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THE INTERNATIONAL
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CONSULTATIVE COMMITTEE

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TELEMATIC, DATA TRANSMISSION, ISDN BROADBAND, UPT AND TELECONFERENCE SERVICES:

OPERATIONS AND QUALITY OF SERVICE

VIDEOTELEPHONY SERVICES – GENERAL

Recommendation F.720

FOREWORD

The CCITT (the International Telegraph and Telephone Consultative Committee) is a permanent organ of the International Telecommunication Union (ITU). CCITT is responsible for studying technical, operating and tariff questions and issuing Recommendations on them with a view to standardizing telecommunications on a worldwide basis.

The Plenary Assembly of CCITT which meets every four years, establishes the topics for study and approves Recommendations prepared by its Study Groups. The approval of Recommendations by the members of CCITT between Plenary Assemblies is covered by the procedure laid down in CCITT Resolution No. 2 (Melbourne, 1988).

Recommendation F.720 was prepared by Study Group I and was approved under the Resolution No. 2 procedure on the 4th of August 1992.

CCITT NOTE

In this Recommendation, the expression "Administration" is used for conciseness to indicate both a telecommunication Administration and a recognized private operating agency.

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Recommendation F.720

VIDEOTELEPHONY SERVICES – GENERAL

(1992)

The CCITT,

considering

(a) that videotelephony services have been introduced in pilot form in various network environments in a number of countries;

(b) that videotelephony services are liable to be demanded by users around the whole world;

(c) that users will expect an acceptable minimum Quality of Service;

(d) that users will expect an ease of use comparable to ordinary telephony;

(e) that users will expect a high level of interoperability with other audiovisual services and with telephony,

adopts

the subsequent Recommendation dealing with the general description for videotelephony services.

The relevant attributes and values are incorporated as part of each dedicated service description.

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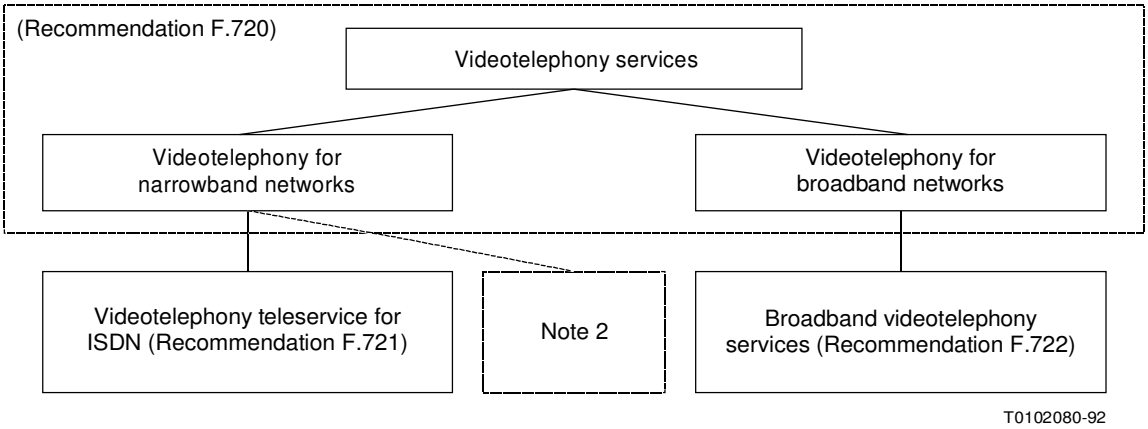
1 Introduction

The purpose of this Recommendation is to define and describe the general features and attributes of the videotelephony service regardless of the network environment where the service might be provided. The videotelephony service is classified in the following two main categories:

– videotelephony service for narrow-band networks;

– videotelephony service for broadband networks.

