384 kbit/s unrestricted, 8 kHz structured bearer service category*

Information transfer attributes

1. Information transfer mode: circuit
2. Information transfer rate: 384 kbitB/Fs
3. Information transfer capability: unrestricted
4. Structure: 8 kHz integrity
5. Establishment of communication: demand/reserved/permanent
6. Symmetry: bidirectional symmetric/bidirectional asymmetric/unidirectional (Note)
7. Communication configuration: point-to-point/multipoint

Access attributes

8. Access channel: H_0(384) for user information D(16) or D(64) for OAM information
9. Access protocol: I-Series for D-channel

General attributes

10. Supplementary services provided
11. Quality of Service
12. Interworking possibilities for further study
13. Operation and commercial aspects

Note — Bidirectional-asymmetric services are for further study.

6.8 *Provision of individual circuit-mode 384 kbit/s unrestricted, 8 kHz structured bearer services*

a) Overall provision : | A

b) Variations of secondary attributes:

Establishment Symmetry Communication Provision of communication of configuration Provision

I.231.6/1 demand pt-pt A

I.231.6/2 reserved bidirectional pt-pt E

I.231.6/3 permanent pt-pt E

I.231.6/4 reserved ?04 ?05 unidirectional pt-pt A

I.231.6/5 permanent ⌡ pt-pt A I.231.6/6 reserved ?04 ?05 bidirectional multipt A

I.231.6/7 permanent ⌡ multipt A I.231.6/8 reserved ?04 ?05 unidirectional multipt A

I.231.6/9 permanent ⌡ multipt A

c) Access

H.T. [T6.231]

lw(42p) | lw(54p) | lw(42p) | lw(48p) | lw(42p) .

Table [T6.231], p.

6.9 *Dynamic description*

The dynamic description for this service needs further study and is not yet available.

7 I.231.7 — **Circuit-mode 1536 kbit/s unrestricted, 8 kHz structured bearer service category**

7.1 *Definition*

This bearer service category provides the unrestricted transfer of 1536 kbitB/Fs user information over a $H_{1\backslash d1}$ channel at the S/T reference point. Transfer of OAM information for reserved and permanent services may be provided via a D-channel in another interface structure.

7.2 *Description*

For further study.

7.3 *Procedures*

For further study.

7.4 *Network capabilities for charging*

This Recommendation does not cover charging principles. Future Recommendations in the D-Series are expected to contain that information.

It shall be possible to charge the subscriber accurately for the service.

7.5 *Interworking requirements*

For further study.

7.6 *Interaction with supplementary services*

For further study.

7.7 *Attributes and values of attributes of the circuit-mode 1536 kbitB/Fs unrestricted, 8 kHz structured bearer service category*

Information transfer attributes

1. Information transfer mode: circuit
2. Information transfer rate: 1536 kbit/s
3. Information transfer capability: unrestricted
4. Structure: 8 kHz integrity
5. Establishment of communication: demand/reserved/permanent
6. Symmetry: bidirectional symmetric/bidirectional asymmetric/unidirectional (Note)
7. Communication configuration: point-to-point/multipoint

Access attributes

8. Access channel: $H_{1\backslash d1}$(1536) for user information D(16) or D(64) for OAM signalling
9. Access protocol: I-Series for D-channel

General attributes

10. Supplementary services provided
11. Quality of Service
12. Interworking possibilities for further study
13. Operation and commercial aspects

Note — Bidirectional-asymmetric services are for further study.

7.8 *Provision of individual circuit-mode 1536 kbit/s unrestricted, 8 kHz structured bearer services*

a) Overall provision : | A

b) Variations of secondary attributes:

Establishment Symmetry Communication Provision of communication of configuration Provision

I.231.7/1 demand pt-pt A

I.231.7/2 reserved bidirectional pt-pt E

I.231.7/3 permanent pt-pt E I.231.7/4 reserved ?04 ?05
unidirectional pt-pt A

I.231.7/5 permanent ⌡ pt-pt A

I.231.7/6 reserved ?04 ?05 bidirectional multipt A

I.231.7/7 permanent ⌡ multipt A I.231.7/8 reserved ?04 ?05
unidirectional multipt A

I.231.7/9 permanent ⌡ multipt A

c) Access

H.T. [T7.231]

lw(42p) | lw(54p) | lw(42p) | lw(48p) | lw(42p) .

