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SERIES F: NON-TELEPHONE TELECOMMUNICATION
SERVICES

Audiovisual services

**Framework Recommendation for multimedia
services**

ITU-T Recommendation F.700

(Formerly CCITT Recommendation)

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ITU-T RECOMMENDATION F.700

FRAMEWORK RECOMMENDATION FOR MULTIMEDIA SERVICES

Summary

This Recommendation provides a methodology for constructing multimedia services which is timely and responsive to the needs of both the End-User and Service Provider. This methodology is based on a modular approach using a set of network independent building blocks or other communications capabilities being developed within ITU-T.

The methodology is intended for use in developing a series of General Service Recommendations which combine the required modular elements in order to build generic services.

Source

ITU-T Recommendation F.700 was revised by ITU-T Study Group 16 (2001-2004) and was approved under the WTSC Resolution No. 1 procedure on 17 November 2000.

FOREWORD

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The World Telecommunication Standardization Conference (WTSC), which meets every four years, establishes the topics for study by the ITU-T Study Groups which, in their turn, produce Recommendations on these topics.

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Recommendation F.700

FRAMEWORK RECOMMENDATION FOR MULTIMEDIA SERVICES

(revised in 2000)

1 Introduction

1.1 Scope

This Recommendation provides a methodology for constructing multimedia services which is timely and responsive to the needs of both the End-User and Service Provider. This methodology is based on a modular approach using a set of network independent building blocks or other communications capabilities being developed within ITU-T.

The methodology described in this Recommendation is intended for use in developing a series of General Service Recommendations which combine the required modular elements in order to build generic services (e.g. for Multimedia Conferencing Service, Multimedia Distribution Service, etc.). These Recommendations provide functional descriptions of services that are independent from the networks that support them. Because different networks may have different performance and bring different constraints, a related series of network specific Recommendations describe the way the services are adapted on each particular network.

The service descriptions are not intended to impose a particular and detailed way of offering the services, but to provide the minimum set of functions and performance parameters necessary for achieving a sufficient quality of service and for insuring communication between users served by different service providers. Manufacturers and service providers are free to offer additional functions and enhanced quality of service.

1.2 Definitions

Information in curly brackets indicates source of definitions when other than F.700. Additional information is contained in Annex D.

1.2.1 application: An application is a set of activities performed to respond to the needs of the users in a given situation for purposes such as business, education, personal communication or entertainment. It implies software and hardware utilization could be performed in a fully or partially automatic way and could be accessed locally or remotely. In the last case, it requests use of telecommunication services.

1.2.2 communication task: A communication task is a functional entity of a multimedia service that performs communication features. It handles a set of media components in a synchronized way in order to convey and control complex information types.

1.2.3 media component: Media components are those parts of a communication service which provide the communication capabilities related to a single information type. They provide the necessary functions for user information handling, such as information capture, presentation, storage, transfer and post-processing. As the information types differ considerably in their basic elements, the specific functions also differ from information type to information type.

1.2.4 medium (Plural Media) {MHEG}: A means by which information is perceived, expressed, stored or transmitted. The term is to be avoided in its stand-alone form. To be unambiguous it should only be used in expressions such as perception medium, representation medium, presentation medium, storage medium, transmission medium, etc.

1.2.5 multimedia {MHEG}: The term multimedia is an adjective and must be attached to a noun which provides the context. For example, multimedia service or application, multimedia terminal, multimedia network and multimedia presentation.

1.2.6 multimedia application: A multimedia application is an application that requests the handling of two or more representation media (information types) simultaneously which constitute a common information space. Examples are cooperative document editing, long distance meetings, remote surveillance, medical document remote analysis and teletraining.

1.2.7 multimedia representation {MHEG}: The property of handling several types of representation media.

1.2.8 multimedia service: Multimedia services are telecommunication services that handle two or more types of media in a synchronized way from the user's point of view. A multimedia service may involve multiple parties, multiple connections, and the addition or deletion of resources and users within a single communication session.

1.2.9 presentation {MHEG}: A state which is ready for human perception.

1.2.10 presentation medium: The means for presenting information to the user, commonly known as an output device, such as a screen, printer or loudspeaker.

NOTE – Presentation is not to be confused with the OSI Presentation Layer.

1.2.11 representation: The process of reproducing information for human perception.

1.2.12 representation medium: The type of the information in its coded form, ready for transmission. Examples of representation media are:

<i>Representation media</i>	<i>Possible coded forms</i>
characters or text	ASCII, EBCDIC
graphics	CEPT, NAPLPS or CAPTAIN videotex, CGM
audio	TSS, G.711, MIDI, future MPEG/Audio standard
still picture	Fax Group 3, Group 4, JPEG standard
moving picture (video)	ITU-T Recommendation H.261, H.262, H.263 or Sequence ITU-R Recommendation BT.601

NOTE – The representation medium is defined independently of the direction of transmission (i.e. to or from the user or between equipment). Each representation medium may be used both for input or output. For example, character representation may be used both for text display and for text input from a keyboard; graphics may be used both for graphic display and graphic input; audio or pictures may be used both for reproduction and for capture.

