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SECTION 4

TELESERVICES SUPPORTED BY AN ISDN

Recommendation I.240

DEFINITION OF TELESERVICES

(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 teleservices to be supported by an ISDN. These definitions form the basis for detailed descriptions of teleservices as given in Recommendation I.241 which are used to define the network capabilities required.

Teleservices are described by prose definitions and descriptions, by attributes and by dynamic descriptions, which altogether define the service characteristics at a given access point where the customer accesses the service. Recommendation I.140 and Recommendation I.210, Annex C describe the use of attributes for this purpose.

2 Definition of teleservices in ISDN

This section defines the teleservices identified so far to be supported by an ISDN. Additional teleservices are for further study.

The definition of teleservices is based upon the list of attributes given in Recommendation I.210, Annex C.

The higher layer attribute values (i.e. the layer 4 to 7 protocol functions and ‘‘type of user information’’) the low layer attribute values (i.e., the information transfer attributes, the access attributes and the general attributes) are the recommended functions for teleservices. The ‘‘type of user information’’ attribute is considered the only dominant attribute. The value of this attribute is the same as the service name used in the E- and F-series Recommendations for the particular service being provided in ISDN.

The information transfer and access attribute values for teleservices given in the service descriptions are the proposed values when using the circuit-mode and packet-mode bearer capabilities of the ISDN. For the case of telephony, only the circuit-mode is to be used. Implementations using alternative low layer attribute values are permitted but are for further study. From a service interworking perspective it is desirable that the possible combinations of values of the low layer attributes of teleservices be the same as the bearer capabilities of the bearer services defined in I.230-series of Recommendations.

The following teleservices have been identified so far to be supported by an ISDN:

I.241.1 Telephony

I.241.2 Teletex

I.241.3 Telefax 4

I.241.4 Mixed mode

I.241.5 Videotex

I.241.6 Telex

The prose descriptions (step 1.1) and static descriptions (step 1.2) of these services are given in Recommendation I.241. The common dynamic description (step 1.3) for demand bearer services given in Recommendation I.220 is also applicable to teleservices.

Note — Prose descriptions for mixed mode, Videotex and telex are not yet included.

3 Recommended support of teleservices

In order to facilitate the development of compatible ISDNs and related user equipment, Recommendation I.241 outlines the recommended support of teleservices defined in this Recommendation. This outline consists of two parts:

a) description of the overall support of a teleservice by its dominant attribute value, i.e., the value of the high layer attribute: type of user information. The recommended overall support of a teleservice is described as:

E an essential teleservice to be made available internationally;

A an additional teleservice which may be available in some ISDNs, and which may also be available internationally;

FS the recommended support of this teleservice is for further study,

b) with each teleservice, a description of the agreed non-dominant attributes, e.g. values of the high layer attributes: layer 4 to 7 protocol functions. If an ISDN supports the teleservice, the recommended support of the values of these secondary attribute combinations within this teleservice is described as:

E an essential combination of attribute values to be made available internationally (when an ISDN supports the particular teleservice);

A an additional combination of attribute values which may be available in some ISDNs, and which may also be available internationally (when an ISDN supports the particular teleservice);

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

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

The recommended overall support of teleservices as given in Recommendation I.241 is summarized in Table 1/I.240.

4 Prose definitions of teleservices

In order to give an overview of the teleservices identified, their definitions, as given in Recommendation I.241, are reproduced below.

I.241.1 **Telephony**

The ‘‘telephony service’’ provides users with the ability for real-time two-way speech conversation via the network.

I.241.2 **Teletex**

Teletex is an international service enabling subscribers to exchange office correspondence in the form of documents containing Teletex coded information on an automatic memory-to-memory basis via the ISDN.

I.241.3 **Telefax 4**

Telefax 4 is an international service enabling subscribers to exchange office correspondence in the form of documents containing facsimile coded information automatically via the ISDN.

H.T. [T1.240]
TABLE 1/I.240
Recommended overall support of teleservices by ISDNs

No.	Service	Support
I.241.1	Telephony	E/A | ua)
I.241.2	Teletex	A
I.241.3	Telefax 4	A
I.241.4	Mixed mode	A
I.241.5	Videotex	A
I.241.6	Telex	FS

a) It is anticipated that ISDNs will offer telephony as a basic telecommunication service. Some networks will offer this as a teleservice. However, due to national regulation policies, some networks will offer telephony as a bearer service rather than as a teleservice.

Tableau 1/I.240 [T1.240], p.1

I.241.4 **Mixed mode**

This service provides combined text and facsimile communication (mixed mode) for end-to-end transfer of documents containing mixed information of text and fixed images. The high layer attributes are based on the Recommendations for Teletex and Telefax 4.

I.241.5 **Videotex**

The Videotex service in the ISDN is an enhancement of the existing Videotex service with retrieval and mailbox functions for text (alpha) and graphic information.

I.241.6 **Telex**

This service provides interactive text communication. The digital signal at the SB/FT reference point follows the internationally agreed Recommendations for telex above the ISDN physical layer.

Recommendation I.241

TELESERVICES SUPPORTED BY AN ISDN

(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.

In Recommendation I.240, six teleservices are identified to be supported by an ISDN, i.e. telephony, Teletex, Telefax 4, mixed mode, Videotex and telex.

This Recommendation contains the service descriptions for these teleservices. Descriptions for other teleservices are for further study. The description of teleservices is structured in accordance with the three steps in stage 1 of the service description method.

The recommended support for these teleservices is given in § . | | 8 (i.e. 1.8, 2.8, 3.8 etc.) of each individual service description.

1 I.241.1 — **Telephony**

1.1 *Definition*

The ‘‘telephony service’’ provides users with the ability for real-time two-way speech conversation via the network.

