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Foreword

This ETSI Technical Report (ETR) has been produced by the Terminal Equipment (TE) Technical Committee of the European Telecommunications Standards Institute (ETSI).

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

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1 Scope

This ETR studies interworking and interoperability between retrieval services (Videotex, possibly including moving video) and audiovisual services (videotelephony, videoconferencing) on narrow band networks (Integrated Services Digital Network (ISDN) and Public Switched Telephone Network (PSTN)). Retrieval services include Videotex information retrieval applications possibly including moving video and applications based on retrieval of videotelephony ITU-T Recommendations H.320 [14] and H.261 [17] coded information.

The interworking and interoperability of retrieval services and audiovisual services support applications consisting of combinations of Videotex, videotelephony and/or videoconferencing applications.

The services under consideration are Videotex, videotelephony and videoconferencing.

This ETR investigates possible scenarios of interworking and interoperability between retrieval services and audiovisual services on narrow band networks and the requirements on Terminal Equipment (TE).

2 References

This ETR incorporates by dated or undated reference, provisions form other publications. These references are cited at the appropriate places in the text and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this ETR only when incorporated in it by amendment or revision. For undated references the latest edition of the application referred to applies.

[1] ETS 300 145: "Integrated Services Digital Network (ISDN); Audiovisual services; Videotelephone systems and terminal equipment operating on one or two 64 kbit/s channels".

NOTE 1: ETS 300 145 is the ETSI equivalent of ITU-T Recommendation H.320 [14]. The scope of ETS 300 145 is restricted to 1B and 2B ISDN videophones.

[2] ETS 300 144: "Integrated Services Digital Network (ISDN), Audiovisual services, Frame structure for a 64 kbit/s to 1 920 kbit/s channel and associated syntax for inband signalling".

NOTE 2: ETS 300 144 is the ETSI equivalent to ITU-T Recommendations H.221 [15] and H.230 [16].

[3] CCITT Recommendation B.13 (1988): "Terms and definitions".

[4] ITU-T Recommendation F.300 (1993): "Videotex service".

[5] ETS 300 142: "Integrated Services Digital Network (ISDN) and other digital telecommunications networks; Line transmission of non-telephone signals; Video codec for audiovisual services at p * 64 kbit/s [ITU-T Recommendation H.261 (1993) modified]".

[6] ETS 300 072: "Terminal Equipment (TE); Videotex presentation layer protocol, Videotex layer data syntax".

[7] ETS 300 149: "Terminal Equipment (TE); Videotex; Audio syntax".

[8] ETS 300 177: "Terminal Equipment (TE); Videotex; Photographic syntax".

[9] Draft ITU-T Recommendation T.120: "Transmission protocol for multimedia data".

[10] ETS 300 143 (1994) and A1: "Integrated Services Digital Network (ISDN); Audiovisual services; Inband signalling procedures for audiovisual terminals using digital channels up to 2 048 kbit/s".

[11] I-ETS 300 380 (1995): "Universal Personal Telecommunication (UPT); Access devices Dual Tone Multi-Frequency (DTMF) sender for acoustic coupling to the microphone of a handset telephone".

[12] ITU-T Recommendation H.231 (1993): "Multipoint control units for audiovisual systems using digital channels up to 2 Mbit/s".

[13] ITU-T Recommendation H.243: "System for Establishing Communication Between Three or More Audiovisual Terminals Using Digital Channels up to 2 Mbit/s".

[14] ITU-T Recommendation H.320: "Narrow-band Visual Telephone Systems and Terminal Equipment".

[15] ITU-T Recommendation H.221: "Frame structure for a 64 to 1 920 kbit/s channels in audiovisual services".

[16] ITU-T Recommendation H.230 (1995): "Frame-synchronous controls and indications for audiovisual systems".

[17] ITU-T Recommendation H.261 (1993): "Video codec for audiovisual services at P x 64 kbit/s".

[18] ETS 300 001: "Attachments to the Public Switched Telephone Network (PSTN); General technical requirements for equipment connected to an analogue subscriber interface in the PSTN".

[19] ITU-T Recommendation T.122: "Multipoint communication service for audiographics and audiovisual conferencing service definition".

[20] ITU-T Recommendation T.123: "Protocol stacks for audiographic and audiovisual teleconference applications".

[21] ITU-T Recommendation T.124: "Generic Conference Control".

[22] ITU-T Recommendation T.125: "Multipoint communication service protocol specification".

[23] ITU-T Recommendation X.25 (1993): "Interface between data terminal equipment (DTE) and data circuit-terminating equipment (DCE) for terminals operating in the packet mode and connected to public data networks by dedicated circuit".

[24] CCITT Recommendation G.711 (1988): "Pulse code modulation (PCM) of voice frequencies".

[25] CCITT Recommendation G.722 (1988): "7 kHz audio coding within 64 kbit/s".

[26] CCITT Recommendation G.728 (1992): "Coding of speech at 16 kbit/s using low-delay code excited linear prediction".

[27] ITU-T Recommendation H.224 (1994): "A real-time control protocol for simplex applications using the H.221 LSD/HSD/MLP channels".

3 Definitions and abbreviations

3.1 Definitions

For the purposes of this ETR, the following definitions apply.

audiovisual conversational service: An interactive service which provides for bi-directional communication by means of real-time (no store-and-forward) end-to-end audiovisual information transfer from user to user or between user and host.

Combined Videotex and Audio-Visual (Data) (AV(D)) terminal: A TE that consists of a combination of an ISDN Videotex terminal and an ITU-T Recommendation H.320 [14] terminal. Both logical terminals can be active each at a time or together. When operated together, each terminal part will use a B-channel, or two B-channels are allocated for use by H.320 and the ISDN D-channel for use by a Videotex protocol.

H.320 terminal without data-facility: A TE that conforms to the methods described in ETS 300 145 [1], but does not offer data capabilities. In the scope of this ETR it implies that the terminal is at least capable of receiving audio and video sent in a framed structure (ETS 300 144 [2]). And that the terminal is at least capable of sending audio and video in a framed structure (ETS 300 144 [2]).

H.320 terminal with data-facility: A TE that conforms to the methods described in ETS 300 145 [1]. In the scope of this report it implies that the terminal is at least capable of receiving audio, video and data sent in a framed structure (ETS 300 144 [2]). And that the terminal is at least capable of sending audio, video and data in a framed structure (ETS 300 144 [2]).

interactive protocol: A means to interact between the terminal and service centre on the application layer.

InterWorking Unit (IWU): A unit that transforms information streams according to the appropriate protocols.

PSTN videotelephony terminal: A TE that is able to exchange audio, video (still or moving images) and possibly data over the PSTN.

retrieval service: An interactive service which provides the capability of accessing information stored in databases centres. The information will be sent to the user on demand only. The information can be retrieved on an individual basis, i.e., the time at which an information sequence is to start under the control of the user (CCITT Recommendation B.13 [3]).

service centre: A computer system used by a service provider to authorise access to a service. Other functions of the service centre may include assistance to users in selecting the particular application required (either provided by the service centre or by other host computers), as well as management facilities such as billing, statistics gathering, etc. The same computer may also be a host computer and/or provide a gateway function [(definition derived from ITU-T Recommendation F.300 [4])].

Videotex terminal enhanced with H.261: A TE that uses the Videotex protocols over the ISDN network and, in addition, is able to decode and represent video images encoded according to the schemes defined in ETS 300 142 [5].

3.2 Abbreviations

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

AP	Access Point
AV	Audio Visual
AVD	Audio Visual Data
BAS	Bitrate Allocation Signal
CIF	Common Intermediate Format
DB	Data Base
DTMF	Dual Tone Multi Frequency
HSD	High Speed Data
ISDN	Integrated Services Digital Network
IWU	Interworking Unit
LSD	Low Speed Data
MCU	Multiple Control Unit
MLP	Multi Layer Protocol
PC	Personal Computer
PSPDN	Packet Switched Public Data Network
PSTN	Public Switched Telephone Network
QCIF	Quarter Common Intermediate Format
SBV	Syntax Based Videotex
TE	Terminal Equipment
TFI	Terminal Facility Identifier
UUS	User-To-User Signalling
Vph	Videotelephony
WS	Work Station

4 Interworking environment

This ETR examines the interworking between interactive services with retrieval facility and audiovisual conversational services. The approach taken describes a number of existing and predictable terminal types for audiovisual conversational services in view of communication with retrieval services. For each terminal type, the scenarios for accessing and information storage are described. Possible constraints of such interworking are presented in related subclauses.

The following subclauses give an impression of the environment in which the interworking will take place.

4.1 Retrieval services

Retrieval services are characterised by the interactive communication of users with remote databases. Users, equipped with suitable terminals, provide commands to an application at the service centre or database computer. The service centre responds by sending information to the user either for further information, selection (menus), or for consumption (requested information). In this ETR, the considered retrieval service is Videotex with information retrieval facility.

Videotex is a class of retrieval service that provides a high degree of guidance to its users. The database queries are under application control. The application usually enables simple retrieval and the presentation of stored information or processes which the user inputs, and presents the result of that processing (e.g. searching of information according to a given criterion in the database). The information types provided in Videotex are defined by the Videotex syntaxes covering: text, alpha-mosaic, re-definable character and colour sets, still images (JPEG) and audio (ETS 300 072 [6], ETS 300 149 [7] and ETS 300 177 [8]).

The commands accepted by Videotex services are not restricted to a limited set because user input can be processed directly by an application, thereby enabling a diversity of types of behaviour. However, existing Videotex services use a fixed set of commands for general information retrieval functions (service and dialogue functions according to ITU-T Recommendation F.300 [4], subclause 3.2).

Though the encoding of the commands activating the functions may differ from one service to another, the functions performed are common. Until the end of 1994, a standardized set of functions does not contain general commands for control of stored continuous information such as audio and video.

Whenever in the next clauses the term interactive protocol is used it refers to a means to exchange commands to activate the above mentioned functions relating continuous information.

4.2 Audiovisual conversational services

Audiovisual conversational services like videotelephony and videoconferencing are characterised by the capability to exchange real-time audiovisual information (audio - e.g. speech, moving video or stills). In the more advanced cases the TE provides a means for exchanging data in parallel to the audiovisual information.

A typical videotelephony/videoconferencing equipment lacks the application controls of an information retrieval terminal. The output devices of a videotelephony are capable to present audio and video information. This matches the requirements for retrieved information.

Some applications of retrieval services require terminals with a full alphanumeric keyboard on the user side. Terminals designed specifically for audiovisual conversational services may not be equipped with such a keyboard. This may impose a general constraint on the use of such terminal categories during the interworking under consideration because the terminals can only properly access those applications that require just a numeric keypad with a limited set of control characters. This may be possible only if the coding of control characters is the same or is converted into the form used in the retrieval service. On the other hand, some audiovisual conversational terminal categories (e.g. PC based terminals) may be used for interworking not only with interactive services with retrieval facilities but also with other service facilities (e.g. messaging, transactions). Detailed study of these additional possibilities are out of the scope of this ETR.

4.3 Multipoint services

Multipoint conversational services are a natural extension of point-to-point conversational services. In multipoint services the participants are connected to each other in such a way that a conference between three or more sites can take place. To establish an audiovisual multipoint conference, a Multipoint Control Unit (MCU) is necessary. A MCU is defined as a piece of equipment located in a node of the network or in a terminal that connects several terminals and, according to certain criterion, processes audiovisual signals and distributes them to the connected terminals. The inband signalling between the MCU and the terminals follows the principles specified in ETS 300 144 [2].

MCU conferences can use different schemes to realise the required functionality. Most often the video image of the current speaker is distributed towards all other participants, the video image of the previous speaker is routed to the current speaker and the audio of all participants is mixed and distributed. This scheme is called "voice conducted".