1.2.13 telecommunication service: A telecommunication service is a set of telecommunication capabilities that works in a complementary and cooperative way in order to let users perform applications.

1.3 Multimedia service development methodology

Multimedia services may be seen from different points of view.

From the end user's point of view, a multimedia telecommunication service is the combination of telecommunication capabilities required to support a particular multimedia application. Such a service is usually considered to be independent of the network(s) providing these capabilities.

From the Network Provider's point of view, a multimedia telecommunication service is a combination or set of combinations of two or more media components (e.g. audio, video, graphics, etc.) within a particular network environment in such a way as to produce a new telecommunication

service. This telecommunication service is considered to be fully dependent on the specific capabilities of the networks utilized.

Additionally, the user wishes to have the same type of presentation and mode of operation for all services needed to support similar applications; and the Service or Network provider desires to have common protocols and interfaces to accommodate interoperability for a variety of technical implementations.

1.3.1 Communication capabilities

Communication capabilities are the fundamental sets of communication tasks, media components and integration mechanisms required to develop the complex spectrum of multimedia services. Control and processing functions are also needed for assembling these capabilities into a service and adapting the signals.

1.3.2 Multimedia service recommendations

The description of a multimedia service can be accomplished from the basic communication capabilities by utilizing the procedures specified in clause 2. The methodology for describing these generic service architectures in a series of general ITU-T service Recommendations is described in clause 3. This process can best be summarized by a modular reference model organized in four levels as discussed in 1.4. Appropriate modular elements from the communication plane and the control plane, as shown in 1.5, are tied together to build various services.

1.4 Multimedia services reference model

Following a modular approach the reference model is organized in four levels. Figure 1 shows the application level on top of the three service platform levels.

- 1) *Application level*
The level at which the essential functional characteristics of an end-user application are described from the end user's point of view irrespective of the underlying technical aspects of the services or particular network solution.
- 2) *Service level*
The level at which the basic set of communication services or support tools required to satisfy the functional requirements of the application layer are identified. The overall service principles (for performance, quality of service, security, charging, intercommunication) are defined and described.
A service is built up by combining communication tasks and organizing their interaction. The service level may contain a description of how to find where end-users and terminals are located.
- 3) *Communication task level*
The level at which the specific communication tasks required to build the services are defined and described. A communication task is a functional entity of a multimedia service which performs its communication features. It handles a set of media components in a synchronized way, in order to convey and control complex information types.
- 4) *Media component level*
The level at which the multimedia aspects of the services are made apparent through the identification and description of the individual (monomedia) components related to a single information type, such as audio, video, etc.

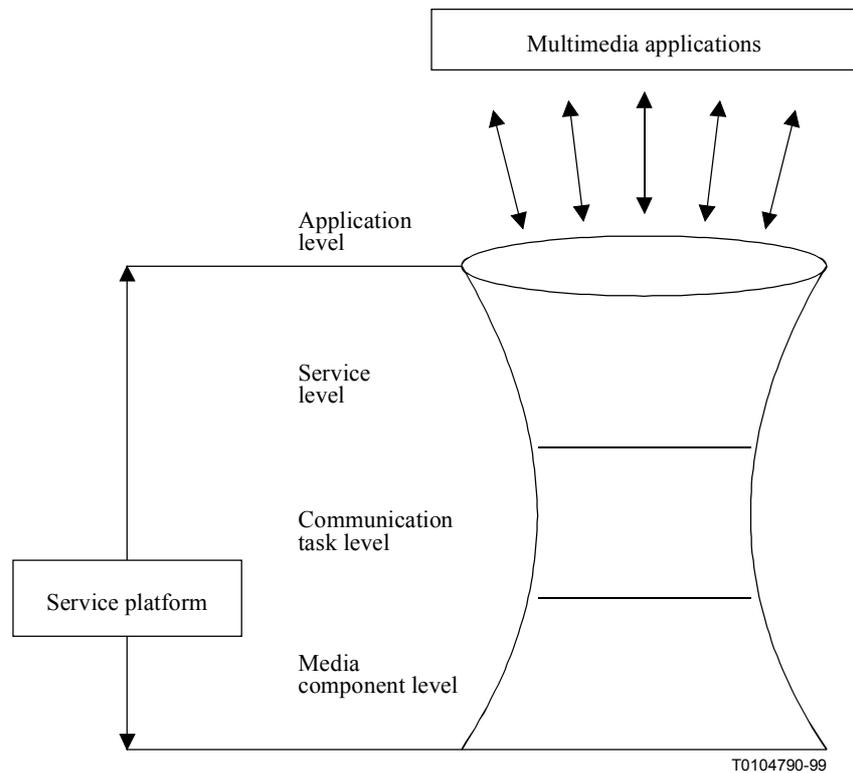


Figure 1/F.700 – Multimedia services reference model

1.5 Functional model of the service platform

In addition to the modular elements in these levels, control and processing functions are required for operating the service. These functions may be considered as lying in a different plane that interacts with all three levels of the communication plane (service level, communication task level, media component level). They are also organized in modular entities, the Middleware Service Elements (MSEs). See Figure 2.