1.2 *Description*

1.2.1 *General description*

The ‘‘telephony service’’ provides speech transmission at an audio bandwidth of 3.1 kHz. The communication is bidirectional, with both directions continuously and simultaneously active during the speech phase. The network may use processing techniques appropriate for speech such as analogue transmission, echo cancellation and low bit-rate encoding.

The digital signal at the SB/FT reference point follows the encoding laws for speech (according to Recommendation G.711), A-law or μ-law and the network may use digital signal processing techniques. It may also be necessary to use echo cancellation techniques in particular when interworking with other networks such as the PSTN. User information is provided over a B-channel, signalling is provided over the D-channel. Tones and announcements are provided by the network, encoded according to Recommendation G.711, although terminals can generate tones or other indications based on the messages received.

1.2.2 *Specific terminology*

a) *Voice quality* — The required acoustic performance is described in terms of loudness ratings, frequency response, quantizing distortion, etc. Overall requirements are given in the Recommendations of the P-Series.

b) *Transmission delay* — The maximum delay is that specified for the general telephone network (cf. Recommendation G.114). The permissible variation of the actual delay is for further study.

c) *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 *ProvisionB/Fwithdrawal*

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

1.3.1.2 The teleservice 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*

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

The service is originated by the originating user activating the terminal, performing service selection (if applicable) for the originating terminal, and terminating customer selection. During this process the originating user is given appropriate indications as to the state of the call.

i) A service selection is required on a multi-service terminal.

ii) Terminating customer selection is selecting the required termination (user/network interface) by an appropriate means [for example, the use of direct-dialling-in (DDI), or multiple subscriber number].

iii) Indications during call origination may include an indication that the network is ready to receive the network address information (proceed indication) and an indication that the call is progressing through the network. It shall be possible to have audible indications which may be accompanied by other indications.

b) *Call acceptance (answer)*

Selection of the terminating customer is indicated to each user by appropriate indications (*call arrival indication* and *awaiting answer indication*). The acceptance of the call by the terminating user, i.e. answer, causes the indications to be removed and bidirectional communication paths to be provided. The call is now termed in the ‘‘speech phase’’.

c) *Call release*

A request to terminate the service may be generated by either user. If one user terminates the service the other user is given an appropriate indication as to the state of the call.

d) *Failure situations due to user error*

The following failure situations may occur due to user error:

i) user taking too long to input the network address information will be given a failure indication, e.g. during overlap sending (see Recommendations I.451 and I.220);

ii) user inputting a non valid network address, e.g. an unallocated address, will be given a failure indication.

e) *Failure indications due to terminating termination state*

i) User attempting to set up a call to a termination where no free B-channels are available will receive a busy indication unless call waiting or another supplementary service is in operation.

Note — In support of some supplementary services (e.g. call waiting, line hunting), it may optionally be necessary for the subscriber to register some additional parameters (e.g. destination number used to distinguish PSTN telephony calls) with the network to allow the network to know when a channel is busy with telephony.

ii) User attempting to set up a call to a termination where the call is not accepted, i.e. no response indicating call acceptance is received, will, after a defined period, be given a call failure indication (see Recommendations I.451 and I.220).

f) *Failure situations due to network conditions*

User attempting to set up a call but meeting problems in the network (e.g. congestion) will be given a suitable indication.

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.

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

1.5 *Interworking requirements*

1.5.1 Interworking is required between the ISDN and PSTN.

1.6 *Interaction with supplementary services*

Not applicable. Each supplementary service description identifies the applicability with this teleservice.

1.7 *Attributes and values of attributes of the telephony service*

a) *LOW LAYER ATTRIBUTES*

Information transfer attributes

1. Information transfer mode: circuit

2. Information transfer rate: 64 kbit/s

3. Information transfer capability: speech

4. Structure: 8 kHz integrity

5. Establishment of communication: on demand

6. Symmetry: bidirectional symmetric

7. Communication configuration: point-to-point

Access attributes

8. Access channel (and rate): B(64) for user information, D for signalling (Note)

9. Access protocol

9.1 Signalling access protocol layer 1: I.430/I.431

9.2 Information access protocol layer 2: I.440/I.441

9.3 Signalling access protocol layer 3: I.450/I.451

9.4 Information access protocol layer 1: I.430/I.431; G.711

9.5 Signalling access protocol layer 2: not applicable

9.6 Information access protocol layer 3: not applicable

b) *HIGH LAYER ATTRIBUTES*

10. Type of user information: speech

11. Layer 4 protocol functions: not applicable

12. Layer 5 protocol functions: not applicable

13. Layer 6 protocol functions: Recommendation G.711

14. Layer 7 protocol functions: not applicable

c) *GENERAL ATTRIBUTES*

15. Supplementary services provided: further study

16. Quality of Service: further study

17. Interworking possibilities: to and from PSTN

18. Operational and commercial: further study

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

1.8 *Recommended support of telephony by an ISDN*

The definition of E (essential) and A (additional) can be found in Recommendation I.240.

a) Overall support : E/A

Note — It is anticipated that ISDNs will offer telephony as a basic telecommunication service. Some networks will offer this as a teleservice. However, due to national regulation policies, some networks will offer telephony as a bearer service rather than as a teleservice.

b) Variations of non-dominant attributes :

1) Information transfer mode

— Circuit : E

2) *Establishment* *Symmetry* *Communication* *Support* *of communication configuration* *support*

demand pt-pt E

reserved bidirectional pt-pt FS

permanent sym´etrique pt-pt A demand multipt A

reserved bidirectional pt-pt FS

permanent sym´etrique multipt A

3) Access

H.T. [T1.241]

Signalling and OAM (Note 1)		User information		Support
Channel and rate	Protocols	Channel and rate	Protocols	
D(16)	{			
I.430, I.440, I.441, I.450, I.451 (Note 2)				
}	B(64)	I.430, G.711	E	
D(64)	{			
I.431, I.440, I.441, I.450, I.451 (Note 2)				
}	B(64)	I.431, G.711	E	

Note 1 — Definition of protocols for OAM is for further study.