Another scheme for controlling who sees who in a multipoint conference is by using the chair control functions which are defined as an option in ITU-T Recommendations H.231 [12] and H.243 [13]. However, these functions are not standardized by ETSI. To use these functions, a special terminal, a chair control terminal, is required. A full use of these functions requires that a H.320 terminal has implemented functions that are not standardized in ETS 300 145 [1].

The third scheme is the use of the functions and protocols defined in ITU-T Recommendations T.122 [19], T.123 [20], T.124 [21] and T.125 [22]. These protocols can be used in both point-to-point and multipoint communication. The work on these Recommendations was completed in 1995, and terminals will be on the market soon.

For the voice-controlled conferences normal ITU-T Recommendation H.320 [14] compliant terminals can be used. For the H.243/H.231 (chairman controlled) conferences a more enhanced H.320 terminal is required, because the H.243/H.231 are optional functionalities of ITU-T Recommendation H.320 [14]. MLP or T.120 series compliant terminals are not yet on the market.

4.4 Terminal equipment and networks

In this ETR, an overview of possible interworking scenarios is presented. Each scenario is described in a separate clause. This clause (clause 4) has described a relation between scenarios and TE.

The ETR clearly distinguishes between the PSTN and ISDN. For the ISDN case there are a great number of options. The result is quite a large number of slightly different scenarios that just differ in one option of the base videotelephony recommendation, e.g. the use or non use of the data facility of ITU-T Recommendation H.320 [14].

5 PSTN videotelephony terminal

A PSTN videotelephony terminal is a terminal that provides its user with the possibility to speak and exchange a video image (moving and still) with another user using a similar terminal, and possibly exchange data information with the other user by means of a data transfer facility.

The terminal uses the PSTN as a network, meaning the exchanged signals are within the limits of the signals allowed (supported) by the PSTN (ETS 300 001 [18]). To transmit the information modems are used. The functionality of a PSTN videotelephony terminal is very similar to voice telephone terminals. Thereby, most PSTN videotelephony terminals offer the user the possibility to enable/disable the exchange of moving video and to prepare and send a snapshot video image.

The exchanged information; audio/video/possibly data/control is digitally encoded. The control information instructs the terminal on the bandwidth division of the audio, video and, possibly, data information. Two solutions are valuable for a PSTN videotelephony terminal to have access to a remote database. The first solution is that the database provides audiovisual information and possibly data information according to the selected PSTN videotelephony protocol. The second solution is to provide an InterWorking Unit (IWU) to transform the information from the (Videotex) database to the used PSTN videotelephony protocol.

In subclause 5.1, PSTN videotelephony terminals without use of data-channel facility are under consideration. The use of the data-channel will be dealt with in subclause 5.2, PSTN videotelephony terminals with use of the data-channel facility.

NOTE: There are proprietary systems on the market that are incompatible. Both ITU-T and ETSI are working on standards for PSTN videotelephony terminals.

5.1 Terminal without data-facility

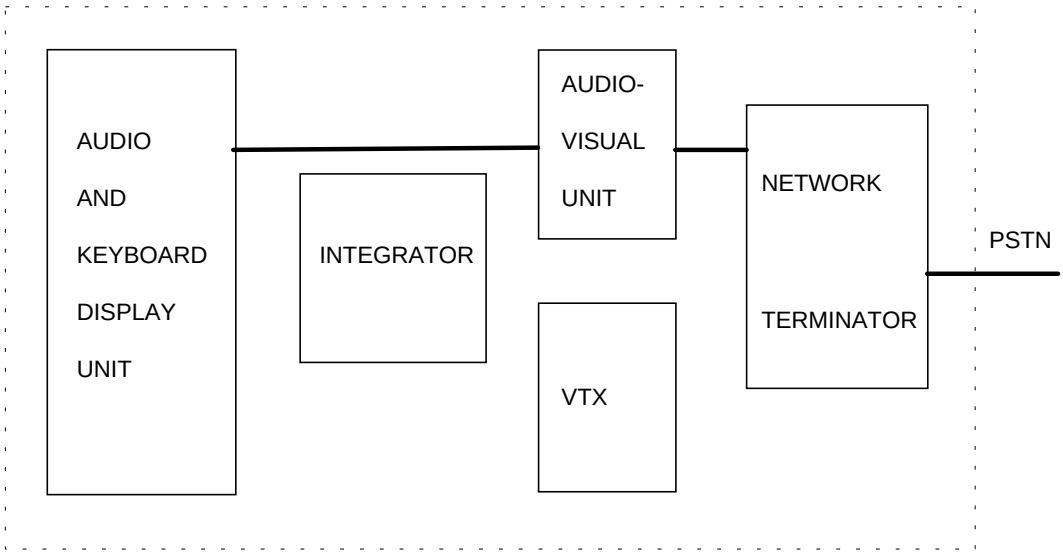

Figure 1: PSTN videotelephony terminal without data-facility

Figure 1 shows a PSTN videotelephony terminal without data-channel facility. In this terminal type, a Videotex decoder and integrator are not used.

5.1.1 Access to a PSTN videotelephony service centre

5.1.1.1 Description

A dedicated PSTN videotelephony terminal has access to a PSTN videotelephony service centre. The information on the database is stored for retrieval by a PSTN videotelephony terminal.

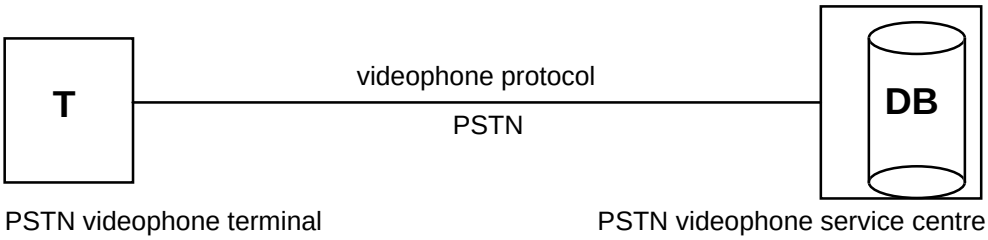

Figure 2: PSTN videotelephony terminal access to a PSTN videotelephony service centre

5.1.1.2 Applications

The service under consideration allows new applications for a PSTN videotelephony terminal.

The PSTN videotelephony service centre could emerge as a mixture of stills (comparable with Videotex databases) and additional information sequences. Similar interaction as with current Videotex service centres will be expected. In addition, some control over continuous information could be required (e.g. pause, continue, slow, fast, interrupt).

A number of audio services currently exist, e.g. news, weather forecast and on-line transmission from parliaments. It is likely that similar services based on audiovisual information will emerge. Audio services have all telephone subscribers as potential users, the potential number of users of PSTN audiovisual services is still very low.

5.1.1.3 Constraints

a) Databases need to be able to provide the stored information according to the PSTN videotelephony protocol.

b) Users should be able to instruct the database in order to retrieve required information.

5.1.1.4 Protocols

To retrieve information from the PSTN videotelephony database to the PSTN videotelephony terminal, an interactive protocol needs to operate between the terminal and database.

The end user can select information from the database via that interactive protocol.

Dual Tone Multi Frequency (DTMF) can be used in the interactive protocol. In this case, the PSTN videotelephony needs to be able to insert DTMF tones in the audio-channel during an active connection. It is not yet known if the existing or planned speed coding algorithms can transmit DTMF signals.

5.1.2 Access to a Videotex service centre

5.1.2.1 Description

A dedicated PSTN videotelephony terminal has access to a Videotex database. An IWU between the terminal and remote service centre will provide the interworking between the Videotex service and the PSTN videotelephony protocol.

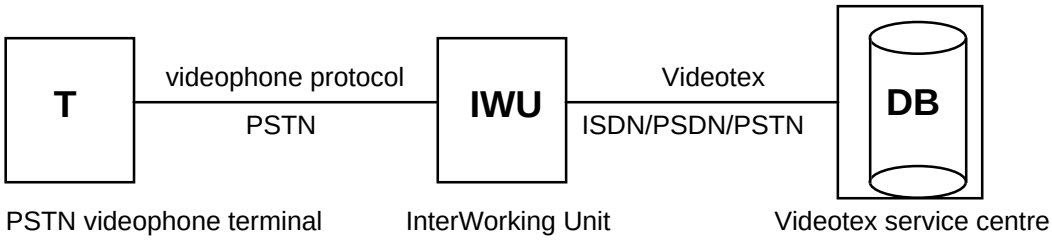

Figure 3: PSTN videotelephony terminal access to a Videotex service centre

This configuration is, from the PSTN videotelephony terminal's viewpoint, identical to the one described in subclause 5.1.1. The IWU could act as a "standard" Videotex terminal. In the ideal situation there are no additional requirements on the Videotex service centre. The task of the IWU is to transcode the image built from the received information, and encoded according the Videotex syntax, into the PSTN videotelephony encoding.

5.1.2.2 Applications

The access of a PSTN videotelephony terminal to a Videotex service centre provides the extension of the use of Videotex services to PSTN videotelephony terminals.

Videotex databases are now widespread. The number of installed PSTN videotelephony terminals is small. This scenario offers the possibility to enlarge the services for users of PSTN videotelephony terminals.

5.1.2.3 Constraints

The transformation of Videotex information to audiovisual information implies some constraints:

- refreshment speed: the videotelephony protocol needs to be able to keep track of the refreshment of the information the Videotex service is providing;

- support of functionalities: the IWU cannot possibly translate all Videotex functionalities into the audiovisual data stream of the videotelephony protocol;

- most textual based Videotex information should maintain its quality/readability while re-encoded in the PSTN videotelephony encoding;

- PSTN videotelephony terminals need to support means for its user to control the retrieval process.

5.1.2.4 Protocols

An interactive protocol needs to be developed to allow the retrieving of information in the Videotex database. As in subclause 5.1.1.4, DTMF can be used in this interactive protocol. However, the capability of the speech coding algorithm to transmit DTMF should be clarified.

5.1.2.5 InterWorking Unit (IWU)

The IWU can be located in the terminal (the terminal becomes a Videotex terminal), between the terminal and the Videotex service centre, and in the Videotex service centre. The location of the IWU at the Videotex service centre can be at an Access Point (AP).

5.2 Terminal with data-facility

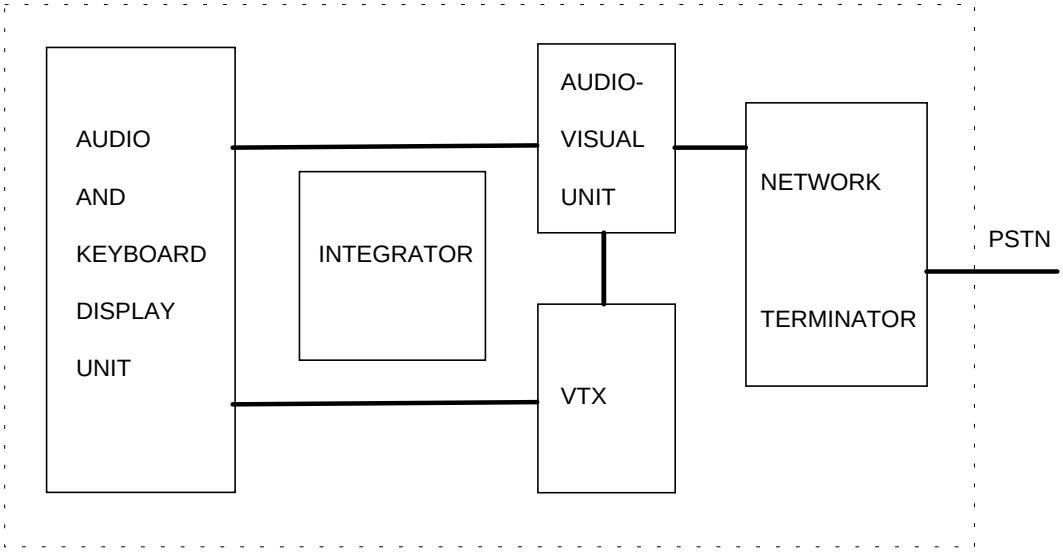

Figure 4: PSTN videotelephony terminal with data-facility

Figure 4 shows a PSTN videotelephony terminal with a data-channel facility. The data-channel is used to transport the Videotex information; the terminal includes a Videotex decoder. The terminal type does not use an Integrator.