The intention is to assign a dedicated Recommendation for each type of videotelephony service in specific networks. The dedicated Recommendation is due to contain a description in detail of the service concerned with all relevant characteristics and attributes. Recommendation F.721 covers the basic videotelephony service in the Integrated services digital network (ISDN) due to this classification. Dedicated service Recommendations for higher quality videotelephony services are for further study. The higher quality videotelephony service will not necessarily employ any fixed information transfer rate as variable bit rate coding may be used. The classification of videotelephony services is depicted in Figure 1/F.720.



Note 1 – In broadband ISDN the service offerings may also comprise videotelephony services using low bit rates.

Note 2 – In the future, videotelephony services may be provided also other networks requiring new dedicaded service Recommendations.

FIGURE 1/F.720
Classification of videotelephony services

2 Definition

Videotelephony service is an audiovisual conversational teleservice providing bidirectional symmetric real-time transfer of voice and moving colour pictures between two locations (person-to-person) via the networks involved. The minimum requirement is that under normal conditions the picture information transmitted is sufficient for the adequate representation of fluid movements of a person displayed in head and shoulders view (see Note).

Note – The smoothness of the movements in the reproduced picture is essentially dependent on the amount of motion with respect to the transfer rate of transmitted picture information. The above requirements are supposed to be met under such conditions where the amount of motion is limited or the throughput is high enough not to impair the received picture. Degradation is likely to appear as increased blurring and jerkiness in the reproduced picture. Besides this, other artifacts may occur.

3 Description

3.1 *General description*

The plain videotelephony service includes only the basic user requirements, namely speech and motion picture with essential controls and indications; the service can be enhanced with options providing auxiliary facilities such as transmission of high resolution still images of documents, photographs, drawings, charts, objects, etc. (see Note).

Note – Speech supported only by still picture transmission and/or telewriting is not considered as a part of the videotelephony service. This type of communication may either be considered as a separate audiovisual service or as a form of audiographic conference service in a point-to-point configuration.

The videotelephony service is likely to be used in much the same way as the ordinary telephone service for individual communication, the enhancement being in the visibility of the communicating parties which implies a number of possible new applications.

An essential feature of the service is that it is always provided in conjunction with ordinary telephony allowing the user to intercommunicate with all kinds of audiovisual services by using merely the speech communication facility of a videotelephone terminal. In other words, videotelephone terminals must be capable of supporting telephony.

A videotelephony service may also be used in applications such as communication of speech – and hearing – impaired persons using sign language and remote surveillance where the speech communication facility is of minor importance.

In case the service is provided in a network and terminal environment which offers a number of different quality levels depending, among others, on the transmission medium used and respective charging, it must be possible for the user to select the level/mode of operation and/or type of videotelephony service he/she wishes and also change it during the call if provided by the network or supported by the terminals. The latter option may be provided as a supplementary service.

Two different types of call shall be possible:

– point-to-point calls;

– multipoint calls (see Note).

Note – For multipoint calls a unit for mixing speech signals and/or combining video signals is required. This will be defined in another context later.

3.2 *Description of various videotelephony services*

Two primary videotelephony service categories have been identified, for narrow-band networks and for broadband networks. The principle features of either type of service are described below.

3.2.1 *Videotelephony service for narrow-band networks*

The videotelephony service for narrow-band networks provides end-to-end communication of moving colour pictures with spatial resolution, temporal resolution and quality equivalent to that obtainable by coding the video signal according to Recommendation H.261 (QCIF and CIF format).

The videotelephone service may be optionally enhanced by facilities such as the transfer of still pictures, graphics, text and end-to-end control messages.

A basic videotelephone teleservice for the narrow-band ISDN has been fully standardized according to Recommendations I.210 and I.240. The stage 1 description for the videotelephony teleservice for ISDN is contained in Recommendation F.721.

In the future, basic videotelephony services for other narrow-band networks (e.g. radio mobile networks, private networks) could be envisaged.