Service platform	
Communication plane	Control and processing plane
services	Middleware service elements
communication tasks	
media components	

Figure 2/F.700 – Functional model of the service platform

1.6 Application of the reference and functional models to the service description

Services call upon tasks for acting on the various media components, in order to handle them and combine them in specific ways appropriate for the application. The functions required by a service are distributed between the 3 levels according to the following principles. The relationship between the services, the communication tasks and the media components is illustrated in Figure 3 of clause 2:

- at the service level, the general functions related to the call and to the type of service;
- at the communication task level, the functions related to the configuration, the time aspects, the linking of media components, e.g. transfer, storage, multipoint aspects, switching or multiplexing signals;

- at the media component level, the functions related to each independent medium, such as capture, coding, presentation, quality aspects.

The service platform also uses Middleware service elements that control the various levels in the communication plane or perform appropriate processing of the transmitted information. These MSEs may thus interact with a specific level (e.g. with the service level for call establishment, charging, security; with the communication task level for procedures, control of data switching or data combining processes, chair control, facility control; with media component level for transcoding, filtering), or they may interact with two levels or even possibly with all levels (e.g. for intercommunication).

2 Communication Capabilities

The multimedia services reference model (Figure 1) shows the applications on top of the service platform. It further indicates that the service platform can be decomposed into three levels: the service level describing the overall aspects, the communication task level describing the communication related aspects, and the media component level dealing with the user information handling (multimedia) aspects. Each of these levels has different aspects including static, dynamic and control. This Recommendation currently concentrates on the static aspects. The dynamic aspects are for further study, unless explicitly defined in this Recommendation in particular in the MSEs.

From the end-user point of view, the communication tasks and the media components form the basic set of communication capabilities from which all multimedia telecommunication services can be constructed.

Figure 3 shows the hierarchy of the service platform as well as the relations among the communication tasks and the media components.

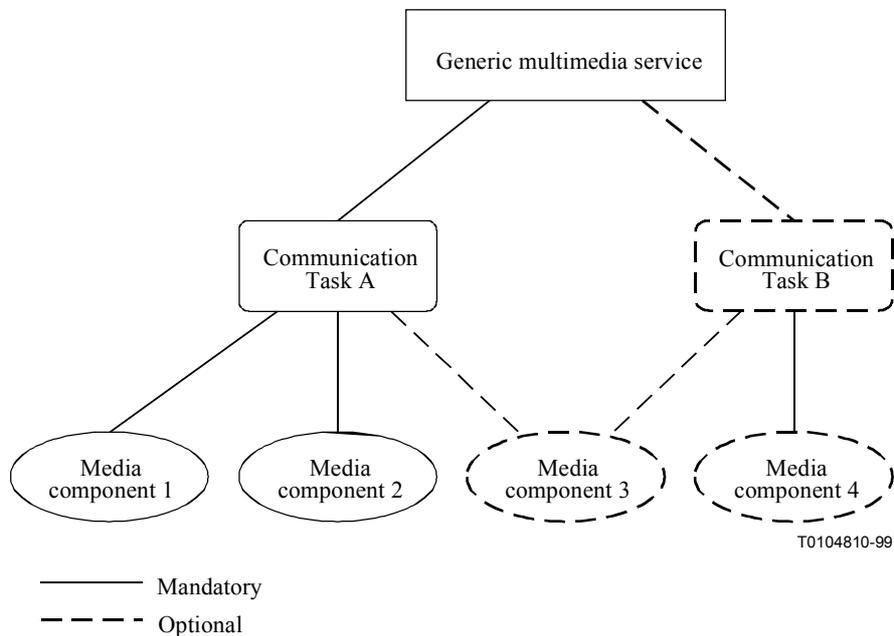


Figure 3/F.700 – Application of the reference model to the description of a generic multimedia service

2.1 Communication tasks

Starting from the users' requirements in a top-down approach, a multimedia service can first be decomposed into a set of communication tasks, each of them being, separately or not, manipulated by the user and/or the service provider. Conversely, in a bottom-up approach starting from the media components, a communication task can be viewed as a means of bringing together the media components that are related to each other for the purpose of the service.

2.1.1 Method of describing communication tasks

The static properties of a communication task are described using attributes and values. The following attributes and possible values have been identified (other attributes are for further study). See Table 1.

Table 1/F.700 – Communication task attributes

Attributes	Possible values
Communication configuration	Point-point/point-multipoint/ multipoint-point/multipoint-multipoint
Symmetry of information flow	Unidirectional/bidirectional-symmetric/bidirectional- asymmetric
Transmission control entity	Source/sink/source and sink/third party
Communication delay	Real-time Near-real-time Non-real-time Specified time
Mandatory media components	Audio/video/text/still picture/graphics/data
Optional media components	Audio/video/text/still picture/graphics/data/ none
Media component interrelations	1) Synchronization between: <ul style="list-style-type: none"> a) audio and video (lip synchronism, location related synchronism); b) audio and text (voice synthesis); c) text and video/still picture/graphics (subtitles synchronized with images); d) graphics and audio. 2) Symmetry between media components of the same type to allow for bidirectionality. 3) Conversion between information types (or media components).
Time continuity	Isochronous/non-isochronous

2.1.2 Attribute considerations

Some attributes are described hereafter.