5.2.1 Access to a PSTN videotelephony service centre

See subclause 5.1.1.

5.2.2 Access to a Videotex service centre

5.2.2.1 Description

The PSTN videotelephony terminal has access to a Videotex database. An IWU between the terminal and remote service centre will provide the interworking between the Videotex service and the PSTN videotelephony protocol.

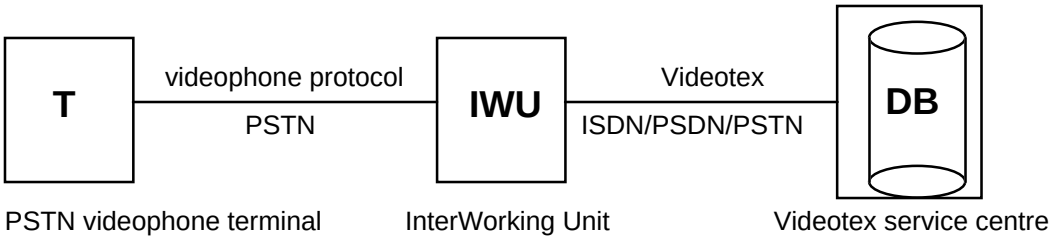

Figure 5: PSTN videotelephony terminal access to a Videotex service centre

5.2.2.2 Applications

Similar applications to those given in subclause 5.2.1.2 are appropriate.

5.2.2.3 Constraints

- PSTN videotelephony terminals need to support means for its user to control the retrieval process.

5.2.2.4 Protocols

An interactive protocol between the PSTN videotelephony protocol and the IWU is necessary to retrieve the information in the Videotex database. As stated in subclause 5.1.1.4, DTMF can possibly be used in this interactive protocol. Another possibility is the use of the PSTN data-channel.

5.2.2.5 InterWorking Unit

The IWU can be located in the terminal, between the terminal and the Videotex service centre, and in the Videotex service centre. The location of the IWU at the Videotex service centre can possibly be at an AP.

6 ISDN terminals

6.1 Videotex terminal enhanced with H.261

A Videotex terminal enhanced with an ITU-T Recommendation H.261 [17] video codec with access to a remote database can be a dedicated Videotex TE, able to support ITU-T Recommendation H.261 [17], or a Personal Computer (PC)/Work Station (WS) able to support Videotex protocols with ITU-T Recommendation H.261 [17].

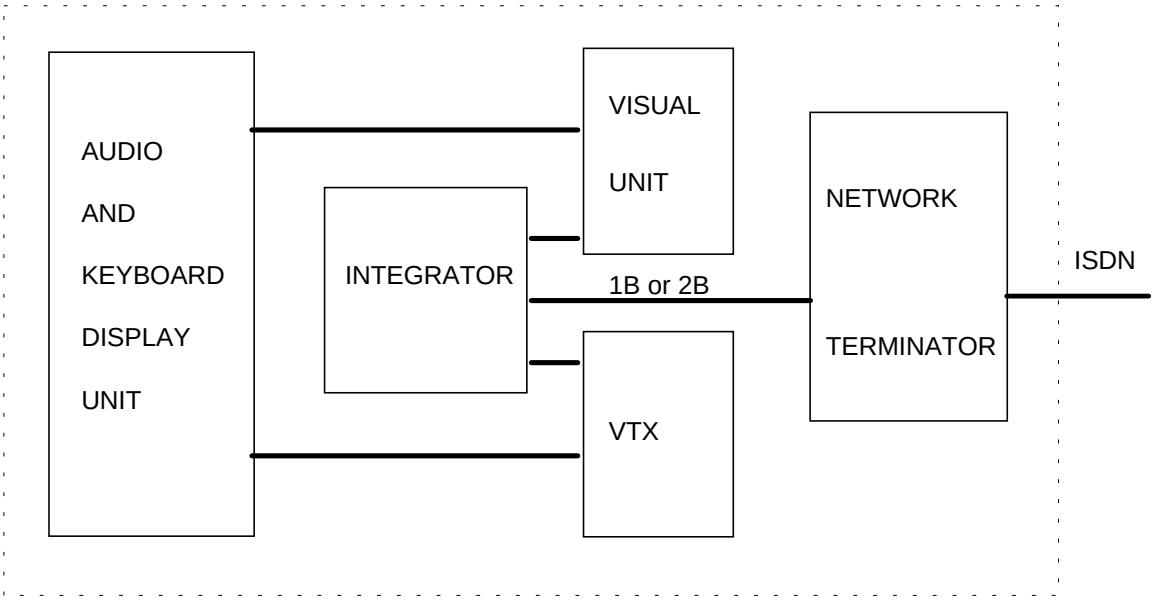

Figure 6: Videotex terminal enhanced with H.261

6.1.1 Description

The Videotex syntax is extended with an extra information type. The Videotex terminal enhanced with ITU-T Recommendation H.261 [17] divides the received information and directs them to the appropriate decoder. One can imagine that some additional information parameters determine the location on the screen where the information is to be presented. This method is very similar to the method used for the Videotex photographic syntax (ETS 300 177 [8]).

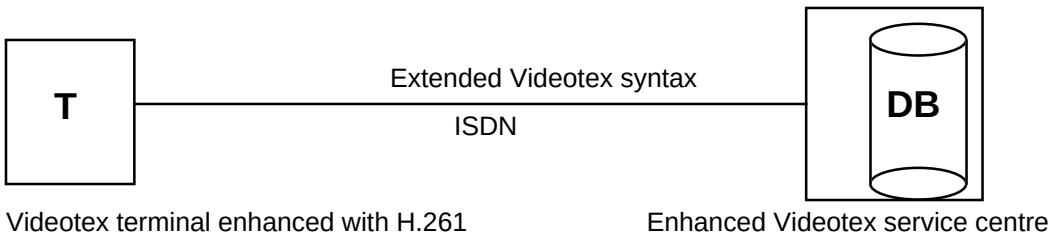

Figure 7: Videotex terminal enhanced with H.261 access to an enhanced Videotex service centre

6.1.2 Applications

The access of a Videotex terminal enhanced with ITU-T Recommendation H.261 [17] to a data service centre gives the possibility to extend the information in Videotex databases.

6.1.3 Constraints

As for all information transmitted via the Videotex syntax, rendering is "on-line" (as soon as possible). For continuous information streams like video this requires a network bandwidth larger than the information bandwidth required. For ITU-T Recommendation H.261 [17] encoded video information, the bandwidth between the Videotex terminal and the service centre needs to be in the order of 64 kbit/s.

6.1.4 Protocols

For the control from the user on the service centre, the base environment, being Videotex services, provides enough functionality for selecting, browsing and retrieval of the information. This functionality is independent from the nature of the information (text, audio, audiovisual). Control of continuous data (pause, slower, faster, restart, backwards) are possible extensions of control functionalities.

In the Videotex environment for ISDN, information is carried by the ITU-T Recommendation X.25 [23] protocol. The maximum data throughput of X.25 over a 64 kbit/s channels is the upper limit of the bandwidth available for continuous information streams.

6.2 Combined Videotex and AV(D) terminal

This terminal includes both a Videotex connection and a videotelephony/videoconferencing connection. Both services can be offered to the terminal independently and simultaneously.

A combined Videotex and AV(D) terminal can use a Videotex connection, an audio, a video and a data channel for communication. These channels can be used in parallel. The algorithm for coding and decoding of the audio and video information is standardized.

The combined Videotex and AV(D) terminal renders the received video image and the received Videotex information on the same display. The terminal can be a dedicated terminal or a PC/WS with extension to support ITU-T Recommendation H.320 [14]. Both cases are under consideration.

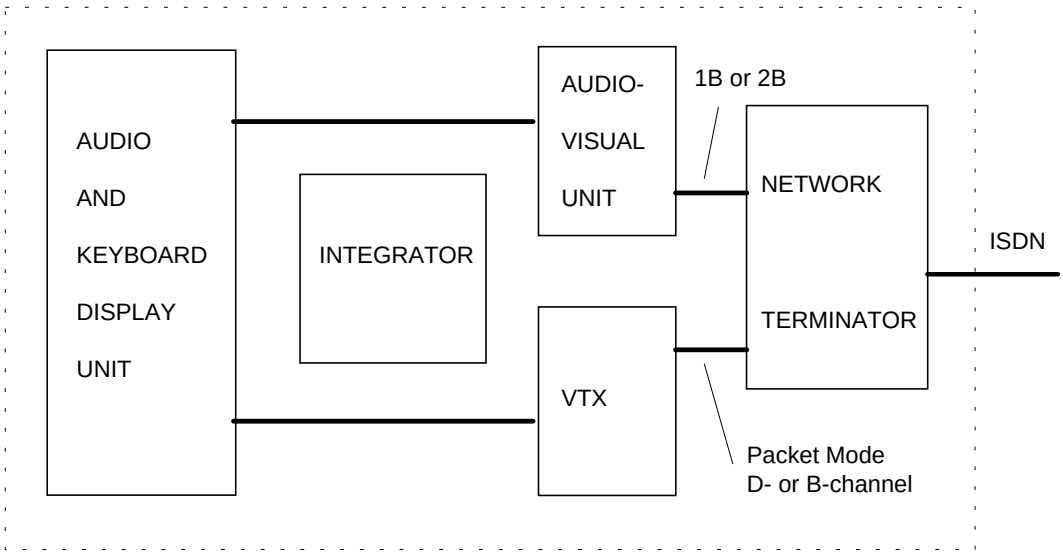

Figure 8: Combined Videotex and AV(D) terminal

The terminal does not use an Integrator.

6.2.1 Access to an ITU-T Recommendation H.320 service centre

The access to an ITU-T Recommendation H.320 [14] (with or without data-facility) service centre can occur when the terminal only activates the AV(D) part. These scenarios will be described in subclauses 6.3.1 and 6.4.1.1.

6.2.2 Access to a Videotex service centre

The access to a Videotex service centre is achieved by the terminal simply by activating its ISDN Videotex terminal functionality.

6.2.3 Access to a Videotex/AV(D) service centre

6.2.3.1 Description

The scenario under consideration uses an ordinary Videotex service to retrieve information and uses the videotelephony service to enhance the retrieval information with audiovisual information. Both parts of the Videotex and AV(D) terminal are active.