Note 2 — Demand services only. Others are for further study.

Table [T1.241], p.

1.9 *Dynamic description*

The circuit-mode dynamic description appears in Recommendation I.220.

2 I.241.2 — **Teletex**

The prose description of the Teletex service is an extract of Recommendation F.200. If more detail is required this Recommendation should be referred to. As such, this service description does not strictly follow step 1.1 of the service description method. Further alignment with this description method requires further study.

2.1 *Definition*

Teletex is an international service, enabling subscribers to exchange office correspondence in the form of documents containing Teletex coded information on an automatic memory-to-memory basis via the ISDN.

2.2 *Description*

2.2.1 *Scope*

The Teletex service provides communication between Teletex equipment which are used for the preparation, editing and printing of correspondence containing text information using a standardized character set (see Recommendation T.61).

The basic element of the correspondence between users is the page which is the smallest unit of text treated as an entity. No restrictions shall exist concerning the operator procedures for generation of the text or the positioning of text within the printable area on a page.

Note 1 — This does not necessarily imply that the characters used to construct a graphic symbol are transmitted in the same sequence as that in which they are keyed.

Note 2 — This does not necessarily imply that the order in which text on a page is transmitted is the same as that in which it was keyed.

Teletex equipment may be a Teletex terminal or a system.

Note 3 — An exception to this rule is the application of the processable mode of operation for which the page, as a basic element of correspondence, cannot be used. The processable mode of operation within the Teletex service is defined in Recommendation F.220.

2.2 *Operation*

2.2.2.1 *General*

The Teletex service in each country and the international interconnection between countries or networks shall use automatic switching so that it is possible for any Teletex subscriber to reach any other Teletex subscriber using fully automatic selection.

It is a requirement to allow the through-connection of a call between a Teletex terminal connected to a private automatic branch exchange (or similar systems) and those connected to public exchanges used for the Teletex service.

A virtual dialogue mode of operation, which appears to the subscriber as an interactive mode, should be possible, although this is not a basic requirement of the Teletex service.

A virtual dialogue mode of operation, which appears to the subscriber as an interactive mode, may become possible as a new standardized option within the Teletex service, allowing both communications between persons and data base access (see Recommendation I.210).

Processable mode of operation, as a standardized option within the Teletex service, allows the transfer of text containing information to permit convenient further editing and processing by the recipient (see Recommendation F.220).

Mixed mode of operation using the techniques of Telefax 4 for the transfer of facsimile-coded information and of Teletex for the transfer of character-coded text is described as a standardized option within the Teletex service in Recommendation F.230.

Two-way alternate (TWA) communication is a capability of the Teletex service, which also includes one-way communication (OWC); the calling subscriber will have full control of the Teletex call.

2.3 *Procedures*

2.3.1 *ProvisionB/Fwithdrawal*

The national and international facilities of the Teletex service, including the TeletexB/Ftelex conversion facilities, shall be open continuously.

Teletex subscriber equipment for which call numbers are published in the directories shall, in principle, be available to accept calls continuously.

In order to facilitate the 24-hour duration of the service, it is permitted to use a centralized storage in the network to realize the receiving memory capability of the terminal.

2.3.2 *Call phases*

The operations for each call may be divided into the following three phases:

a) Preparation

— preparation of the information in local mode;

— loading of the information into a memory,

b) Transmission (in principle, automatic)

— call establishment;

— pre-information phase (see Note);

— information transfer from memory-to-memory (see Note);

— post information phase (see Note);

— call clearing.

Note — During these parts of the transmission phase the network must be transparent with respect to control procedures.

c) Output

— emptying the memory.

Note — The information may consist of one or more Teletex documents each consisting of one or more Teletex pages.

The control procedures as specified in Recommendation T.62 shall be used as end-to-end communication procedures between any Teletex equipment in the basic service.

The lower layer protocols and the network independent basic transport protocol to be used for Teletex are specified in Recommendations T.70 and T.90.

The network-dependent control procedures for the Teletex are those that are defined for ISDN.

2.3.3 *Call identification line*

The Teletex procedures include the exchange of reference information prior to sending any document. This reference information includes identification of the parties to the call as well as the date and time. Also, supplementary reference information is exchanged during a call to allow reference to an individual document or page for error recovery or other purposes.

This reference information, taken together, is defined to be printable on a single line called the call identification line. Use of this information is a local decision except in recovering from an interrupted transmission.

The call identification line is composed of four fields as follows (see Figure 1/I.241):

— Field 1: identification of the called Teletex equipment;

— Field 2: identification of the calling Teletex equipment;

— Field 3: date and time;

— Field 4: supplementary reference information.

Figure 1/I.241 [T2.241], p. (a traiter comme tableau MEP)

2.3.4 *Error protection*

Within the Teletex service a high layer error detection and correction is provided in the session layer for all those errors which are not corrected by the network layers.

To ensure call integrity, error protection will be provided by Teletex control procedures (see Recommendations T.62, T.70 and T.90). The error rate on the pre-information, information and post-information phases should not exceed 1 in 10^6 characters.

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.

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

2.5 *Interworking requirements*

2.5.1 Within the Teletex service, interworking between terminals connected to different networks is required. Real-time connection between terminals operating at different speeds has to be provided on the basis of at least 2.4 kbitB/Fs.

2.5.2 *Intercommunication with other services*

2.5.2.1 The Teletex service will provide the ability for intercommunication in both directions with the telex service by means of conversion facilities (see Recommendations F.201, U.201, T.390).