3.2.2 *Videotelephony service for broadband networks*

The videotelephony service for broadband networks provides end-to-end communication of moving colour pictures with high spatial and temporal resolution and video quality equivalent to conventional TV standards (PAL, SECAM, NTSC) or better and enhanced voice/sound quality, possibly stereo transmission and optionally facilities for the transfer of still pictures, graphics, text and end-to-end control messages.

3.3 *Applications related to videotelephony*

The videotelephony service can be utilized in a broad range of applications depending on the Quality of Service for audio and/or video that can be achieved in different types of services.

A videotelephony service employing the bearer capabilities of broadband networks is expected to meet the needs of the subsequently listed applications. Because of the high video quality, this service provides, besides the means for face-to-face dialogue, the possibility to transfer any kind of moving scenes. Also pictures of three-dimensional objects, graphic material, e.g., sketches, drawings, photographs and documents containing text and graphics can be transferred without any restrictions. Commercial and domestic scenes, instruction procedures and films can be transferred to the communication partner.

The constraints imposed by limited transfer capability of narrow-band networks on spatial and temporal image resolutions make certain types of communication less applicable to the videotelephony service for narrow-band networks.

Taking into account the aspects mentioned above, the following principle applications of videotelephony are possible among others:

a) face-to-face dialogues involving at least head-and-shoulder images;

b) dialogue including interactive viewing of documents such as sketches, diagrams or charts and objects that can be shown on the screen;

c) access of the user to videoconferences;

d) remote video surveillance;

e) communication between hearing and speech impaired persons using the sign language.

Based on these examples, other enhanced videotelephone applications may also emerge.

The user should be given the possibility to select the essential parameters best suiting his specific application. For instance, in applications b) high spatial resolution is required and on the other hand in e), good motion tolerance is important. Moreover, the transfer rate used for audio should be selectable, in particular when it has charging or video quality implications.

3.4 *Supplementary services and enhancements*

The same spectrum of supplementary services supporting telephony is in principle applicable for videotelephony.

Other supplementary services or enhancements, dedicated to videotelephony, e.g. videotelephony conference services, are for further study. Relevant enhancements are those supporting the transfer of high resolution still pictures and graphics information in a variety of formats like digitized video or other standard document formats. A paper/film scanner or video frame capture may be used as an image input source. Besides this, the possibility to access electronic mail or videotex services with a videotelephone terminal may be supported.

3.5 *Specific terminology*

Fall back: Procedures performed either by the network or by the calling terminal that allows the calling user to be connected in any case with the called user at any terminal where the call is offered (3.1 kHz telephone terminal or videotelephone terminal).

4 Procedures

4.1 *General*

The call control procedures should be from the user's point of view as simple as for ordinary telephony in order to achieve good acceptance. The audible signalling tones must have the same meaning as for telephony. Visual guidance with the aid of the videotelephone terminal display may play an important role in the invocation and operation of the service.

4.2 *Provision/withdrawal*

Provision of the service will be by arrangement with the relevant Administration.

4.3 *Normal procedures*

4.3.1 *Activation/deactivation/registration*

Not applicable.

4.3.2 *Invocation and operation*

4.3.2.1 *Call request*

The call set-up must be available for the user as a single operation, preferably not different from that for telephony.

As a user option, the terminal can instead be set such that video communication is established only when requested by the users. If a call attempt involves more than one transmission channel, and not all transmission channels are available for the call (for whatever reasons), the call shall still proceed with the best level of video quality available. It must be possible for the user to select the transmission rate or other relevant parameters affecting on the service quality and respective service and tariff class.

Call set-up from the user's point of view can be optionally executed by initiating first the voice communication and adding the videocommunication after the connection has been established.

4.3.2.2 *Call release*

In general, the procedure for disconnecting a videotelephone call shall be the same as for ordinary telephony. Speech and image shall be disconnected simultaneously.

4.3.2.3 *Change of service*

During a single call the change of service can be executed unrestricted as desired by the users with the aid of in-call modification procedures if provided by the network. A change of selected audiovisual capabilities is provided by in-band signalling and protocols.