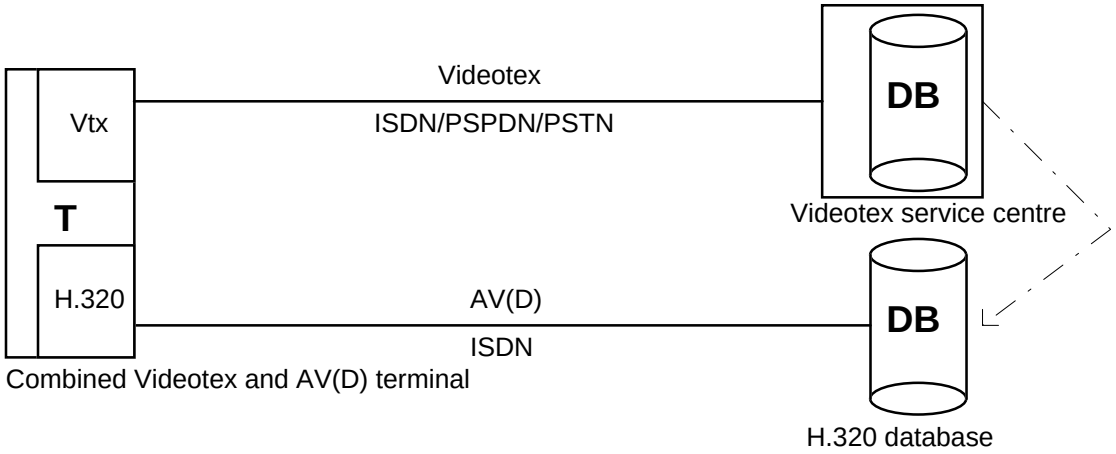

Figure 9: Combined Videotex and AV(D) terminal access to a Videotex and AV(D) service centre

6.2.3.2 Applications

The enhancement of the Videotex service with audiovisual information allows upgraded Videotex services. The audiovisual database might receive information from the Videotex application at the Videotex database to establish a communication with the terminal (call back procedure).

When the Syntax Based Videotex (SBV) protocol is used between the terminal and the Videotex service centre, the Videotex service centre can instruct the terminal to build a connection to the H.320 database requesting for a certain piece of information. The Videotex service centre can do this repeatedly per retrieved video sequence or just once for the duration of the session. In the latter case the Videotex service centre needs to be communicate with the H.320 database in order to indicate the Audio Visual (AV) sequence to be sent.

6.2.3.3 Constraints

- Combined Videotex and AV(D) terminals needs to use its Videotex part for its user to control the retrieval process.

- Videotex service centres should have some kind of control on the position and size of the video image, in order to present the retrieved information in an integrated way.

In the situation that ITU-T Recommendation H.320 [14] builds the connection with the terminal (call back procedure), additional constraints are:

a) a protocol needs to be available to establish communication between the Videotex service centre and the H.320 database;

b) a mechanism needs to exist for accounting and billing of the full service;

c) audiovisual databases need to be able to set up a connection to the terminal.

In the situation that the Videotex server instructs the terminal to connect to the H.320 database, additional constraints are:

1) the Videotex part of the terminal needs to control the dialling functions of the H.320 part of the terminal;

2) there needs to be a means to provide some sequence selection information during or right after connection establishment to the H.320 database.

If both connections are established from the user terminal to the Videotex service centre and the H.320 database, an additional constraint is that a protocol needs to be available to establish communication between the Videotex service centre and the H.320 database.

6.2.3.4 Protocols

The Videotex protocols and videotelephony protocols are as appropriate.

6.3 H.320 terminal without data-facility

An ITU-T Recommendation H.320 [14] terminal without data-facility with access to a remote database can be a dedicated H.320 videotelephony terminal, without data-facility, or a PC/WS with an extension to support ITU-T Recommendation H.320 [14], without data-facility.

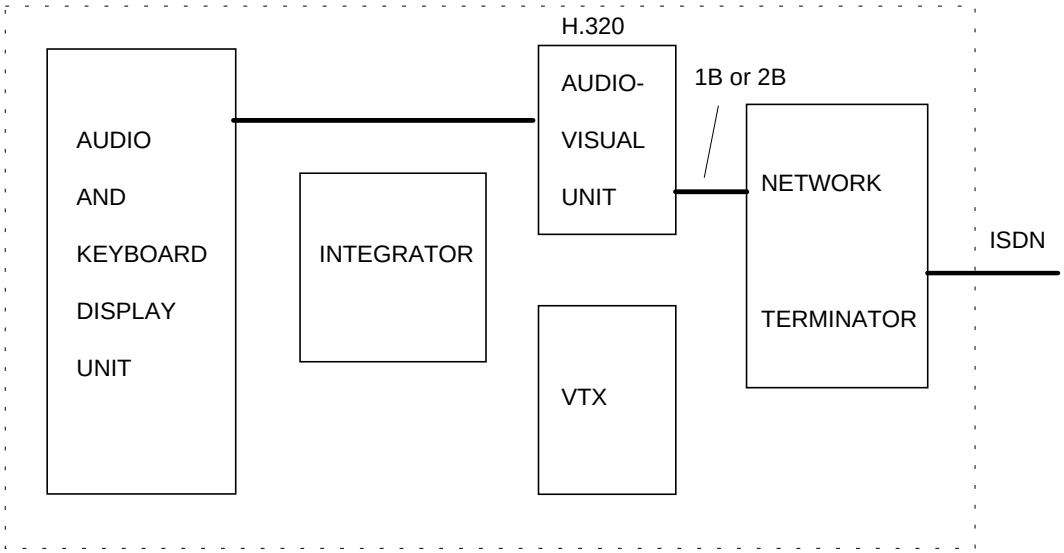

Figure 10: H.320 terminal without data-channel facility

The terminal does not use a Videotex decoder or integrator.

6.3.1 Access to an H.320 service centre

6.3.1.1 Description

An ITU-T Recommendation H.320 [14] terminal without data-facility can receive video (ITU-T Recommendation H.261 [17]) and audio (CCITT Recommendations G.711 [24], G.722 [25], or G.728 [26]) information packed in a framed structure (ETS 300 144 [2]). The interaction between the end user and the service centre takes place via these information types or the inband signalling procedures defined for audiovisual services or via outband signalling (e.g. the ISDN D-channel) or by using ISDN supplementary service (e.g. User-to-User Signalling (UUS)).

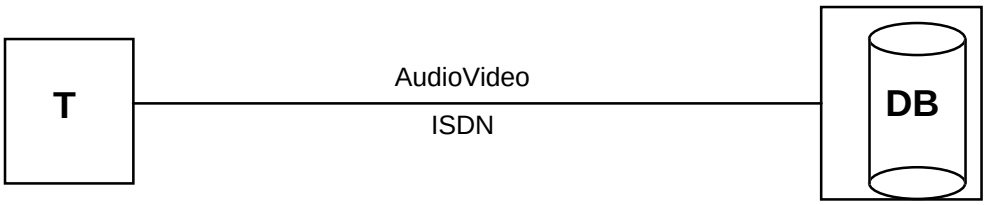

Figure 11: H.320 terminal without data-facility access to an H.320 service centre

6.3.1.2 Applications

The access of an ITU-T Recommendation H.320 [14] terminal to an ITU-T Recommendation H.320 [14] service centre gives the possibility to provide retrieval services to an audiovisual terminal.

6.3.1.3 Constraints

The database needs to store the information in a way to be able to extract the data by means of the ITU-T Recommendation H.221 [15] framing structure (ETS 300 144 [2]).

The ITU-T Recommendation H.320 [14] terminal needs to support means for its user to control the retrieval process.

A problem area is the number of combinations that are possible for dividing the bandwidth between video and audio, and the number of options that the information can be encoded. Options are:

H.221: 1 B-channel (64 kbit/s, 56 kbit/s),
2 B-channels (2*64 kbit/s, 2*56 kbit/s).
Video:CIF/QCIF frame rates 7,5 up to 30 fps.
Audio:G.711 [24] (μ-law, A-law), G.722 [25] or G.728 [26].
Rates: audio: 56 kbit/s, 48 kbit/s, 16 kbit/s,
video: remainder of the 2 B-channels bandwidth.

Combination of the above options lead to a large number of transfer "modes". ITU-T Recommendation H.320 [14] terminals support different modes, and not all modes are common between all vendors (or terminal types). Normally CCITT Recommendation G.711 [24] speech and video in a 2B mode is supported.

In ITU-T Recommendation H.320 [14] videotelephony it is practice that the sending terminal instructs its codec to encode the audio/video information according to the receiving capabilities of the other terminal. As a consequence the database should be able to provide information using the mode suitable for the connected terminal. This might require multiple storage of the information (in multiple modes), or an on-line re-encoding mechanism.

Another solution is to store the information in the mode shared by all the targeted user terminals. This can be the mode Quarter Common Intermediate Format (QCIF) (7,5 fps), CCITT Recommendation G.711 [24] (A-law, 56 kbit/s). A draw-back is the lower quality of such a common mode.

NOTE: The above situation is very similar to the situation known for Videotex services where there exist many terminals supporting different profiles. Via the Terminal Facility Identifier (TFI), the terminal informs the database about its receiving capabilities. Then the Videotex service tries to serve the terminals as well as possible. Some services use duplications of the data-base, others use converters, and again others just degrade the service to a level supported by the terminal (might involve no provision of data).

6.3.1.4 Protocols

An interactive protocol is necessary to retrieve information from the database (see subclause 5.1.1.4). The ISDN D-channel can be used for interchange data of the interactive protocol. Another possibility is the DTMF in the audio stream via the ISDN B-channel. A third possibility is an extension of the inband signalling procedures specified in ETS 300 143/A1 [10] and ETS 300 144 [2].

6.3.2 Access to a Videotex service centre

6.3.2.1 Description

In case an ITU-T Recommendation H.261 [17] terminal has access to a Videotex service centre, an IWU provides the interworking between the Videotex protocol and the videotelephony protocol.

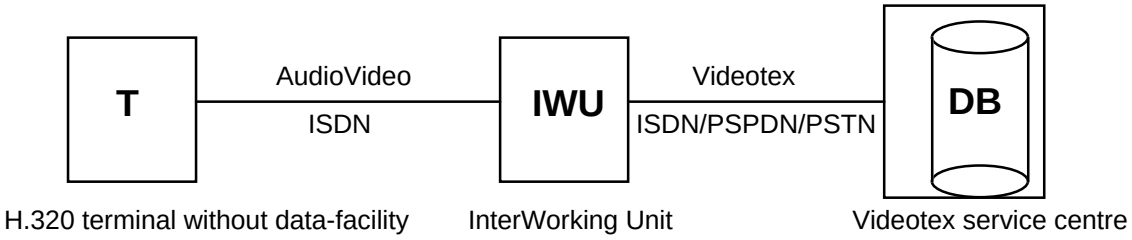

Figure 12: H.320 without data terminal access to a Videotex service centre

6.3.2.2 Applications

The access of an ITU-T Recommendation H.320 [14] terminal to a Videotex service centre provides the extension of Videotex services to be accessed by audiovisual terminals.

6.3.2.3 Constraints

As in subclause 5.2.2.3, the conversion between a Videotex service and videotelephony service based on ITU-T Recommendation H.221 [15] gives the following constraints:

- refreshment speed; the videotelephony protocol needs to be able to keep track of the refreshment of the information the Videotex service is providing;

- support of functionalities; the IWU cannot translate all Videotex functionalities into the audiovisual data stream of the videotelephony protocol;

- most textual based Videotex information should maintain its quality/readability while re-encoded in ITU-T Recommendation H.261 [17]. The CIF/QCIF resolution used in ITU-T Recommendation H.261 [17] is the limiting factor (CIF means 352 x 288 pixels; QCIF means 176 x 144 pixels);

- ITU-T Recommendation H.320 [14] terminals need to support means for its user to control the retrieval process.

6.3.2.4 Protocols

The interactive protocol between the ITU-T Recommendation H.320 [14] terminal and the IWU is necessary to retrieve the information in the Videotex database. As in subclause 6.3.1.4, the ISDN D-channel, DTMF in the ISDN B-channel or audiovisual inband signalling are possible solutions to code the interactive protocol.

6.3.2.5 InterWorking Unit

The IWU transforms the information from the Videotex service to the videotelephony service. The IWU can be located in the AP of the service centre or as a separate unit.

6.4 H.320 terminal with data-facility

An H.320 terminal with data-facility can use an audio, a video and a data channel for communication. These channels can be used in parallel. The algorithm for coding and decoding of the audio and video information is standardized. The data channel can be handled according to the requirements of the application. The H.320 terminal can be a dedicated terminal or a PC/WS with extension to support ITU-T Recommendation H.320 [14].