2.5.2.2 Intercommunication between basic mode and mixed mode Teletex terminals and Classes I, II and III Group 4 facsimile terminals is shown in Table 1/I.241 (see Recommendation F.184).

2.5.2.3 The Teletex service allows for intercommunication with telex and with the Interpersonal Messaging Service (IPM) (see Recommendations F.421, F.422).

H.T. [T3.241]

TABLE 1/I.241

Current status of direct intercommunication

for Teletex and Group 4 facsimile terminals on the same network

lw(48p) | lw(30p) | lw(30p) | lw(30p) | lw(30p) | lw(30p) | lw(30p) .

lw(48p) | cw(30p) | cw(30p) | cw(30p) | lw(30p) | lw(30p) | lw(30p) .

Facsimile Group 4, Class I	F	F	F	
Facsimile Group 4, Class II	F	F	F	
Facsimile Group 4, Class III	MM T F	T, F,	MM	T, F,
Teletex basic mode		T	T	T
Teletex mixed mode	MM T	T,		MM T,
Teletex processable mode 1		T	T	T

T: Basic Teletex document with character coded information only.

F: Group 4 facsimile document with facsimile coded information only.

MM: Mixed-mode document with character and facsimile coded information.

PM1: Processable mode document with character coded information only.

Table 1/I.241 [T3.241], p.

2.6 *Interaction with supplementary services*

Each supplementary service description identifies the applicability with this teleservice.

For the ISDN, the international supplementary services which may be used for Teletex in the circuit mode using a B-Channel are:

i) closed user group;

ii) multiple subscriber number;

iii) user-to-user signalling;

iv) calling line identification presentation;

v) calling line identification restriction;

vi) connected line identification presentation;

vii) connected line identification restriction;

viii) direct-dialling-in.

The use of other supplementary services is for further study.

Supplementary services for Teletex with a packet-mode of operation are for further study.

2.7 *Attributes and values of attributes of the Teletex service*

a) *LOW LAYER ATTRIBUTES*

Information transfer attributes

Circuit-mode bearer capability Packet-mode bearer capability 1. Information transfer mode circuit packet 2. Information transfer rate 64 kbit/s 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

3. Information transfer capability unrestricted (Note 1) unrestricted 4. Structure unstructured (Note 2) service data unit integrity 5. Establishment of communication demand demand (VC), permanent (PVC)

6. Symmetry bidirectional symmetric bidirectional symmetric 7. Communication configuration point-to-point point-to-point

blanc

Access attributes

Circuit-mode bearer capability Packet-mode bearer capability 8. Access channel: B for user information D for signalling 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 9.1 Signalling access protocol layer 1: Rec. I.430/I.431 Rec. I.430/I.431 9.2 Signalling access protocol layer 2: Rec. I.440/I.441 Rec. I.440/I.441, X.31 9.3 Signalling access protocol layer 3: Rec. I.450/I.451 Rec. I.450/I.451, X.31

9.4 Information access protocol layer 1: Rec. I.430/I.431 Rec. I.430/I.431 9.5 Information access protocol layer 2: Rec. X.75 (SLP) Rec. X.25 (LAPB) 9.6 Information access protocol layer 3: ISO 8208 Rec. X.25 (PLP)

blanc

b) *HIGH LAYER ATTRIBUTES*

10. Type of user information : Teletex

11. Layer 4 protocol functions: T.70

12. Layer 5 protocol functions: T.62

13. Layer 6 protocol functions: T.61

14. Layer 7 protocol functions: T.60

c) *GENERAL ATTRIBUTES*

15. Supplementary services provided: see § 2.6

16. Quality of service: for further study

17. Interworking possibilities: see § 2.5

18. Operational and commercial: for further study

SLP — Single link protocol

PLP — Packet layer protocol

VC — Virtual circuit

PVC — Permanent virtual cirtcuit

Note 1 — The interworking arrangements with networks having a restricted 64 kbit/s information transfer capability require further study.

Note 2 — Even if no structure is required the network may provide 8 kHz integrity.

2.8 *Recommended support of Teletex by an ISDN*

a) Overall support : A

b) Variations of non-dominant attributes:

1) Information transfer mode

Note — In the interim period, the circuit mode method of operation is preferred

— circuit: A

— packet: A

2) *Establishment*	*Symmetry*	*Communication*	*Support*	*of communication configuration*	*Support*
demand	bidirectional symmeric	pt-pt	E		

3) *Access*

H.T. [T4.241]

Signalling and OAM (Note 1)		User information		Support
Channel and rate	Protocols	Channel and rate	Protocols	
Circuit mode				
D(16)	{			
I.430, I.440, I.441, I.450, I.451				
(Note 2)				
}	B(64)	I.430, X.75 (SLP), ISO 8208	A	
D(64)	{			
I.431, I.440, I.441, I.450, I.451				
(Note 2)				
}	B(64)	I.431, X.75 (SLP), ISO 8208	A	
Packet mode				
D(16)	{			
I.430, I.440, I.441, I.450, I.451, X.31				
}	B(64) or D(16)	{		
I.430,				
X.25 LAPB,				
X.25 (PLP)				
}	A			
D(64)	{			
I.431, I.440, I.441, I.450, I.451, X.31				
}	B(64)	{		
I.431,				
X.25 LAPB,				
X.25 (PLP)				
}	FS			
VC in B(64)	for futher study	B(64)	for futher study	FS

Note 1 — Definition of protocols for OAM is for further study.

Note 2 — Demand services only. Others are for further study.

Tableau [T4.241], p.5

2.9 *Dynamic description*

The circuit-mode dynamic description appears in Recommendation I.220.

3 I.241.3 — **Telefax 4**

The prose description of the Telefax 4 service is an extract of Recommendation F.I84. (If more detail is required this Recommendation should be referred to.) Therefore it does not strictly follow Step 1.1 of the service description method. Closer alignment with the method requires further study.