4.3.2.4 *Videotelephony conference call*

Conference facilities supporting the videotelephony service are necessary either in the network and/or at the user premises.

The procedures and functions are for further study.

4.3.2.5 *Controls and indications*

4.3.3 *User guidance*

User guidance can take place in the form of dialogue between the system and the user: information concerning the status of the call can be displayed on the screen or on another possible display of a videotelephone terminal (both the calling and called party can apply). Guidance may be based on the display of alphanumeric characters in a selectable language, or by other visual means accompanied by appropriate audible announcements taking into account the needs of hearing and speech impaired users.

The audible call progress signals used in any videotelephony service shall comply with those of ordinary telephony. Visual counterparts of the audible call progress signals should be defined and standardized.

It must be possible for both the calling and called party to switch on and off the outgoing picture without disconnecting the connection allocated for video transmission. In case the outgoing picture is suppressed, a predetermined substitutional pictogram should be displayed on the screen of the remote terminal.

Using a specific control, a user should be able to display the outgoing picture on the screen of the videotelephone terminal, either prior to call set-up or during the call (self view).

4.3.4 *Auxiliary functionalities*

It should be possible to display the picture of the communicating parties on the screen of either terminal, although not necessarily simultaneously.

Hands-free and loudspeaking modes are desirable and may be provided in videotelephone terminals.

Besides the suppression of the outgoing video information, it should be possible to mute the audio channel as desired by the user. The other party may receive an indication on the activated muting.

4.4 *Exceptional procedures*

In case of decreasing of service quality (e.g. due to high error rate or other network reasons) appropriate indication should be given for both parties, even if the problems concern only one direction.

5 Network aspects

For further study.

6 Terminal aspect

6.1 *General systems requirements*

In order to perform the basic functions necessary for the videotelephony service the terminal equipment must include devices capable of:

- capturing participant's picture(s);
- displaying remote user's picture(s);
- capturing audio;
- reproducing audio;
- audio coding;
- video coding;
- management of network interfaces.

The terminal equipment also includes devices capable of performing the following functions:

- user control;
- user indication;
- self view;
- testing.

Terminals intended to be used in multipoint connections may need additional basic functions related to multipoint operation. These functions are for further study.

6.2 *Videotelephone terminal equipment*

The basic videotelephone terminal equipment may include only the basic elements listed in 6.1.

Possible enhancements to the equipment are:

- orientable camera and zoom;
- still picture camera;
- interfaces for an additional camera, an additional screen or a video recorder;
- remote control of a distant camera for some specific applications;
- keyboard for the videotex service;
- telewriting.

This list is not exhaustive and is only given as a set of examples. As a general rule, the number of controls that a user has to operate should be kept to a minimum. Training should not be necessary for using the terminal. Clear and concise instructions should be given, for instance on the screen, especially for the supplementary services with which the user may not be very familiar.

7 Quality of Service

7.1 *Picture quality*

Picture quality is a measure of the ability of a video transmission system to accurately reproduce moving scenes. Video quality objectives are generally expressed in terms of spatial and temporal resolution. Optimization and more accurate definition of the picture quality requires further study.

The recovery time for pictures built-up when the video source is changed should be low enough not to impair the service quality. Further studies are required.

7.1.1 *Videotelephony service for narrow-band networks*

Optimization and more accurate definition of the picture quality including motion tolerance require further study (see Note).

Note – The urgent need to accomplish both subjective and objective methods to evaluate the quality of a heavily compressed motion picture is widely identified.

7.1.2 *Videotelephony service for broadband networks*

Picture quality must be at least as that of high quality domestic TV-receivers (see among others, CCIR Recommendation R.601).

7.2 *Audio quality*

The minimum speech quality must be as good as that of ordinary PCM telephony based on either A-law or μ-law encoding (at least no significant impairment is allowed with regard to Recommendation G.711).

Efficient echo control must be provided in the local facilities as echoes may seriously impair the audio quality.