2.1.2.1 Time aspects

The time aspects are described by two attributes: communication delay and time continuity. See Table 2.

The communication delay may have four possible values:

- real-time, i.e. a fraction of a second; this applies for instance to a conversation, or to some video games where user actions have to show immediately on the screen;
- near-real-time, i.e. a few seconds; this applies for instance to retrieval services where the user is waiting for an answer from the system; the acceptable delay depends upon the complexity of the request and the length of the answer;
- non-real-time; this would apply to the storage of information, for instance to archiving or to the storage of a message, where the action can be done within any reasonable but non-critical delay;
- specified time, i.e. at a future exactly defined time or during a future period of time; this could apply for instance to some types of near video on demand, where the user could ask in advance for a film to be sent to him at some future given time, or to a retrieval service where, for a complex request that would take some time for the research or the handling of data, the system would call back later at a given time; it could also apply to messages sent during the night period when the tariff would be lower; similarly, a non-urgent message requiring some human intervention at the receiving end could be sent at any time during office hours.

The time continuity has the attribute values "isochronous" or "non-isochronous." Isochronous transmission is necessary if the user terminal equipment has no buffering capabilities, or if the capturing device does not tolerate interruptions or variations in transmission speed or does not have a large enough storage capacity.

Table 2/F.700 – Table characterizing the relationship between communication delay and time continuity

Communication delay	Service examples	
	Isochronous	Non-isochronous
Real-time	Conversation	N/A
Near-real-time	On-line audiovisual retrieval (Note)	On-line data retrieval (Note)
Non-real-time	Near video on demand	Data messaging
Specified time	Audiovisual messaging (Note)	Audiovisual messaging (Note)
NOTE – Isochronicity depends on the terminal device storage and capture capacities.		

2.1.2.2 Transmission control entity

User information is always transmitted from the source(s) to the sink(s). Usually, one of the users acting as source or sink will control the information transfer, i.e. start and stop it. However, some applications may require a third party to initiate the information transmission.

2.1.3 Provisional list of communication tasks

Communication tasks may be derived by combining the attributes "communication configuration", "symmetry of information flow", and "transmission control entity". Six combinations are identified in Table 3 as meaningful. Communication tasks may be further distinguished by other attributes such as time aspects. Others may also be meaningful (e.g. tasks using third party control).

Table 3/F.700 – Provisional list of communication tasks

Communication configuration	Communication tasks for three types of information flow		
	Bidirectional	Unidirectional source controlled	Unidirectional sink controlled
Point-to-point	Conversing	Sending	Receiving
Point-to-multipoint		Distributing	
Multipoint-to-point			Collecting
Multipoint-to-multipoint	Conferencing		

2.1.4 Description of generic communication tasks

Brief prose descriptions and the descriptions of the static aspects of the six generic communication tasks are presented here for illustration of the concept. These generic communication tasks include the complete set of functionalities (superset), without any of the restrictions that may occur when the service is offered to customers on a specific network.

Detailed descriptions are presented in Annex B.

Figure 4 is the key to the symbols in the figures in this subclause:

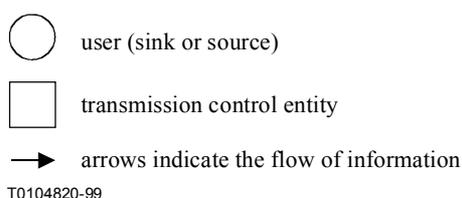


Figure 4/F.700 – Key to following figures

2.1.4.1 Generic communication task conversing

Prose description

The generic communication task conversing provides for point-to-point real-time (isochronous) exchange of information between two users. The users may be humans or machines. The information may be monomedium as well as multimedia. See Figure 5.

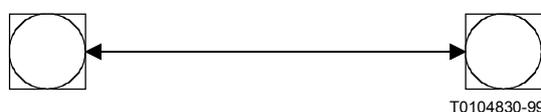


Figure 5/F.700 – Generic task conversing

Attributes

Values

- Communication configuration: point-to-point
- Symmetry of information flow: bidirectional
- Transmission control entity: source and sink
- Mandatory media components: all are possible, and an option is none

Optional media components: all are possible, and an option is none

Communication delay: real-time

Time continuity: isochronous

Media component interrelations:

- symmetry between media components of the same type to allow for bidirectionality;
- synchronization between:
 - audio and video (lip synchronism, location related synchronism);
 - audio and text (voice synthesis);
 - text and video/picture/graphics (subtitles synchronized with images).

2.1.4.2 Generic communication task conferencing

Prose description

The generic communication task conferencing provides for multipoint real-time exchange of information among multiple users. The users may be humans or machines. The information may be monomedium as well as multimedia. See Figure 6.