3.1 *Definition*

Telefax 4 is an international service enabling subscribers to exchange office correspondence in the form of documents containing facsimile coded information, automatically via the ISDN.

3.2 *Description*

3.2.1 *General description*

The Telefax 4 service provides a basic level of compatibility between all terminals participating in the service. It offers bidirectional communication between two users via the ISDN using 64 kbitB/Fs digital signals over the B-channel.

There are three classes of Group 4 facsimile terminals:

Class I — In this class the minimum requirement terminal is a terminal able to send and receive documents containing facsimile encoded information (in accordance with Recommendation T.6 and the T.400-Series).

Class II — In this class the minimum requirement terminal is a terminal able to transmit documents that are facsimile encoded (in accordance with Recommendation T.6 and the T.400-Series). In addition, the terminal must be capable of receiving documents which are facsimile coded (in accordance with Recommendation T.6 and the T.400-Series), teletex coded (in accordance with the basic coded character repertoire as defined in Recommendation T.61) and also mixed-mode documents (in accordance with Recommendations of the T.400-Series).

Class III — In this class the minimum requirement terminal is a terminal that is capable of generating, transmitting and receiving facsimile coded documents (in accordance with Recommendation T.6 and the T.400-Series), teletex coded documents (in accordance with the basic coded character repertoire as defined in Recommendation T.61) and mixed-mode documents (in accordance with Recommendations of the T.400-Series).

The basic element of the correspondence between users is the page which is the smallest unit of text treated as an entity. No restrictions shall exist concerning the operator procedures for generation of the text or the positioning of text within the reproducible area on a page.

3.2.2 *Operation — General*

The Telefax 4 service in each country and the interconnection between countries or networks shall use automatic switching so that it is possible for any Telefax 4 subscriber to reach any other Telefax 4 subscriber using fully automatic selection.

It is a requirement to allow the through-connection of a call between Group 4 facsimile terminals connected to a private automatic branch exchange (or similar systems) and those connected to public exchanges used for the Group 4 facsimile service.

Two-way alternate (TWA) communication is a capability of the Telefax 4 service, which also includes one-way communication (OWC); the calling subscriber will have full control of the Group 4 facsimile call.

3.3. *Procedures*

3.3.1 *ProvisionB/Fwithdrawal*

The national and international Telefax 4 service shall be open continuously.

Telefax 4 terminals for which call numbers are published in the directories shall, in principle, be available to accept calls continuously.

In order to facilitate the 24-hour duration of service it is permitted to use a centralized storage in the network to realize the receiving memory capability of the terminal.

3.3.2 *Call phases*

The operations for each call may be divided into the following three phases:

a) preparation:

— preparation of the information to be transmitted;

b) transmission:

— call establishment (automatic);

— pre-information phase (see Note);

— information transfer (see Note);

— post information phase (see Note);

— call clearing.

Note — During these parts of the transmission phase the network must be transparent with respect to control procedures.

c) output:

— displaying the message either by immediate printing or from a storage medium upon control by the operator.

Note — The information may consist of one or more Telefax 4 documents each consisting of one or more Telefax pages.

The control procedures as specified in Recommendation T.62 and Recommendations of the T.400-Series shall be used as end-to-end communication procedures between terminals in the service.

The low layer protocols and the network independent basic transport protocol for Telefax 4 are specified in Recommendations T.70 and T.90.

The network-dependent control procedures for the Telefax 4 service are those that are defined for ISDN.

3.3.3 *Call identification line*

The Telefax 4 procedures include the exchange of reference information prior to sending any document. This reference information includes identification of the parties to the call as well as the date and time. Also, supplementary reference information is exchanged during a call to allow reference to an individual document or page for error recovery or other purposes. Date and time have to be provided by the network and sent to the calling terminal in the call set-up phase.

This reference information, taken together, is defined to be printable on a single line called the call identification line. Use of this information is a local decision except in recovering from an interrupted transmission. In the case of automatic linking, the use of this information is for further study.

For the format of the call identification line see Recommendation F.200.

3.3.4 *Error protection*

To ensure call integrity, error protection will be provided by Telefax 4 control procedures (see Recommendations T.62, T.70 and T.90). Besides the error detection and correction mechanism in layer 2 (and 3) an additional error detection and correction mechanism is provided in the session layer. By this mechanism, errors of the higher layer functions (e.g. commandB/Fresponse sequence error) and transmission errors, which are not corrected by the lower layers, will be corrected, for example, by retransmission of one or several pages.

The error rate on the pre-information, information and post-information phases should not exceed $1 \times 10^{\mathrm{D}}$lF261^{6}.

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.

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

3.5 *Interworking requirements*

3.5.1 Within the Telefax 4 service, interworking between terminals connected to different networks is required for:

a) Telefax 4 (ISDN) — Telefax 4 (CSPDN: Circuit switched public data network)

b) Telefax 4 (ISDN) — Telefax 4 (PSPDN: Packet switched public data network)

c) Telefax 4 (ISDN) — Telefax 4 (PSTN: Public switched telephone network)

In the case of international interworking between Group 4 facsimile terminals connected to dissimilar networks, Recommendation X.300 shall apply. For international interworking between PSTN and ISDN, a (separate) Telefax 4 interworking unit may be necessary.

International routes between ISDNs for the Telefax 4 service shall be capable of supporting user data rates up to 64 kbitB/Fs.

3.5.2 *Intercommunication with other services*

3.5.2.1 Intercommunication between basic mode and mixed mode Teletex terminals and Classes I, II and III Group 4 facsimile terminals connected to the Telefax 4 service is shown in Table 2/I.241.

In both the Teletex and Telefax 4 services, the equipment providing mixed mode should enable a direct exchange of documents in accordance with Recommendations T.6, T.61 and of the T.400-Series.