A distinction has been made in terminals which do not include a Videotex decoder (subclause 6.4.1) and terminal which include a Videotex decoder (subclause 6.4.2).

6.4.1 Without Videotex decoder

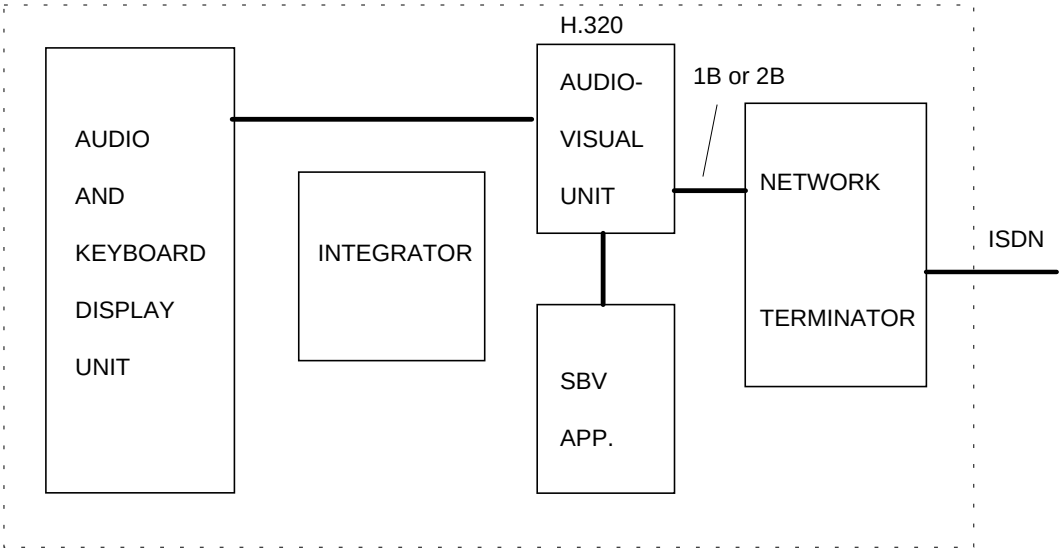

Figure 13: H.320 terminal with data-channel facility and without Videotex decoder

This terminal type does not use an Integrator.

6.4.1.1 Access to an H.320 service centre

6.4.1.1.1 Description

The H.320 terminal has access to a remote service centre which supports the interchange of data by means of the H.320 protocol.

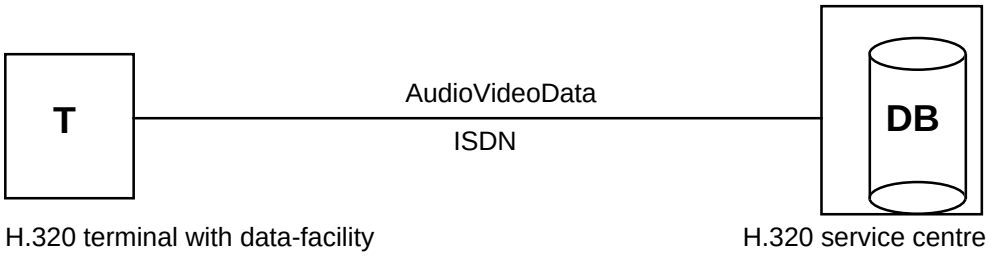

Figure 14: H.320 terminal with data-facility access to an H.320 service centre

6.4.1.1.2 Applications

The H.320 terminal with access to an H.320 service centre can allow applications to retrieve information that contains video, audio, text and data. The use of text and data requires additional recommendations on the use of the H.320 data channel(s).

6.4.1.1.3 Constraints

- H.320 service centres need to be able to provide information via the H.320 protocol.

- H.320 terminals need to be able to support the interactive protocol.

6.4.1.1.4 Protocols

An interactive protocol needs to be developed to have access to the information in the database. As in subclause 6.3.1.4, the ISDN D-channel, DTMF in the B-channel, or audiovisual inband signalling can be used to code the interactive protocol. Another solution is the use of the H.320 data channel to support the interactive protocol. In this case, the data channel could transport access information, as well as retrieval information. When the H.320 data channel is used, the Videotex protocols are a valid starting point for the interactive protocol.

Some work is required to link the information in the AV-channels with the data-channel, e.g. spatial positioning and sizing of the "video window".

6.4.1.2 Access to a Videotex service centre

6.4.1.2.1 Description

The access of an H.320 terminal to a Videotex service centre requires an IWU to establish the interoperability between a Videotex service and an H.320 with data service. The IWU can be located in an AP. The IWU transfers the Videotex information into an ITU-T Recommendation H.261 [17] encoded video information stream. The H.320 data capabilities are not used.

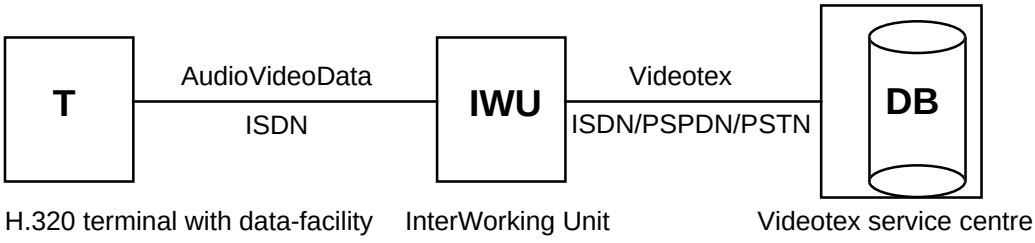

Figure 15: H.320 terminal with data-facility access to a Videotex service centre

6.4.1.2.2 Applications

The access of an H.320 terminal to a Videotex service centre provides the extension of Videotex services to be accessed by audiovisual terminals.

6.4.1.2.3 Constraints

As in subclause 5.1.2.3, the conversion between a Videotex service and videotelephony service based on ITU-T Recommendation H.221 [15] gives the following constraints:

- refreshment speed; the videotelephony protocol needs to be able to keep track of the refreshment of the information the Videotex service is providing;

- most textual based Videotex information should maintain its quality/readability while re-encoded in ITU-T Recommendation H.261 [17]. The CIF/QCIF resolution used in ITU-T Recommendation H.261 [17] is the limiting factor (CIF means 352 x 288 pixels; QCIF means 176 x 144 pixels);

- H.320 terminals need to support means for its user to control the retrieval process.

6.4.1.2.4 Protocols

The interactive protocol between the H.320 terminal and the IWU is necessary to retrieve the information in the Videotex database. As in subclause 6.3.1.4, the ISDN D-channel, DTMF in the ISDN B-channel or audiovisual inband signalling are possible solutions to code the interactive protocol. Another solution is offered by the use of the H.320 data channel. For the moment, no recommendations exist on the use of the Low Speed Data (LSD) and High Speed Data (HSD) data channels of ITU-T Recommendation H.320 [14]. Technically, the data channels can be used to transfer the interactive protocol required for retrieval services. The Videotex protocol seems a valid starting point for development when the interactive protocol uses the H.320 data channels.

6.4.1.2.5 InterWorking Unit

The IWU transforms the information from the Videotex service to the videotelephony service. The IWU can be located in the AP of the service centre or as a separate unit.

6.4.1.3 Access to a Videotex centre via an MCU

6.4.1.3.1 Description

The access of an H.320 (with or without data-facility) terminal to a Videotex service centre can be realised during a multipoint video conference. The IWU presents the information of the Videotex service centre to the Multipoint Control Unit (MCU) as a normal H.320 terminal. Thus by transcoding the Videotex information into ITU-T Recommendation H.261 [17] encoded video information. The IWU needs to support the necessary audiovisual inband signalling to establish a connection with the MCU.

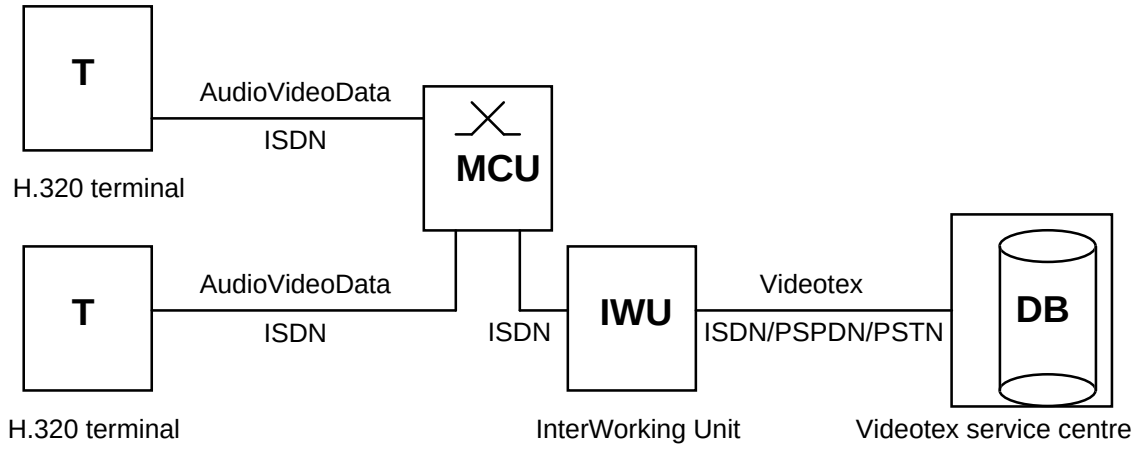

Figure 16: H.320 terminal access to a Videotex service centre via a MCU

The IWU and Videotex service centre appears to the MCU as a participant of the conference. Depending on the switching techniques used by the MCU, the image produced by the IWU is broadcast to the conference participants, when:

- the audio from the IWU is dominant for a minimum interval (voice activated switching);

- the chairman of the conference, or the person with the baton, instructs the MCU to broadcast the image received from the IWU (a chairman control function of ITU-T Recommendation H.243 [13]);

- a terminal requests the MCU to forward the image (a function of ITU-T Recommendation H.243 [13]);

- the IWU instructs the MCU to broadcast the image (a function of ITU-T Recommendation H.243 [13]);

  NOTE: The ITU-T Recommendation H.243 [13] functions are not standardized by ETSI.

6.4.1.3.2 Applications

During a conference the participants can retrieve information from a Videotex service centre. The videoconferencing service is extended with information retrieval service.

6.4.1.3.3 Constraints

- Identical constraints as given in subclause 6.4.1.2.3 apply.

- Control of the retrieval process at the Videotex service centre needs to be provided to at least one of the participants.

6.4.1.3.4 Protocols

A requirement for the interaction between the participants and the service centre is that all participants should be able to influence the retrieval process (unless an acting chairman prohibits the interaction). This protocol should provide a path from the MCU through the IWU to the Videotex service centre. The functionality of this protocol needs to allow the retrieval of the information in the Videotex database to be presented by the asking H.320 terminal only or to be presented to all participants in the conference.

Using the H.320 data channel for carrying the interactive protocol is not likely since the data channel can only be used in unidirectional broadcast mode when a MCU is involved (MCU without Multi Layer Protocol (MLP) functionality is assumed).

The use of the ISDN D-channel for the interactive protocol is not likely since it will place special requirements on the MCU.

DTMF for carrying the interactive protocol can be used since standard MCUs will forward a mixture of all audio received to the participants. The DTMF tones will reach the IWU. From a user's point of view the noise in the audio channel might become disturbing.

6.4.1.3.5 InterWorking Unit

See subclause 6.4.1.2.5. In addition, the IWU should support ITU-T Recommendation H.243 [13] functionalities in order to co-operate with the MCU. One can imagine that the IWU will force itself as broadcast source each time the retrieved information from the Videotex service centre changes (is updated).