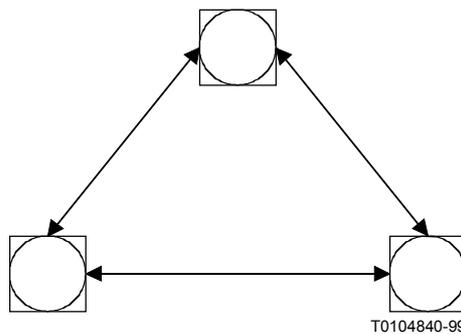


Figure 6/F.700 – Generic task conferencing

Attributes

Values

Communication configuration:

multipoint-to-multipoint

Symmetry of information flow:

bidirectional

Transmission control entity:

source and sink

Mandatory media components:

all are possible, and an option is none

Optional media components:

all are possible, and an option is none

Communication delay:

real-time

Time continuity:

isochronous

Media component interrelations:

- symmetry between media components of the same type to allow for bidirectionality;
- synchronization between:
 - audio and video (lip synchronism, location related synchronism);
 - audio and text (voice synthesis);
 - text and video/picture/graphics (subtitles synchronized with images);
 - synchronization between audio and graphics.

2.1.4.3 Generic communication task sending

Prose description

The generic communication task sending provides for point-to-point real-time and non-real-time transfer of information from one user to another with the information source being the controlling entity. The users may be humans or machines. The information may be monomedium as well as multimedia. See Figure 7.



Figure 7/F.700 – Generic task sending

Attributes	Values
Communication configuration:	point-to-point
Symmetry of information flow:	unidirectional
Transmission control entity:	source
Mandatory media components:	all are possible, and an option is none
Optional media components:	all are possible, and an option is none
Media component interrelations:	synchronization is possible
Communication delay:	all are possible
Time continuity:	all are possible

2.1.4.4 Generic communication task distributing

Prose description

The generic communication task distributing provides for the transfer of information from one user to (more than one) other users with the information source being the controlling entity. The users may be humans or machines. The information may be monomedium as well as multimedia. See Figure 8.

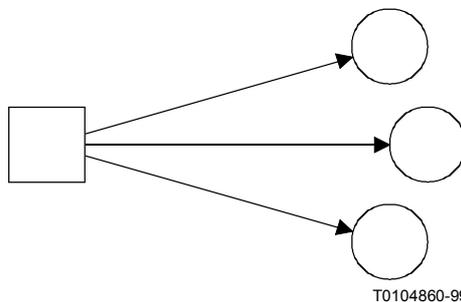


Figure 8/F.700 – Generic task distributing

Attributes	Values
Communication configuration:	point-to-multipoint
Symmetry of information flow:	unidirectional
Transmission control entity:	source
Mandatory media components:	all are possible, and an option is none
Optional media components:	all are possible, and an option is none
Media component interrelations:	synchronization is possible
Communication delay:	all are possible
Time continuity:	all are possible

2.1.4.5 Generic communication task receiving

Prose description

The generic communication task receiving provides for point-to-point transfer of information from one user to another user with the information sink being the controlling entity. The users may be humans or machines. The information may be monomedium as well as multimedia. See Figure 9.



Figure 9/F.700 – Generic task receiving

Attributes	Values
Communication configuration:	point-to-point
Symmetry of information flow:	unidirectional
Transmission control entity:	sink
Mandatory media components:	all are possible, and an option is none
Optional media components:	all are possible, and an option is none
Media component interrelations:	synchronization is possible
Communication delay:	all are possible
Time continuity:	all are possible

2.1.4.6 Generic communication task collecting

Prose description

The generic communication task collecting provides for the transfer of information from (more than one) user to another with the information sink being the controlling entity. The users may be humans or machines. The information may be monomedium as well as multimedia. See Figure 10.

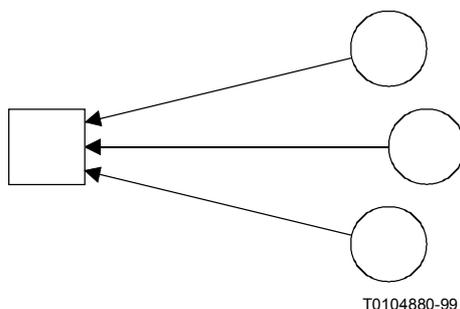


Figure 10/F.700 – Generic communication task collecting

Attributes	Values
Communication configuration:	multipoint-to-point
Symmetry of information flow:	unidirectional
Transmission control entity:	sink
Mandatory media components:	all are possible, and an option is none
Optional media components:	all are possible, and an option is none
Media component interrelations:	synchronization is possible
Communication delay:	all are possible
Time continuity:	all are possible

Additional *generic* communication tasks are for further study.

Dynamic aspects of communication tasks are for further study.

2.2 Media components

A media component provides the specific information handling functions related to a single information type. The following are examples of information types suited for information presentation to human users: text, audio, graphics, still images and video. This list is non-exhaustive.

NOTE – There may be some telecommunication services supporting multimedia applications, the description of which may not use media components.