H.T. [T5.241]
TABLE 2/I.241
Current status of direct intercommunication

for Teletex and Group 4 facsimile terminals on the same network

lw(48p) | lw(30p) | lw(30p) | lw(30p) | lw(30p) | lw(30p) | lw(30p) .
lw(48p) | cw(30p) | cw(30p) | cw(30p) | lw(30p) | lw(30p) | lw(30p) . Facsimile Group 4, Class I F F F _ lw(48p) | cw(30p) | cw(30p) | cw(30p) | lw(30p) | lw(30p) | lw(30p) . Facsimile Group 4, Class II F F F _ lw(48p) | cw(30p) | cw(30p) | cw(30p) | cw(30p) | cw(30p) | cw(30p) . Facsimile Group 4, Class III F T, F, MM T, F, MM T T, MM T _ lw(48p) | cw(30p) | cw(30p) | cw(30p) | cw(30p) | cw(30p) | cw(30p) . Teletex basic mode T T T T T _ lw(48p) | cw(30p) | cw(30p) | cw(30p) | cw(30p) | cw(30p) | cw(30p) . Teletex mixed mode T, MM T, MM T T, MM T _ lw(48p) | cw(30p) | cw(30p) | cw(30p) | cw(30p) | cw(30p) | cw(30p) . Teletex processable mode 1 T T T T T, PM1

T: Basic Teletex document with character coded information only.

F: Group 4 facsimile document with facsimile coded information only.

MM: Mixed-mode document with character and facsimile coded information.

PM1: Processable mode document with character coded information only.

Table 2/I.241 [T5.241], p.

3.5.2.2 Intercommunication is desirable between terminals of the Telefax 4 service and terminals of services other than Telefax 4 provided over ISDN and other public switched networks.

Intercommunication possibilities between Telefax 4 terminals and Telefax 3 terminals have to be provided (see also Recommendation F.180):

a) Telefax 4 (ISDN) — Telefax 3 (PSTN)

b) Telefax 4 (ISDN) — Telefax 3 (ISDN, via terminal adaptors)

In case a) Telefax 4 terminals use specific service features in ISDN. Intercommunication should be supported by ISDN-PSTN interworking units.

In case b) Telefax 3 terminals and Telefax 4 terminals which are to be connected in the PSTN can also be connected to the ISDN via terminal adaptors.

3.6 *Interaction with supplementary services*

Each supplementary service description identifies the applicability with this teleservice.

For the ISDN, the international supplementary services for the Telefax 4 service in the circuit mode using a B-channel are:

i) closed user group ;

ii) multiple subscriber number ;

iii) user-to-user signalling ;

iv) calling line identification presentation ;

v) calling line identification restriction ;

vi) connected line identification presentation ;

vii) connected line identification restriction ;

viii) direct-dialling-in

The use of other supplementary services is for further study.

Supplementary services for Telefax 4 with a packet mode of operation are for further study.

3.7 *Attributes and values of attributes of the Telefax 4 service*

a) *LOW LAYER ATTRIBUTES*

Information transfer attributes

Circuit-mode bearer capability Packet-mode bearer capability 1. Information transfer mode circuit packet 2. Information transfer rate 64 kbit/s 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

3. Information transfer capability unrestricted (Note 1) unrestricted 4. Structure unstructured (Note 2) service data unit integrity 5. Establishment of communication demand demand (VC)/permanent (PVC)

6. Symmetry bidirectional symmetric bidirectional symmetric 7. Communication configuration point-to-point point-to-point

Access attributes

Circuit-mode bearer capability Packet-mode bearer capability 8. Access channel B for user information D for signalling 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 (Note 3)

9. Access protocol 9.1 Signalling access protocol layer 1 Rec. I.430/I.431 Rec. I.430/I.431 9.2 Signalling access protocol layer 2 Rec. I.440/I.441 Rec. I.440/I.441, X.31 9.3 Signalling access protocol layer 3 Rec. I.450/I.451 Rec. I.450/I.451, X.31 9.4 Information access protocol layer 1 Rec. I.430/I.431 Rec. I.430/I.431

9.5 Information access protocol layer 2 Rec. X.75 (SLP) Rec. X.25 (LAPB) 9.6 Information access protocol layer 3 ISO 8208 Rec. X.25 (PLP)

blanc

b) *HIGH LAYER ATTRIBUTES*

10. Type of user information: Telefax 4

11. Layer 4 protocol functions: T.70

12. Layer 5 protocol functions: T.62

13. Layer 6 protocol functions: T.400-Series (Note 4)

13.1 Resolution [pixels per inch (ppi)]: 200 × 200 standard;

240 × 240, 300 × 300, 400 × 400 optional

14. Layer 7 protocol functions: T.503, T.521, T.563

c) *GENERAL ATTRIBUTES*

15. Supplementary services provided: see § 3.6

16. Quality of service: for further study

17. Interworking possibilities: see § 3.5

18. Operational and commercial: for further study

Note 1 — The interworking arrangements with networks having a restricted 64 kbitB/Fs information transfer capability require further study.

Note 2 — Even if no structure is required the network may provide 8 kHz integrity.

Note 3 — User information transferred via virtual channel on the D-channel is for further study.

Note 4 — Further study is required to identify a more precise reference in the T.400-Series of Recommendations.

3.8 *Recommended support of Telefax 4 by an ISDN*

a) Overall support: A

b) Variations of non-dominant attributes:

1) Information transfer mode

Note — In the interim period, the circuit mode method of operation is preferred.