6.4.1.3.6 MCU

This can be a standard MCU using: voice activated conference control, ITU-T Recommendation H.243 [13] functionalities or other conference control means. The possibility exists that more MCUs can be interconnected.

6.4.2 With Videotex decoder

An H.320 terminal enhanced with Videotex can use an audio, a video and a data channel for communication. These channels can be used in parallel. The algorithm for coding and decoding of the audio and video information is standardized. The data channel is handled according to the Videotex syntaxes. The H.320 terminal renders the received video image and the received Videotex information on

the same display. The H.320 terminal can be a dedicated terminal including a Videotex decoder, or a PC/WS able to support ITU-T Recommendation H.320 [14] and including a Videotex decoder.

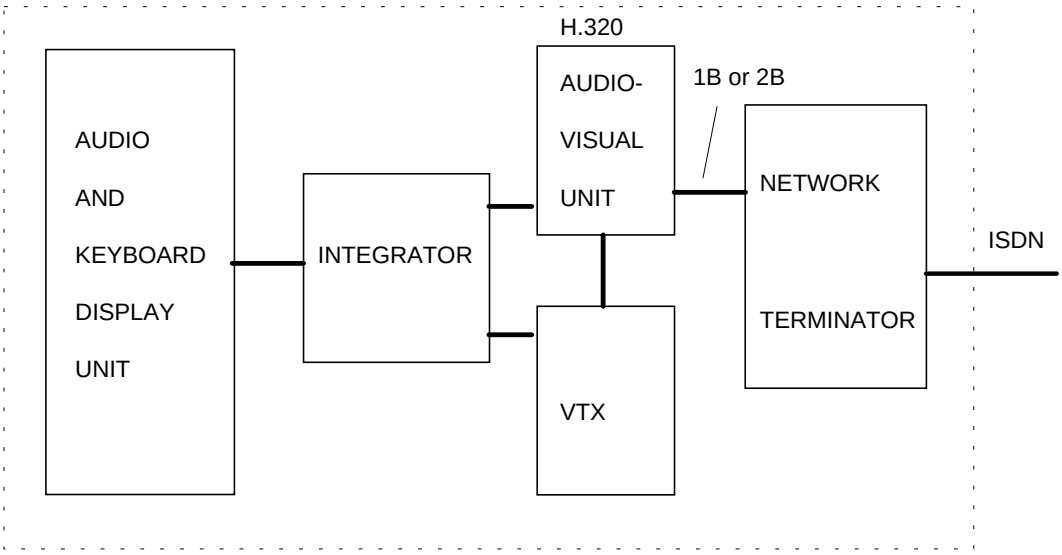

Figure 17: H.320 terminal with data-channel facility and with Videotex decoder

6.4.2.1 Access to an H.320 service centre

6.4.2.1.1 Description

The H.320 terminal has access to a remote service centre which supports the interchange of data by means of the H.320 protocol.

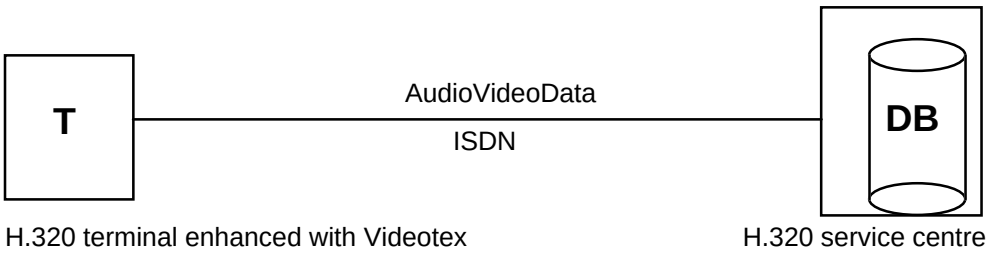

Figure 18: H.320 terminal enhanced with Videotex access to an H.320 with data service centre

6.4.2.1.2 Applications

The H.320 terminal enhanced with Videotex with access to an H.320 service centre can allow applications to retrieve information that contains video, audio, text and data. The use of text and data requires additional recommendations on the use of the H.320 data channel(s), however the Videotex recommendations can be used to define the meaning of the transferred bytes.

Using the three streams, Audio Visual Data (AVD), an application can provide the user with audiovisual information in parallel with Videotex encoded information. One can imagine an application sending an audiovisual sequence accompanied with textual information either superimposed or around the displayed image.

6.4.2.1.3 Constraints

- H.320 terminals enhanced with Videotex need to be able to support the interactive protocol.

- The data channel available in the H.320 service should be available for additional information. In a similar way that the Videotex syntax for JPEG encoded still images provides means for spatial positioning of the image, there should be means for positioning and sizing the video image on the terminal.

6.4.2.1.4 Protocols

An interactive protocol needs to be developed to have access to the information in the database. As in subclause 6.3.1.4, the ISDN D-channel, DTMF in the B-channel or audiovisual inband signalling can be used to code the interactive protocol. Another solution is the use of the H.320 data channel to support the interactive protocol. In this case, the data channel could transport access information, as well as retrieval information. The Videotex interactive protocols should be used as a base for the interactive protocol.

Some work is required to link the information in the AV-channels with the data channel, e.g. spatial positioning and sizing of the "video window".

6.4.2.2 Access to a Videotex service centre

6.4.2.2.1 Description

The access of an H.320 terminal enhanced with Videotex to a Videotex service centre requires an IWU to establish the interoperability between a Videotex service and an H.320 service. The IWU can be located in an AP. The Videotex information is transferred to the terminal using the H.320 data channel.

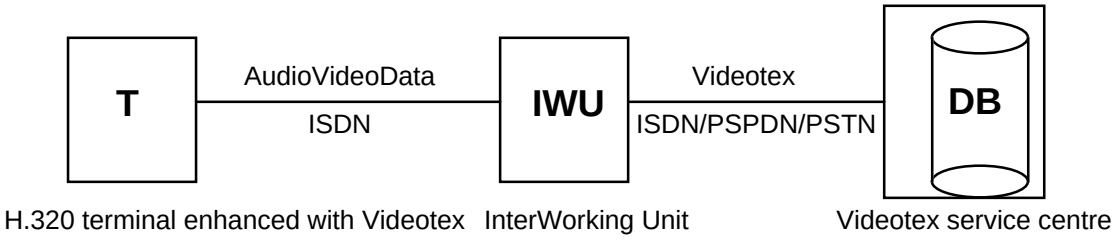

Figure 19: H.320 terminal enhanced with Videotex access to a Videotex service centre

6.4.2.2.2 Applications

The access of an H.320 terminal enhanced with Videotex to a Videotex service centre provides the extension of Videotex services to be accessed by audiovisual terminals.

6.4.2.2.3 Constraints

- H.320 terminals enhanced with Videotex need to support means for its user to control the retrieval process.

6.4.2.2.4 Protocols

The interactive protocol between the H.320 terminal and the IWU is necessary to retrieve the information in the Videotex database. As in subclause 6.3.1.4, the ISDN D-channel, DTMF in the ISDN B-channel or audiovisual inband signalling are possible solutions to code the interactive protocol. Another solution is offered by the use of the H.320 data channel. For the moment, no recommendations exist on the use of the LSD and HSD data channels of ITU-T Recommendation H.320 [14]. Technically, the data channels can be used to transfer the interactive protocol required for retrieval services. The Videotex protocol seems a valid starting point when the interactive protocol uses the H.320 data channels.

6.4.2.2.5 InterWorking Unit

The IWU transports the information from the Videotex service to the videotelephony service. The IWU can be located in the AP of the service centre or as a separate unit. Since the H.320 terminal enhanced with Videotex is capable of handling Videotex information from the H.320 data channel, the IWU simply needs to insert the Videotex information received from the Videotex service centre into the data channel and vice versa. In the meanwhile the audio and video channel are filled with "no information" by the IWU.

6.4.2.3 Access to a Videotex/AV(D) service centre

6.4.2.3.1 Description

The access of an H.320 terminal enhanced with Videotex to a Videotex service centre and an AV database requires an IWU to establish the interoperability between a Videotex service and an H.320 service. The IWU can be located in an AP of the Videotex service centre. The Videotex information is transferred to the terminal using the H.320 data channel, and the information from the AV database is transferred using the H.320 audio and video channel.

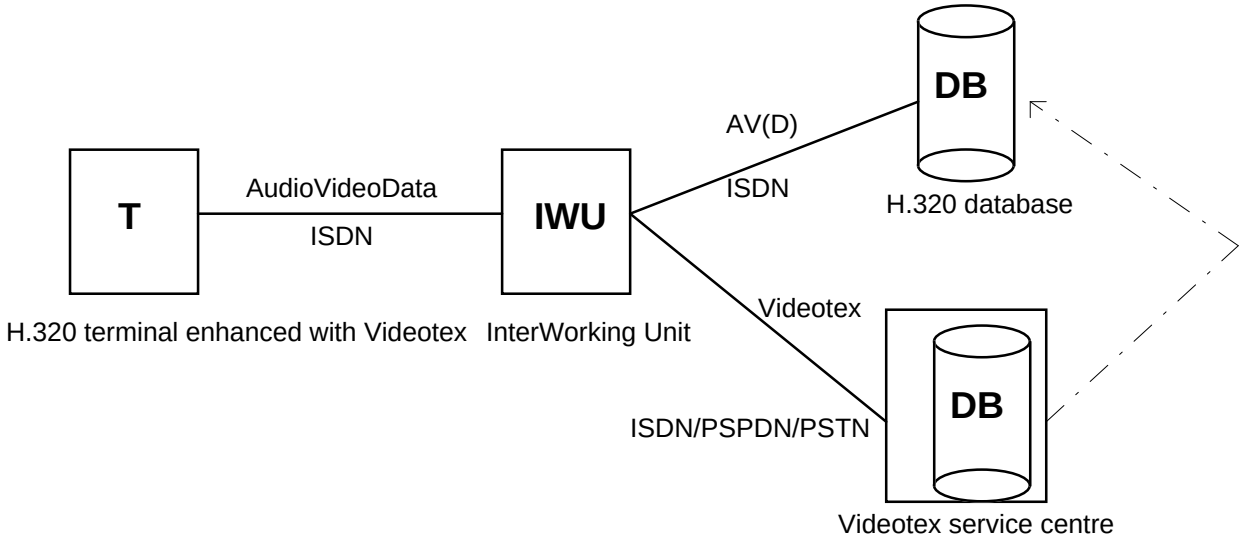

Figure 20: H.320 terminal enhanced with Videotex access to a combined Videotex and AV(D) service centre

6.4.2.3.2 Applications

The access of an H.320 terminal enhanced with Videotex to a Videotex service centre and an AV database provides the extension of Videotex services enabling the integration of AV information with the Videotex information. The resulting type of service is similar to the applications feasible with the scenario of subclause 6.4.2.1. The IWU, H.320 database and the Videotex service centre of this scenario perform the same roles as the H.320 service centre in subclause 6.4.2.1.

6.4.2.3.3 Constraints

- H.320 terminals enhanced with Videotex need to support means for its user to control the retrieval process.

- Videotex service centres should have some kind of control on the position and size of the video image, in order to present the retrieved information in an integrated way.

6.4.2.3.4 Protocols

The interactive protocol between the H.320 terminal and the IWU is necessary to retrieve the information in the Videotex database. As in subclause 6.3.1.4, the ISDN D-channel, DTMF in the ISDN B-channel or audiovisual inband signalling are possible solutions to code the interactive protocol. Another solution is offered by the use of the H.320 data channel. For the moment, no recommendations exist on the use of the LSD and HSD data channels of ITU-T Recommendation H.320 [14]. Technically, the data channels can be used to transfer the interactive protocol required for retrieval services. The Videotex protocol seems a valid starting point when the interactive protocol uses the H.320 data channels.