Table [T7.231], p.

7.9 *Dynamic description*

The dynamic description for this service needs further study and is not yet available.

8 I.231.8 — Circuit-mode 1920 kbit/s unrestricted, 8 kHz structured bearer service category

8.1 *Definition*

This bearer service category provides the unrestricted transfer of 1920 kbit/s user information over a $H_{1\backslash d2}$ channel at the S/T reference point. The transfer of OAM information for reserved and permanent services may be provided over a D-channel.

8.2 *Description*

For further study.

8.3 *Procedures*

For further study.

8.4 *Network aspects for charging*

This Recommendation does not cover charging principles. Future Recommendations in the D-Series are expected to contain that information.

It shall be possible to charge the subscriber accurately for the service.

8.5 *Interworking requirements*

For further study.

8.6 *Interaction with supplementary services*

For further study.

8.7 *Attributes and values of attributes of the circuit-mode 1920 kbit/s unrestricted, 8 kHz structured bearer service category*

Information transfer attributes

1. Information transfer mode: circuit
2. Information transfer rate: 1920 kbit/s
3. Information transfer capability: unrestricted
4. Structure: 8 kHz integrity
5. Establishment of communication: demand/reserved/permanent
6. Symmetry: bidirectional symmetric/bidirectional asymmetric/unidirectional

(Note)

7. Communication configuration: point-to-pointB/Fmultipoint

Access attributes

8. Access channel: $H_{1\backslash d2}$(1920) for user information D(64) for OAM information
9. Access protocol: I-Series for D-channel

General attributes

10. Supplementary services provided — Refer to Recommendation I.250
11. Quality of Service ?04 12. Interworking possibilities ?05 for further study
13. Operation and commercial aspects

Note 1 — Bidirectional-asymmetric services are for further study.

8.8 *Provision of individual circuit-mode 1920 kbit/s unrestricted, 8 kHz structured bearer services*

a) Overall provision : | A

b) Variations of secondary attributes:

Establishment	*Symmetry*	*Communication*	*Provision*	*of communication of configuration*	*Provision*
I.231.8/1	demand	pt-pt	A		

I.231.8/2 reserved bidirectional pt-pt E

I.231.8/3 permanent pt-pt E

I.231.8/4 reserved ?04 ?05 unidirectional pt-pt A

I.231.8/5 permanent ⌡ pt-pt A I.231.8/6 reserved ?04 ?05
bidirectional multipt A

I.231.8/7 permanent ⌡ multipt A I.231.8/8 reserved ?04 ?05
unidirectional multipt A

I.231.8/9 permanent ⌡ multipt A

c) Access

H.T. [T8.231]

lw(42p) | lw(54p) | lw(42p) | lw(48p) | lw(42p) .

Table [T8.231], p.

8.9 *Dynamic description*

The dynamic description for this service needs further study and is not yet available.

Recommendation I.232

PACKET-MODE BEARER SERVICES CATEGORIES

(Melbourne, 1988)

Recommendation I.210 describes the principles for defining telecommunication services supported by an ISDN including the concept of bearer services, teleservices and supplementary services. It also provides the means for the definition and description of such services.

The purpose of this Recommendation is to define a recommended set of packet-mode bearer services categories, to describe individual packet-mode bearer services and to recommend their provision in ISDN. The definitions and descriptions form the basis to define the network capabilities required for the support of the services in ISDN.

Bearer service categories are described by prose definitions and descriptions, by attributes and their values and by dynamic descriptions following the description method given in Recommendation I.130. The application of the attribute technique and the definitions of these attributes and attribute values is given in Recommendation I.140.