Generic media components are not restricted to a particular implementation but include all possible quality levels and options. They are used in the description of generic services that are not offered as such to customers: the specific services offered to customers are implemented on a given network with some limitations that narrow the range of choices.

The following generic media components support the information types listed above: text, audio, graphics, still picture and video. Generic media components to support other information types are for further study.

Quality aspects are, from the user's viewpoint, strongly related to the options among which the user may choose when specifying the appropriate specific media component. Therefore the description of the generic media components includes all functionalities and standards related to the information type. When a specific service is offered to a customer, the available media components usually contain only a subset of these functionalities.

Each media component provides the communication capabilities related to its single information type. It allows for the capture and representation of information, its transfer from originating user(s) to destination user(s), its presentation to human users, processing, filing and retrieval. Detailed descriptions of each media component are in Annex A:

- Generic media component text.
- Generic media component audio.
- Generic media component graphics.
- Generic media component still image.
- Generic media component motion video.
- Generic media component data.

2.3 Middleware service elements

The MSEs contain all the control features and the processing functions associated with the service and communication task levels, possibly but not necessarily with the media component level (for instance the coding and decoding process belongs to the media component). Each service uses several MSEs, and a given MSE may be used by different services.

An MSE is a completely independent modular entity. However an MSE may call upon another MSE when particular functions are required. For instance security functions provided by an MSE may be used by other MSEs, e.g. for authentication before accessing a document or performing a task or for encryption of a confidential document. MSEs may also exchange data (e.g. call control may need data from the directory).

The control features are usually embodied in protocols independent from the transmission systems. Their functional descriptions are independent from the basic protocol, but the set of specific commands and messages associated with the protocol has to support the required functions.

Table 4 shows a list of generic and specific functions, and the associated MSEs. This list is not limitative and other MSEs may be added if the need arises. Moreover some of the MSEs may have to be split if some of the functions they include are used independently.

Table 4/F.700 – List of functions and corresponding MSEs

Generic functions	Specific functions	MSEs
security	authentication/non- repudiation	security
	privacy	
	integrity	
directory		directory
reservation		reservation
call control	call set-up	call control
	in-call modification	
	quality negotiation	
charging and billing		charging and billing
media selection		media selection
conference control	conference management	conference control
	multipoint protocol	
searching	browsing, navigation	retrieval control
mailing	sending mail	mail control
	retrieving mail	
polling		poll control
application control	navigation in a document	application control
	device control	
processing	selection	processing
	assembly	
	translation	
	media conversion	
storage		storage
replication		replication
intercommunication		intercommunication

The MSEs may also be paralleled with the concept of middleware developed in the context of the GII (global information infrastructure) which is defined as the set of mediation functions relating applications to the underlying networks. The list of Middleware functions is very close to the list of MSE functions.

2.4 Supplementary services

Supplementary services are offered to users in conjunction with basic telecommunication services, and they provide users with enhanced or optional communication capabilities. The use of supplementary services in relation to multimedia services described in accordance with this Recommendation may be possible.