Between the Videotex service centre and the H.320 database there should be a protocol in order to give the Videotex service centre control over the H.320 database.

6.4.2.3.5 InterWorking Unit

The IWU transforms the information from the Videotex service to the videotelephony service. The IWU can be located in the AP of the service centre or as a separate unit. The location of the IWU at the H.320 terminal effectively changes this scenario into the scenario of subclause 6.2.3. Since the H.320 terminal enhanced with Videotex is capable of handling Videotex information from the H.320 data channel, the IWU simply needs to insert the Videotex information received from the Videotex service centre into the data channel and vice versa. In the meanwhile the audio and video channel are filled by copying the information received from the H.320 database.

The task of the IWU becomes more complex when the H.320 database also provides information in the H.320 data channel. In this case, a method needs to be developed to multiplex this data with the Videotex data from the Videotex service centre.

6.4.2.4 Access to a Videotex centre via an MCU

6.4.2.4.1 Description

The access of an H.320 terminal enhanced with Videotex to a Videotex service centre can be realised during a multipoint video conference. The IWU presents the information of the Videotex service centre to the MCU via the H.320 data channel and inserts idle bits in the audio and video channel.

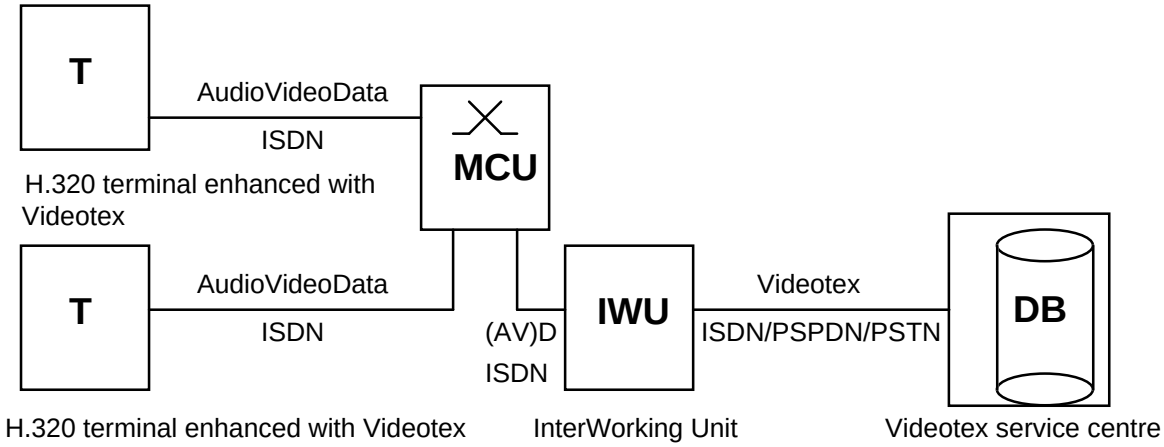

Figure 21: H.320 with data + Videotex terminal access to a Videotex service centre via a MCU

The IWU and Videotex service centre appears to the MCU as a participant of the conference. Since the retrieved Videotex information is transferred through the H.320 data channel, the IWU needs to instruct the MCU to configure the H.320 data channel in broadcast mode with the IWU as the source.

Since the information is presented in the data channel, several problems related to missing audio and video information need to be solved. The use of H.320 data channel in a multipoint conference is not standardized by ETSI, the use of the ITU-T T.120 protocols is recommended.

6.4.2.4.2 Applications

During a conference the participants can retrieve information from a Videotex service centre. The video conference service is extended with information retrieval service.

6.4.2.4.3 Constraints

- Identical constraints as in subclause 6.4.2.2.3 apply.

- Control of the retrieval process at the Videotex service centre needs to be provided to at least one of the participants.

- The interactive protocol can possibly not use the H.320 data channel in the direction from participant to Videotex service centre due to a uni-directional broadcast from IWU to the conference participants.

6.4.2.4.4 Protocols

See subclause 6.4.1.3.4.

6.4.2.4.5 InterWorking Unit

See subclause 6.4.2.2.5. In addition, the IWU uses ITU-T Recommendation H.243 [13] functionalities in order to instruct the MCU to open the H.320 data channel with the IWU as source.

6.4.2.4.6 MCU

This can be a standard MCU using: voice activated conference control, ITU-T Recommendation H.243 [13] functionalities or other conference control means. It can be possible that more MCUs are interconnected.

7 Scenario and terminal relevance

7.1 Classification of terminals

In this clause, the TE as introduced in the previous clauses is classified. This provides a ranking of most likely terminals that will emerge in the near future. An overview is given of the "technical aspects" of the terminals. Are the terminals on the market? Do the interworking scenarios impose large changes to the implementation? Does the terminal address the interworking topic? What means for carrying the interactive protocol are relevant? Then the user aspects of the terminal types are discussed.

7.1.1 Technical aspects

Table 1

Terminals:	Available	Terminal	Service (service centre)	Transport mechanism for interactive protocol				
				DTMF	D-channel	data channel (LSD/ HSD/ MLP/..)	SBV	T.SI
PSTN videotelephony without data-facility see subclause 5.1	y	1	5.1.1: 2 (Vph) 5.1.2: 4 (Videotex)	++	--	--	--	--
PSTN videotelephony with data-facility see subclause 5.2	y	1	5.2.1: 2 (Vph) 5.2.2: 4 (Videotex)	++	--	+	•	--
Videotex terminal enhanced with H.261 see subclause 6.1	n	5	6.1: 3 (Videotex)	--	-	--	++	--
Combined Videotex and AV(D) see subclause 6.2	-	1	6.2.1: 2 (H.320) 6.2.2: 1 (Videotex) 6.2.3: 3 (both)	++	•	-	+	--
H.320 terminal without data-facility see subclause 6.3	y	1	6.3.1: 2 (H.320) 6.3.2: 4 (Videotex)	++	-	--	--	--
H.320 terminal with data-facility without Videotex decoder see subclause 6.4.1	y	1	6.4.1.1: 2 (H.320) 6.4.1.2: 4 (Videotex) 6.4.1.3: 5 (MCU)	++	-	•	+	--
H.320 terminal with data-facility with Videotex decoder see subclause 6.4.2	n	2	6.4.2.1: 2 (H.320) 6.4.2.2: 3 (Videotex) 6.4.2.3: 4 (both) 6.4.2.4: 5 (MCU)	++	-	++	+	--
H.320 + T.120 + T.SI annex A	n	3-4	+	++	•	++	-	++
H.320 + T.120 + SBV annex A	n	3-4	+	++	•	++	+	-

(continued)

Table 1 (concluded)

Available	Is the terminal type available on the market? y = yes, n = no
Terminal	What is the effort to realise such a terminal? 1 = no effort, ..., 5 = whole develop trajectory
Service	What is the effort to realise such a service? -- no, - poor quality, • acceptable, + good, ++ excellent
DTMF	Can the interactive protocol be carried by DTMF tones? -- no, - difficult, •reasonable, + easy, ++ common practise
D-channel	Can the interactive protocol be carried by the ISDN D-channel? -- no, - difficult, •reasonable, + easy, ++ common practise
H.320 data channel	Can the interactive protocol be carried by the H.320 data channel? -- no, - difficult, •reasonable, + easy, ++ common practise
SBV	Can the required interactive protocol make use of the SBV protocol? -- no, - difficult, •reasonable, + easy, ++ common practise
T.SI	Can the required interactive protocol make use of the T.SI protocol? -- no, - difficult, •reasonable, + easy, ++ common practise

7.1.2 User aspects

Table 2

Terminals:	Text readability (service centre)	Usability/ functionality of interactive protocol	Image quality	Connectivity (multi-vendor)
PSTN videotelephony without data-facility see subclause 5.1	5.1.1: nap (Vph) 5.1.2: - (Videotex)	•DTMF	-	--
PSTN videotelephony with data-facility see subclause 5.2	5.2.1: ++ (Vph) 5.2.2: ++ (Videotex)	+ SBV	--	--
Videotex terminal enhanced with H.261 see subclause 6.1	6.1: ++ (Videotex)	++ SBV	•	++
Combined Videotex and AV(D) see subclause 6.2	6.2.1: ++ (H.320) 6.2.2: ++ (Videotex) 6.2.3: ++ (both)	++ SBV	•	+
H.320 terminal without data-facility see subclause 6.3	6.3.1: nap (H.320) 6.3.2: + (Videotex)	•DTMF	+	++
H.320 terminal with data-facility without Videotex decoder see subclause 6.4.1	6.4.1.1: ++ (H.320) 6.4.1.2: + (Videotex) 6.4.1.3: + (MCU)	+ ?	+	•
H.320 terminal with data-facility with Videotex decoder see subclause 6.4.2	6.4.2.1: ++ (H.320) 6.4.2.2: ++ (Videotex) 6.4.2.3: ++ (both) 6.4.2.4: ++ (MCU)	++ SBV	+	•
H.320 + MLP (T.120 and T.SI) see annex A	++	++ T.SI	+	++
H.320 + MLP (T.120 and SBV) see annex A	++	++ SBV	+	++

Text readability:

nap not applicable;
- when text is to be encoded as images in the PSTN video channel;
+ when test is to be encoded as images in the ISDN video channel;
++ when text can be transferred as codes and is presented via a local character generator.

Usability/functionality of interactive protocol:

In this column the most likely used carrier mechanism for the interactive protocol is indicated. The quality indicator reflects the functionality and the available bandwidth for the interactive protocol:

• DTMF) a low effective bandwidth, only one direction (user to service centre);
+ ? and SBV) low bandwidth;
++ T.SI and SBV) both protocols give good functionality and the channel speed is high enough.

Image quality:

-- due to limited bandwidth that is shared with a data channel the image quality is (very) low;
- due to limited bandwidth (of the PSTN) the image quality is low;
• due to bandwidth restrictions (one B-channel) the image quality is poor;
+ due to the applied ITU-T Recommendation H.261 [17] compression and the bandwidth the image quality is acceptable but not excellent.

Connectivity:

-- system on the market apply proprietary protocols and can therefore not interwork. ETSI STC TE4 is currently working on standardization of the PSTN videotelephony protocols;
• due to the many options in ITU-T Recommendation H.320 [14], without a mandatory base profile there are interworking problems between existing system;
+ connectivity problems can exist because single B-channel mode is not always available, furthermore the idea of two connections with different capabilities might prove too complex;
++ recommendations are in place or coming, existing equipment proofed already to interwork correct (for H.320 MLP this item is an educated guess, as draft ITU-T Recommendation T.120 [9] is not finalised).

7.2 Interactive protocols

In the scenarios several hints are given on the ways that an interactive protocol can be carried between terminal and service centre. In this subclause, a form of comparison between these means is presented. This gives an impression of the relevance to the technical possibilities.

DTMF: DTMF is a modern and flexible system that can be used for both user-network signalling and end-to-end signalling. The prime use is number selection, but it allows for simple interactions and is used frequently for voice interactive systems. It is not really suited for encoding/transferring ASCII or pointing device data. The DTMF signals are usually generated electrically, but acoustical coupling of a DTMF device to the microphone of a handset is another option. It should, however, be pointed out that when using this option the electrical level to the network will depend on the characteristics of the telephone set to which it is acoustically coupled. Annex B to I-ETS 300 380 [11] indicates the variation level that could be expected. A worst case scenario is that a device conforming to this I-ETS will not ensure proper functioning. Some speech coding algorithms are not capable of transmitting DTMF.

- Pros:
  - very easy to add on (DTMF key-pad for microphone);
  - implementations exist.

- Cons:
  - very limited interaction, bandwidth;
  - reliability depends on the characteristics of the telephone handset and the speech coding algorithm used.