The following set of bearer service categories is currently identified and more may be identified in the future:

I.232.1 Virtual call and permanent virtual circuit bearer service category,

I.232.2 Connectionless bearer service category,

I.232.3 User signalling bearer service category.

1 I.232.1 — **Virtual call and permanent virtual circuit bearer service category**

1.1 *Definition*

This bearer service category provides the unrestricted transfer (without alteration) of user information in a packetized manner over a virtual circuit within a B- or D-channel at the SB/FT reference point. Signalling information for virtual call andB/For possibly OAM information for permanent virtual circuit services are transferred via B- or D-channels as described in Recommendation I.462 (X.31).

1.2 *Description*

1.2.1 *General description*

This packet-mode bearer service category allows users (e.g. terminals) in a point-to-point communication configuration to communicate via the ISDN using X.25 encoding, by means of Recommendation I.462 (X.31) procedures over either B- or D-channels, in both directions continuously and simultaneously for the duration of a call.

1.2.2 *Specific terminology*

Not applicable.

1.2.3 *Qualifications*

Not applicable.

1.3 *Procedures*

Detailed procedures for virtual calls appear in Recommendation I.462 (X.31), case B. The description below is a synopsis of those procedures. For actual, complete procedures, refer to Recommendation I.462.

1.3.1 *Provision/withdrawal*

For further study.

1.3.2 *Normal procedures*

1.3.2.1 *Activation/deactivation/registration*

Not applicable.

1.3.2.2 *Invocation and operation*

1.3.2.2.1 *Virtual call procedures*

a) *Call establishment*

For virtual calls, X.25 will be used on an active channel (B or D) to the packet handler. In order to establish that channel and/or to negotiate the type of channel to be used, out-of-band signalling procedures may be used. Once connected to the packet handler, remaining call information, including called user address, are signalled in the X.25 call request.

b) *Data transfer phase*

Once established, the virtual circuit is then available for unrestricted X.25 data transfer in both directions continuously and simultaneously. During the data transfer phase, information exchange occurs with the following characteristics, among others:

— packetized;

— flow control;

— delivery confirmation (optional);

— reset/interrupt.

c) *Terminating the call*

The call may be terminated by either or both of the users by indicating this to the network. In either case, an appropriate indication is sent to the other user. The active channel may be released after the termination of the last virtual call on that channel.

1.3.2.2.2 *Permanent virtual circuit procedures*

For permanent virtual circuits on B- or D-channels, there is no call set-up or clearing. For permanent virtual circuits using B-channel access, a semi-permanent connection of the channel to the packet handler must be in place. The procedures for the control of packets between user terminal equipment and network are covered by X.25 data transfer phase.

1.3.2.3 *InterrogationB/Fediting*

Not applicable.

1.3.3 *Exceptional procedures*

1.3.3.1 *ActivationB/FdeactivationB/Fregistration*

Not applicable.

1.3.3.2 *Invocation and operation*

1.3.3.2.1 *Virtual call*

In case of failure situations due to calling/called user error, user state, or network conditions, appropriate failure indications will be signalled from the network and the call set-up or established call may be terminated. For detailed procedures, see Recommendation I.462.

1.3.3.2.2 *Permanent virtual circuit*

In case of failure situations due to user error, user state, or network conditions, appropriate failure indications will be signalled from the network. For detailed procedures, see Recommendation I.462.

1.3.3.3 *Interrogation/editing*

Not applicable.

1.3.4 *Alternative procedures*

Not applicable.

1.3.5 *Verification*

Not applicable.

1.4 *Network capabilities for charging*

This Recommendation does not cover charging principles. Future Recommendations in the D-Series are expected to contain that information.

1.4.1 *Virtual call charging*

It shall be possible to charge the subscriber accurately for the virtual call service.

1.4.2 *Permanent virtual circuit charging*

It shall be possible to charge the subscriber accurately for the permanent virtual circuit service.

1.5 *Interworking requirements*

General interworking arrangements for this bearer service category are defined in Recommendation X.300. Specific interworking procedures are in Recommendation I.462.