3 Service description process

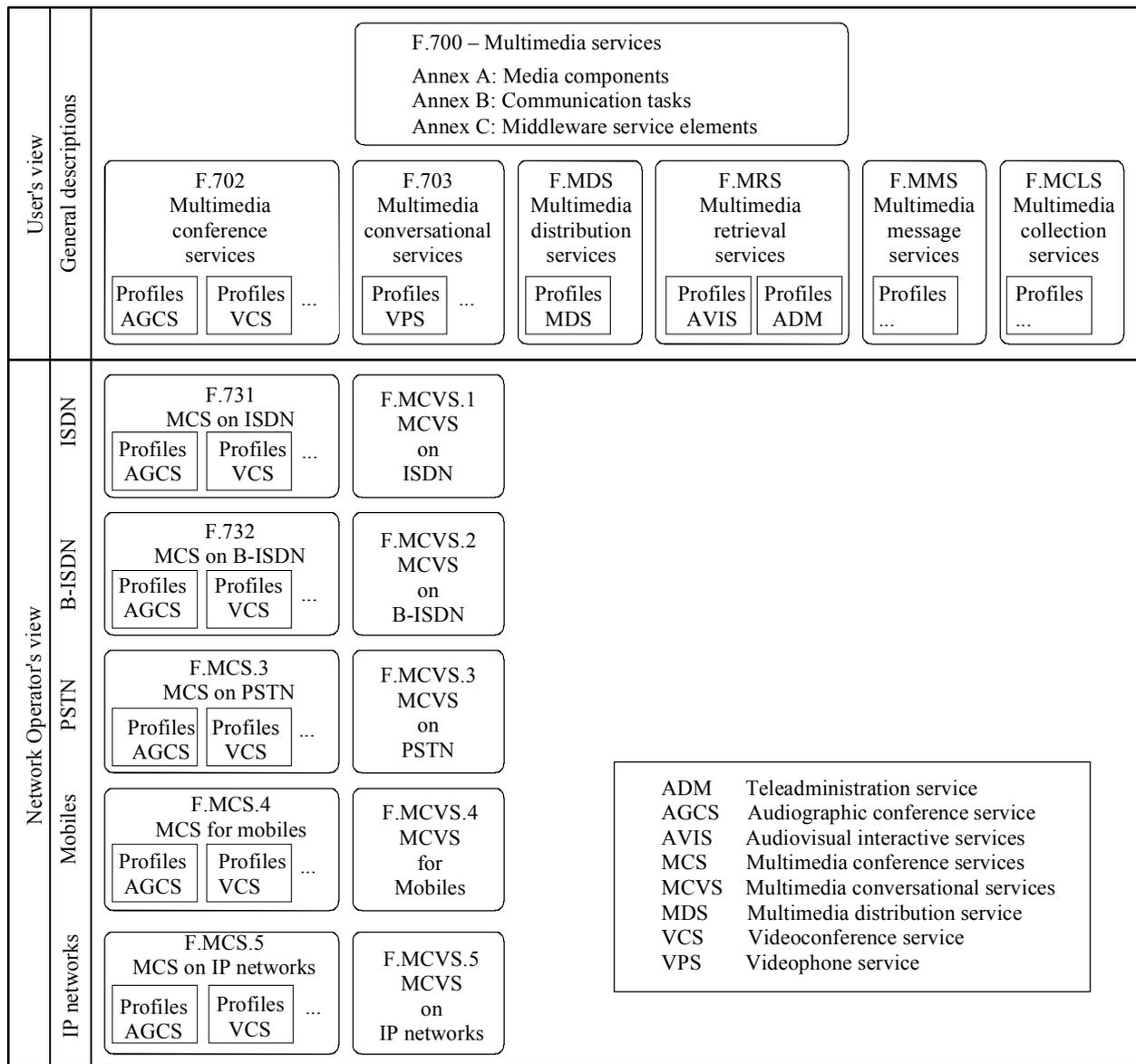
3.1 Framework

Service descriptions have two stages:

- 1) a generic description independent of networks; and
- 2) a generic description for the network on which the service is to be offered.

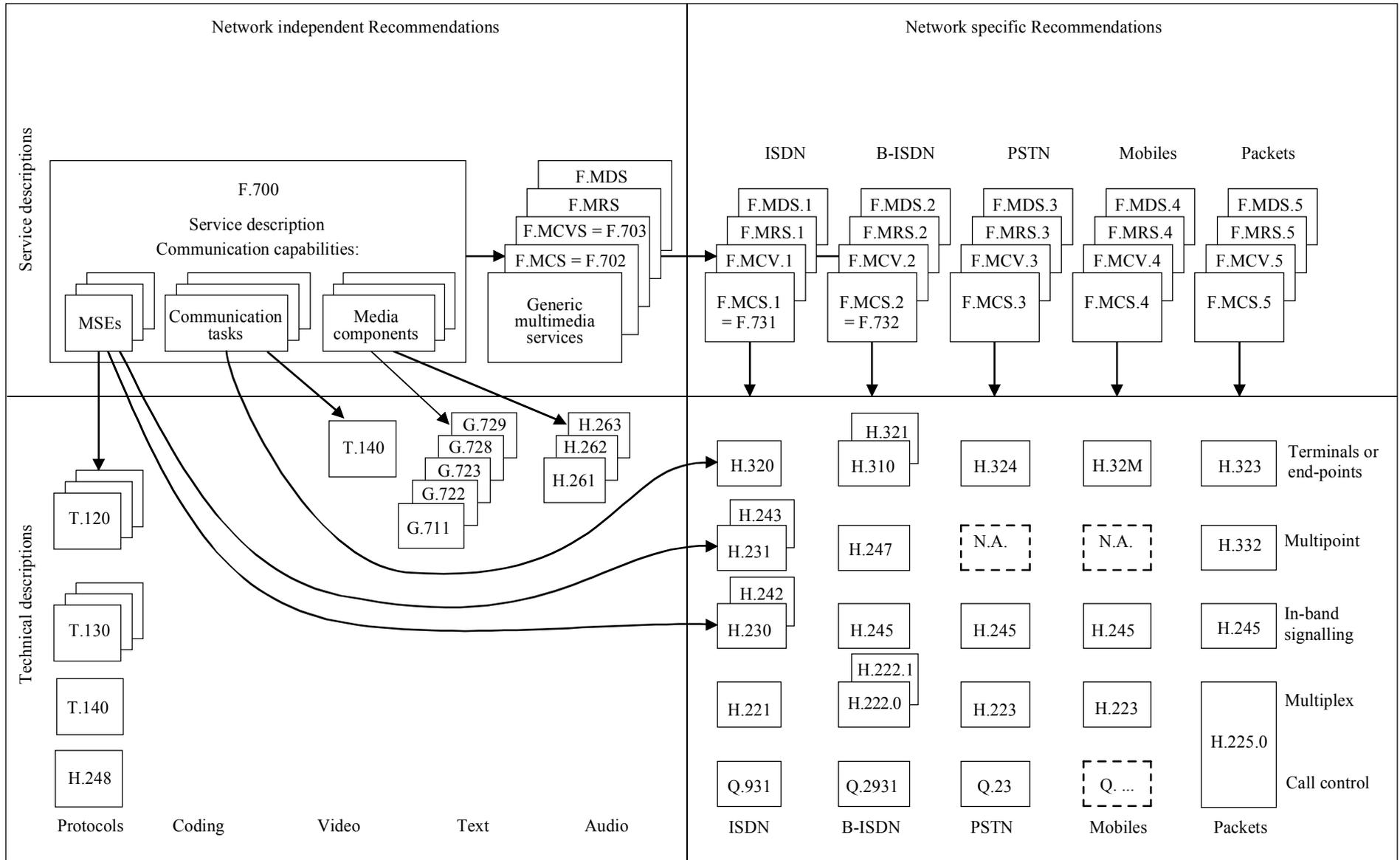
The framework for the Recommendations on multimedia services is illustrated in Figure 11.