D-channel: The ISDN D-channel signalling system DSS1 offers functionality for the transfer of data. One is the data gram like supplementary services UUS (User-to-User Signalling).

- Pros:
  - usable for mail messages;
- Cons:
  - is only operating in set-up, connect, or disconnect phase of a circuit mode ISDN.

The other is packet mode PM D-channel data communication service based on X.31 case A and B.

- Pros:
  - it can carry the interactive protocol;
- Cons:
  - this service is not supported by all ISDN network providers.

H.320 data channel: the H.320 data channel offers the functionality to transfer bits. The data channel offers a large range of bandwidth (from 300 kbit/s up to 124,4 kbit/s on basic rate ISDN). There is not yet a common defined profile for the use of the data channel. This results in interoperability problems between ITU-T Recommendation H.320 [14] compliant terminals where the data channel is concerned. In principle, it is not difficult to map an interactive protocol like SBV on the data channel.

- Pros:
  - can carry the required functionality;
  - can carry additional presentation data that can be more effectively encoded as "ASCII bytes".

- Cons:
  - lack of standardization.

H.320 MLP channel: MLP is a logical sub-channel defined in ETS 300 144 [2]. MLP previously referred to the ITU-T T.120 Multilayer Protocol, but is now just a name for the logical sub-channel which may contain ITU-T T.120 or ITU-T Recommendation H.224 [27] protocol, or Dummy data - see ETS 300 144 [2] and ETS 300 143/A1 [10]. In Europe, the ITU-T Recommendation H.224 [27] protocol will not be used, in this ETR, the use of the ITU-T T.120 series of Recommendations (T.122 [19], T.123 [20], T.124 [21] and T.125 [22]) are considered. These protocols are designed for a multipoint environment, but can be used in point-to-point communication. In a multipoint conference the protocols enable one-to-many and many-to-one information exchange. One-to-one information exchange within a conference is also possible. Both standardized and proprietary applications can be implemented using the multipoint communication service defined in ITU-T Recommendation T.122 [19]. A scenario could be that one participant instructs the service centre and that all participants receive the information coming from that service centre. The available bandwidth for the interactive retrieval protocol over the MLP-channel depends on the other protocol exchanges running interleaved over the MLP-Channel (e.g. Chairman control messages, file transfer etc,...).

- Pros:
  - T.120 will offer useful base functionality for retrieval type of applications.

- Cons:
  - standardization is not yet finished;
  - almost no implementations exist;
  - installed base (ISDN videotelephones) do not support the MLP-channel.

BAS codes: extensions of the Bit Rate Allocation Signal (BAS) codes exchanged in the service channel defined in ETS 300 144 [2], can provide a means to carry the interactive protocol. The exchange rate for the BAS-codes is 400 bit/s, BAS-code extension mostly requires multiple byte codes. So the effective exchange rate will be lower than 400 bit/s.

- Pros:
  - since the extensions still need to be defined, it will (per definition) offer enough functionality.

- Cons:
  - a limited bandwidth, standardization effort needs to be started;
  - no implementations exist.

PSTN control channel: similar to the ETS 300 144 [2], BAS-codes the PSTN videotelephony use a control channel. Information over the bandwidth division between audio/video/data is exchanged via this channel. An extension could be made to carry the information required for the interactive protocol. Certainly, the effective bandwidth will be very low.

- Pros:
  - none.

- Cons:
  - a limited bandwidth;
  - standardization effort needs to be started;
  - no implementations exist.

SBV: SBV stands for the interactive protocol used in the Videotex service applicable when a packet service is offered by the network.

- Pros:
  - it can carry an interactive protocol.

- Cons:
  - it can only interact with packet switched network services.

7.3 Overall conclusions on scenarios

Access to Videotex service centres (subclauses 5.1.2, 5.2.2, 6.1, 6.2.2, 6.3.2, 6.4.1.2, 6.4.2.2):

- Videotex service centres are operational, information is available in Videotex databases;
- new terminal types should be able to access this installed base;
- IWUs that change presentation data can be complex, resulting in poor picture quality (subclauses 5.1.2, 6.2.2, 6.3.2, 6.4.1.2).

Access to Videotex during MCU conference (subclauses 6.4.1.3, 6.4.2.4):

- MCU videoconferencing is emerging, it might be a useful extension of the service.

Access to videotelephony/H.320 service centres (subclauses 5.1.1, 5.1.2, 6.2.1, 6.3.1, 6.4.1.1, 6.4.2.1):

- hardware for these systems is emerging;
- no operational services yet, only experimental systems;
- interactive protocols to retrieve information need to be developed.

Access to combined service centres (subclauses 6.2.3, 6.4.2.3):

- hardware for these systems is emerging;
- information maintenance will be complex.

NOTE: In the very near future, it is expected that access to Videotex service centres will become important, but also that retrieval services will evolve from Videotex services towards AV(D) retrieval services.

7.4 Overall conclusion on terminal types

The terminal types of interest are presented according to interest on the short and mid/long term.

7.4.1 Short term interest

In subclause number order:

Videotex terminal enhanced with ITU-T Recommendation H.261 [17] connected to an enhanced Videotex centre (subclause 6.1):

- an elegant but complicated way to enhance Videotex with moving pictures. By using ITU-T Recommendation H.261 [17], the functionality will be greatly increased as this introduces video into a narrow band service.

Combined Videotex and AV(D) terminal connected to an H.320 database and/or a Videotex database (subclause 6.2):

- this is an easy way to enhance a Videotex service with moving pictures and audio although this requires two separate network connections: one for the Videotex service and one from the H.320 database.

H.320 terminal without data-facility connected to an H.320 service centre (subclause 6.3.1):

- this scenario is easy to implement and the TE already exists.

H.320 terminal enhanced with a Videotex decoder connected to an H.320 database and/or a Videotex database (subclause 6.4.2):

- the terminal implementation is of medium complexity. The terminal itself can be used for standard videotelephony. In this scenario, the IWU transports the Videotex data and hence does not effect the picture quality. This scenario allows more than one participant in a session, although in this case the question of token management is an issue.

7.4.2 Mid/long term interest

In subclause number order:

PSTN videotelephony with data-facility connected to a service centre (subclause 5.2):

- this provides users of PSTN videotelephones in the potential consumer market to have access and interchange information.

H.320 terminal with data-facility connected to a service centre (subclause 6.4.1):

- access to an H.320 service centre is a first candidate to provide users of H.320, including data-facility, access to a service centre; it can also be expected that awareness of the need for access to Videotex service centres directly and by means of an MCU will grow.

H.320 terminal enhanced with a Videotex decoder connected to a Videotex database by means of an MCU (subclause 6.4.2.4):

- this terminal transports the Videotex service through the H.320 data channel; access to Videotex service centres by means of an MCU extends multipoint videoconferencing services with retrieval information.

T.120 terminals (annex A):

- Draft ITU-T Recommendation T.120 [9] facilitates the application of standardized protocols on top of multipoint communication services, e.g. SBV protocol can be used in this way.

Annex A: Considerations for H.320 terminals with MLP

The Multi Layer Protocol (MLP) channel of the ITU-T Recommendation H.320 [14] is similar to the LSD and HSD-channels at the level of the framing of the signals: audio, video and data. The difference is that for the MLP-channel a complete protocol stack is defined, exactly defining the means of bits and bytes. The definition of this protocol stack can be found in the T.120 series of ITU-T Recommendations ([9], [19] to [22]). An overview of these series of Recommendations is presented in figure A.1.

TE having implemented the MLP option can act as normal H.320 terminals (with or without LSD data and with or without Videotex decoders), all the scenarios for ISDN videotelephony equipment can be described. When the MLP protocol stack is actively used, new possibilities for exchanging control commands from user to service centre exist.

Draft Recommendation T.SI (ITU-T SG VIII Q 10) on multipoint still image and annotation conference protocol specification is a method to enable the participant to control a service centre.

NOTE: The service centre is not a straight forwarded Videotex centre, because the still image and annotation protocol differs from the Videotex protocols; an IWU will be required.

Furthermore, draft ITU-T Recommendation T.120 [9] facilitates the application of other standardized protocols on top of the multipoint communications services as described in ITU-T Recommendations T.122 [19] and T.125 [22]. The SBV protocol can thus be used.

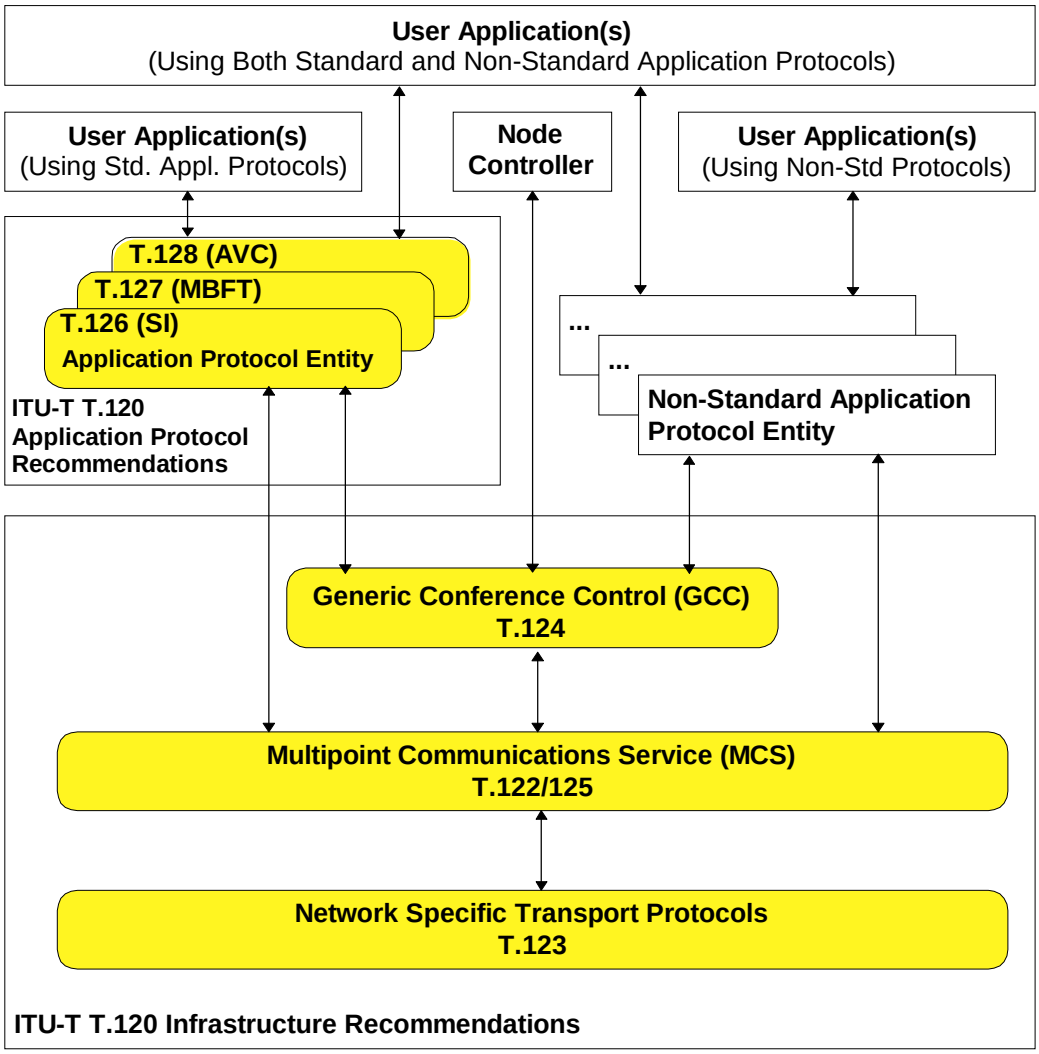

Figure A.1: Overview of draft ITU-T Recommendation T.120

History

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