7.3 *Synchronization of speech and lip movement (lip synchronization)*

Lip synchronizm must be ensured. There should be no subjectively discernible difference of the speech signal with regard to the video.

7.4 *Overall delay*

The overall delay is defined to consist of the one-way delay of the transmission path and the characteristic delay of a videotelephone terminal. Characteristic delay of a videotelephone terminal is the delay introduced by the terminal when only lips and eyes of the talking user are moving.

The overall effect on quality by the delays introduced by videocodecs and transmission facilities needs to be taken into account in the service because increased delays may impair the user acceptability.

Maximum allowable delay including the maximum number of satellite hops are left for further study.

For videotelephony services using separated digital channels it is possible that one or more channels are routed via terrestrial paths while the other(s) is (are) routed via satellite. In these cases the resynchronization is performed by the terminal. The Quality of Service is the same as if all channels were routed via satellite.

7.5 *Sensitivity to transmission errors*

The maximum allowable degradation of service due to transmission errors needs to be defined. Further study required.

8 Interworking and intercommunication requirements

The following interworking/intercommunication situations have been identified:

- intercommunication with 3.1 kHz and 7 kHz telephony services;
- intercommunication between videotelephony services on same and different networks;
- intercommunication with other audio and visual services.

8.1 *Intercommunication/interworking with telephony services*

8.1.1 *General principles*

Considering:

- the fact that at the beginning of the introduction of the videotelephony service the number of videotelephone subscribers is negligible compared with the number of telephone subscribers;
- that a user may have only one type of audiovisual terminal such as videotelephone, 7 kHz telephone or 3.1 kHz telephone,

as a conclusion, a fundamental requirement must be met in order to avoid the situation where videotelephone subscribers can only communicate in a kind of closed user group. Therefore, it is essential, as a default procedure, that every videotelephone subscriber be able to reach from his videotelephone terminal every telephone subscriber.

This condition must be met regardless of the technology applied in the local exchange to which the telephone subscriber is connected. This can lead to interworking or intercommunication situations.

From the user's point of view, a very important attribute of the intercommunication/interworking solutions is a short call set-up delay. Therefore, when a solution is being developed, the set-up delay should be considered as a high priority performance characteristic.

If in case of intercommunication, a videotelephone communication cannot be provided, a telephone call should be initiated. If then no call can be established, an appropriate cause indication shall be given to the calling user.

Every telephone terminal must be able to reach every videotelephone terminal and vice versa. This requirement implies that a videotelephone terminal will be a multiservice terminal supporting also telephone calls as well as videotelephone calls.

8.1.2 *Description*

Terminals for all videotelephony service classes and cases shall, in any case, support voice encoding in accordance with Recommendation G.711 (A-law and μ-law). A videotelephony service may include additional speech encoding as a basic or optional feature depending on the precise service and mode.

Videotelephony service shall intercommunicate with 3.1 kHz, 7 kHz or possibly 15 kHz telephony. The following cases are considered essential:

1) Under the user's control, videotelephony requesting outgoing calls shall be able to initiate:
   - videotelephone calls;
   - ordinary 3.1 kHz telephone calls;
   - telephone calls with extended bandwidth of 7 kHz or possibly 15 kHz, if supported by the terminal of the calling party.
2) For incoming calls, a videotelephone terminal shall be able to respond on a default basis to:
   - videotelephone calls;
   - ordinary 3.1 kHz telephone calls;
   - telephone calls with extended bandwidth of 7 kHz or possibly 15 kHz, if supported by the terminal of the called party.

8.2 *Intercommunication between videotelephony services on different networks*

Intercommunication between videotelephony services on the existing and future networks should also be provided. Further studies are required.

8.3 *Intercommunication with other audiovisual services*

G.711 telephony is the minimum requirement of intercommunication between all types of audiovisual services. Intercommunication or interworking with various types of videoconferencing should be provided. The audiovisual quality is in this case the best common mode. Further studies are required.