1.6 *Interaction with supplementary services*

Not applicable.

1.7 *Attributes and values of attributes of the virtual call and permanent virtual circuit bearer service category*

Information transfer attributes

1. Information transfer mode: packet

2. Information transfer rate: maximum throughput of a given virtual circuit is less than or equal to the maximum bit rate of the user information access channel and the throughput class of the virtual circuit (Note)

3. Information transfer capability: unrestricted

4. Structure: service data unit integrity

5. Establishment of communication: demand (virtual call)/permanent (permanent virtual circuit)

6. Symmetry: bidirectional symmetric

7. Communication configuration: point-to-point

Access attributes

8. Access channel: user information over virtual circuit within B- or D-channel. When D-channel is used, maximum packet size and Quality of Service may be restricted. Signalling may be provided via D-channel and/or virtual circuit within B-channel

9. Access protocol: as specified in Recommendations I.440, I.450, I.451, I.462 and X.25 (layers 2 and 3)

General attributes

10. Supplementary services provided: as listed in Recommendation X.2. Others are for further study

11. Quality of Service ?04 12. Interworking possibilities ?05 for further study
13. Operational and commercial aspects

Note — The exact values of information transfer rates for the virtual call and permanent virtual circuit are for further study.

1.8 *Provision of virtual call and permanent virtual circuit bearer service*

a) Overall provision: | E

b) Variations of secondary attributes:

Establishment de	*Symmetry*	*Communication*	*Provision*		*of communication*	*of configuration*	*Provision*
demand	?04	pt-pt	E	?05	bidirectional symmetric		
permanent	⌡	pt-pt	E				

c) *Access*

H.T. [T1.232]

{
Access channel control
Signalling and OAM
(Notes 1 and 2)
}
Virtual call control
Signalling and OAM
(Notes 1 and 3)
}
Channel and rate
	{
	User information
	Protocols
		Provision
		Channel and rate
			Protocols	Channel and rate	Protocols

D(16)	I.451 I.441 I.430	B(64)	X.25, L3 X.25, L2 I.430	B(64)	X.25, L3 X.25, L2 I.430
D(64)	I.451 I.441 I.431	B(64)	X.25, L3 X.25, L2 I.431	B(64)	X.25, L3 X.25, L2 I.431
D(16)	I.451 I.441 I.430	D(16)	X.25, L3 I.441 I.430	D(16)	X.25, L3 I.441 I.430
D(64) A L1, L2 and L3 Layer 1, layer 2 and layer 3 }	I.451 I.441 I.431	D(64)	X.25, L3 I.441 I.431	D(64)	X.25, L3 I.441 I.431

Note 1 — The definition of other protocols for OAM is for further study.

Note 2 — The protocols listed in this column are for establishing communications with the packet handling function using out-of-band call control signals. This procedure does not apply in certain cases (for example, semi-permanent D-channel connection).

Note 3 — The protocols listed in this column are for the establishment of a virtual circuit using X.25 procedures. These procedures do not apply to permanent virtual circuits.

Table [T.1232], p.

1.9 *Dynamic description*

Dynamic descriptions for the Recommendation I.462 procedures in the virtual call and permanent virtual circuit bearer service category are for future study. State transition diagrams for layer 3 of Recommendation X.25 (Annex B) apply for virtual call and permanent virtual circuit.

2 I.232.2 — **Connectionless bearer service category**

Note — This connectionless bearer service category is a different concept from, and should not be confused with, the OSI Connectionless Mode Network Service. Thus, the name of this service may change as the service is better defined.

Further aspects of this bearer service category are for further study.

3 I.232.3 — **User signalling bearer service category**

Note — This service is different from, and should not be confused with, the user-to-user signalling supplementary service (see Recommendation I.257). The user-to-user signalling supplementary service is used in conjunction with either a bearer service or a teleservice. The user signalling bearer service category stands on its own and is not used in conjunction with a bearer service or a teleservice.

Further aspects of this bearer service category are for further study.