— circuit: A

— packet: A

2) *Establishment* *Symmetry* *Communication* *Support* *of communication configuration* *Support*

demand bidirectional pt-pt E

symmetric

3) Access

H.T. [T6.241]

Signalling and OAM (Note 1) Channel and rate	 Protocols	User information Channel and rate	 Protocols	Support
Circuit mode				
D(16)	{			
I.430, I.440, I.441, I.450, I.451				
(Note 2)				
}	B(64)	I.430, X.75 (SLP), ISO 8208	A	
D(64)	{			
I.431, I.440, I.441, I.450, I.451				
(Note 2)				
}	B(64)	I.431, X.75 (SLP), ISO 8208	A	
Packet mode				
D(16)	{			
I.430, I.440, I.441, I.450, I.451, X.31				
}	B(64) or D(16)	{		
I.430,				
X.25 LAPB,				
X.25 (PLP)				
}	A			
D(64)	{			
I.431, I.440, I.441, I.450, I.451, X.31				
}	B(64)	{		
I.431,				
X.25 LAPB,				
X.25 (PLP)				
}	FS			
VC in B(64)	for further study	B(64)	FS	FS

Note 1 — Definition of protocols for OAM is for further study.

Note 2 — Demand services only. Others are for further study.

Table [T6.241], p.

3.9 *Dynamic description*

The circuit mode dynamic description appears in Recommendation I.220.

4 I.241.4 — **Mixed mode**

The prose definition of the mixed mode service is an extract of Recommendation F.230.

4.1 *Definition*

This service provides combined text and facsimile communication for end-to-end transfer of documents containing mixed information of text and fixed images. The high layer attributes are based on the CCITT Recommendations for Teletex and Telefax 4.

4.2 *Description*

For further study.

4.3 *Procedures*

For further study.

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 *Interaction with supplementary services*

For further study.

4.7 *Attributes and values of attributes of the mixed mode service*

a) *LOW LAYER ATTRIBUTES*

Information transfer attributes

Circuit-mode bearer capability Packet-mode bearer capability 1. Information transfer mode circuit packet 2. Information transfer rate 64 kbit/s 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

3. Information transfer capability unrestricted (Note 1) unrestricted 4. Structure unstructured (Note 2) service data unit integrity 5. Establishment of communication demand demand (VC), permanent (PVC)

6. Symmetry bidirectional symmetric bidirectional symmetric 7. Communication configuration point-to-point point-to-point

blanc

Access attributes

Circuit-mode bearer capability Packet- mode bearer capability 8. Access channel B for user information D for signalling 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 (Note 3)

9. Access protocol 9.1 Signalling access protocol layer 1 Rec. I.430/I.431 Rec. I.430/I.431 9.2 Signalling access protocol layer 2 Rec. I.440/I.441 Rec. I.440/I.441, X.31 9.3 Signalling access protocol layer 3 Rec. I.450/I.451 Rec. I.450/I.451, X.31 9.4 Information access protocol layer 1 Rec. I.430/I.431 Rec. I.430/I.431

9.5 Information access protocol layer 2 Rec. X.75 (SLP) Rec. X.25 (LAPB) 9.6 Information access protocol layer 3 ISO 8208 Rec. X.25 (PLP)

b) *HIGH LAYER ATTRIBUTES*

10. Type of user information: mixed mode

11. Layer 4 protocol functions: X.224, X.214

12. Layer 5 protocol functions: X.225, X.215

13. Layer 6 protocol functions: T.61, X.226, X.216

13.1 Resolution [pixels per inch (ppi)]: 300 × 300

240 × 240

400 × 400 optional,

600, 1200

14. Layer 7 protocol functions: T.501, T.522, T.561

c) *GENERAL ATTRIBUTES*

15. Supplementary services provided: for further study

16. Quality of service: for further study

17. Interworking possibilities: ISDN Teletex, ISDN Telefax 4

(others for further study)

18. Operational and commercial: for further study

Note 1 — The interworking arrangements with networks having restricted 64 kbitB/Fs information transfer capability require further study.

Note 2 — Even if no structure is required the network may provide 8 kHz integrity.

Note 3 — User information transferred via virtual channel on the D-channel is for further study.

4.8 *Recommended support of mixed mode by an ISDN*

a) Overall support: A

b) Variation of non-dominant attributes:

1) Information transfer mode

— circuit: A

— packet: A

2) *Establishment* *Symmetry* *Communication* *Support* *of communication configuration* *Support*

demand bidirectional pt-pt E

symmetric

3) Access

H.T. [T7.241]

Signalling and OAM (Note 1)		User information		Support
Channel and rate	Protocols	Channel and rate	Protocols	
Circuit mode				
D(16)	{			
I.430, I.440, I.441, I.450, I.451				
(Note 2)				
}	B(64)	I.430, X.75 (SLP), ISO 8208	A	
D(64)	{			
I.431, I.440, I.441, I.450, I.451				
(Note 2)				
}	B(64)	I.431, X.75 (SLP), ISO 8208	A	
Packet mode				
D(16)	{			
I.430, I.440, I.441, I.450, I.451, X.31				
}	B(64) or D(16)	{		
I.430,				
X.25 LAPB,				
X.25 (PLP)				
}	FS			
D(64)	{			
I.431, I.440, I.441, I.450, I.451, X.31				
}	B(64)	{		
I.431,				
X.25 LAPB,				
X.25 (PLP)				
}	FS			
VC in B(64)	for further study	B(64)	for further study	FS

Note 1 — Definition of protocols for OAM is for further study.

Note 2 — Demand services only. Others are for further study.

Table [T7.241], p.

4.9 *Dynamic description*

The circuit mode dynamic description appears in Recommendation I.220.

5 I.241.5 — **Videotex**

The prose description for the Videotex service in ISDN is for further study and is intended to be based on Recommendation F.300.

5.1 *Definition*

The Videotex service in the ISDN is an enhancement of the existing Videotex service with retrieval and mailbox functions for text (alpha) and graphic information.

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 Videotex service*

a) *LOW LAYER ATTRIBUTES*

Information transfer attributes

User to Videotex centre Videotex centre to Videotex centre, external computers 1. Information transfer mode: circuit (Note 1) circuit/packet

2. Information transfer rate: 64 kbit/s further study 3. Information transfer capability: unrestricted further study 4. Structure: further study further study 5. Establishment of communication: demand demand/permanent

6. Symmetry: bidirectional symmetric bidirectional symmetric 7. Communication configuration: point-to-point demand/permanent point-to-point, multipoint

Access attributes

8. Access channel: B for user information (Note 2)

D for signalling

9. Access protocol

9.1 Signalling access protocol layer 1: I.430/I.431

9.2 Signalling access protocol layer 2: I.440/I.441

9.3 Signalling access protocol layer 3: I.450/I.451

9.4 Information access protocol layer 1: I.430/I.431

9.5 Information access protocol layer 2: X.75 (SLP)

9.6 Information access protocol layer 3: ISO 8208

b) *HIGH LAYER ATTRIBUTES*

10. Type of user information: Videotex 11. Layer 4 protocol functions 12. Layer 5 protocol functions 13. Layer 6 protocol functions For further study 13.1 Resolution [pixels per inch (ppi)] 13.2 Graphic mode 14. Layer 7 protocol functions

c) *GENERAL ATTRIBUTES:* for further study

Note 1 — The use of packet-mode is for further study.

Note 2 — The use of the D-channel for Videotex information is for further study.

5.8 *Recommended support of Videotex by an ISDN*

a) Overall support : A

b) Variations of non-dominant attributes:

1) Information transfer mode

— circuit user terminal-to-Videotex centre A videotex centre to Videotex centre, external computer A — packet videotex centre to Videotex centre, external computer A

2) *Establishment* *Symmetry* *Communication* *Support* *of communication configuration* *Support*

demand bidirectional pt-pt E

permanent symmetric

(Note)

demand bidirectional multipoint A

permanent symmetric (Note)

(Note)

Note — Between Videotex centres and to external computers.

3) Access

H.T. [T8.241]

Signalling and OAM (Note 1) Channel and rate	Protocols	User information Channel and rate	Protocols	Support
Circuit mode				
D(16) I.430, I.440, I.441, I.450, I.451 (Note 2)	B(64)	I.430, X.75 (SLP), ISO 8208	A	
D(64) I.431, I.440, I.441, I.450, I.451 (Note 2)	B(64)	I.431, X.75 (SLP), ISO 8208	A	
Packet mode				
D(16)	FS	B(64) or D(16)	FS	FS
D(64)	FS	B(64)	FS	FS
VC in B(64)	FS	B(64)	FS	FS

Note 1 — Definition of protocols for OAM is for further study.

Note 2 — Demand services only. Others are for further study.

Table [T8.241], p.

5.9 *Dynamic description*

The circuit mode dynamic description appears in Recommendation I.220.

6 I.241.6 — **Telex**

6.1 *Definition*

This service provides interactive text communication. The digital signal at the SB/FT reference point follows the internationally agreed Recommendations for telex above the ISDN physical layer.

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 telex service*

a) *LOW LAYER ATTRIBUTES*

Information transfer attributes

1. Information transfer mode: circuit (packet is for further study (Note))
2. Information transfer rate: 64 kbit/s
3. Information transfer capability: unrestricted
4. Structure: 8 kHz integrity
5. Establishment of communication: reserved/permanent
6. Symmetry: bidirectional
7. Communication configuration: point-to-point

Access attributes

8. Access channel: B for user information

D for signalling

(D for telex user information is for further study (Note))

9. Access protocol:

9.1 Signalling access protocol layer 1: I.430/I.431

9.2 Signalling access protocol layer 2: U.202

9.3 Signalling access protocol layer 3: U.202

9.4 Information access protocol layer 1: I.430/I.431

9.5 Information access protocol layer 2: U.202

9.6 Information access protocol layer 3: for further study

b) *HIGH LAYER ATTRIBUTES*

10. Type of user information: telex 11. Layer 4 protocol functions 12. Layer 5 protocol functions For further study 13. Layer 6 protocol functions 14. Layer 7 protocol functions

c) *GENERAL ATTRIBUTES*

15. Supplementary services provided: for further study

16. Quality of Service: for further study

17. Interworking possibilities: Telex, Teletex (others: for further study)

18. Operational and commercial: for further study

Note — Subject to satisfying telex quality of service on D-channel.

6.8 *Recommended support of Telex by an ISDN*

a) Overall support: FS

b) Variations of non-dominant attributes:

1) Information transfer mode

— circuit: FS

— packet: FS

2) *Establishment* *Symmetry* *Communication* *Support* | *of communication configuration* *Support* |

demand pt-pt E

reserved bidirectional pt-pt FS

permanent symmetric pt-pt A demand multipt A

reserved bidirectional multipt FS

permanent symmetric multipt A

3) Access

H.T. [T9.241]

Signalling and OAM (Note 1)		User information		Support
Channel and rate	Protocols	Channel and rate	Protocols	
Circuit mode				
D(16) I.430, I.440, I.441, I.450, I.451 (Note 2) }	{ B(64)	I.430, U.202 (Note 3)	FS	
D(64) I.431, I.440, I.441, I.450, I.451 (Note 2) }	{ B(64)	I.431, U.202 (Note 3)	FS	
Packet mode				
D(16)	FS (Note 4)	D(16)	FS	FS

Note 1 — Definition of protocols for OAM is for further study.

Note 2 — Layer 2 and 3 protocols are for further study.

Note 3 — Others are for further study.

Note 4 — Subject to satisfying telex quality of service on D-channel.

Table [T9.241], p.

6.9 *Dynamic description*

For further study.