The service Recommendations in this framework are related to the technical Recommendations in two ways: the use of the technical building blocks defined in these Recommendations such as protocols and coding algorithms, in order to construct the communication capabilities, i.e. the communication tasks and the media components; conversely, they define the service requirements on the equipment, the attributes, the functions and the performance that the technical Recommendations will then have to reflect. Thus a constant dialogue is necessary between the relevant study groups or Questions, in order to obtain the best compromise between, on the one hand, the functions and quality of service desired by the users, and on the other hand the technical constraints and the cost of the implementation. Figure 12 shows the relationships among the service Recommendations and the technical Recommendations.



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Figure 11/F.700 – Framework for the Recommendations on multimedia services



MSEs Middleware service elements

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Figure 12/F.700 – Illustration of the relationship among service and technical descriptions

3.2 Service profiles

The description of generic services leaves them with a large degree of flexibility so that they may support a wide variety of present and future applications. However, it is necessary to ensure that the user obtains a known and homogeneous set of quality levels and standard options that will meet his expectations and the requirements of his application.

Profiles of generic services identify areas of commonality from a customer viewpoint between terminals and server equipment in order to ensure at least a minimum level of communication. Conformance to a profile ensures intercommunication with other terminals to the same profile. A terminal or a server may conform to one or several profile(s), and may have capabilities beyond those embodied in the profile(s).

A profile is defined by a set of communication tasks and media components, with a specified quality level for each component and possible standard options. Different profiles of a generic service type may define different services of that type or different instances of the same service (e.g. different quality levels).

3.3 Quality of service

Quality of service is very important for the user and can be essential in many applications. The levels of quality for the various media component attribute values are specified in the profile descriptions. Other quality/performance parameters are defined at the communication task level, or at the service level.

The following are examples of quality parameters:

- at the media component level: image resolution;
- at the communication task level: differential delay for synchronization of audio and video;
- at the service level: response time for call establishment.

3.4 Generic service descriptions

A generic service is described using service principles (for example, performance, quality of service, security, charging, intercommunications), communication tasks and media components from Annexes A, B and C. Specific instances of the service may be defined as profiles of the generic service and described in the corresponding subclause. The generic service Recommendations should contain the following parts.

Service description outline

- 1 Introduction
- 2 Definitions
- 3 Terminology
- 4 Description
 - 4.1 General description
 - 4.2 Functional model
 - 4.3 Configuration
 - 4.4 Terminal aspects
 - 4.5 Applications
- 5 Static aspects (see Note)

- 5.1 Service level
- 5.2 Communication task level
- 5.3 Media component level
- 6 Dynamic aspects
 - 6.1 Activation phase
 - 6.2 Communication phase
 - 6.3 Termination phase
- 7 Service profiles
- 8 Interworking and intercommunication

NOTE – Static aspects include considerations of quality of service, security, and charging aspects applicable to each level of the reference model.

3.5 Derivation of specific services

Network specific services are related to a particular network. Recommendations for such services should be very short and contain only those specifications that differ among networks, together with any part not covered in the generic Recommendation. Typically these Recommendations will contain complements to a few sections of the generic Recommendation, such as service profiles, interworking and intercommunication requisites, and a table of attributes for each profile.

NOTE – Network specific Recommendations for ISDN will result in a Stage 1 description. See Recommendation I.130.

3.6 Elaboration of service description

The elaboration of the service Recommendations should proceed from the users' needs, expressed in one or more scripts. From these scripts the user requirements are derived and translated into the various elements on which the description is based: a functional model, general functionalities, lists of communication tasks and media components, quality levels, static and dynamic aspects of the service, and finally service profiles; each script may lead to one or several service profiles adapted to variations in the situations or scenarios it describes, and to various possible compromises between cost and quality of service.

The Recommendations obtained through this process should be network independent. Even if some scripts may lead to requirements which can be satisfied by only one type of network (e.g. mobility), the generic services should cover a wide range of applications, related to different scripts and different sets of requirements. Implementation of the service will of course have to use an existing network, and thus network specific complementary Recommendations will also be necessary, as described in 3.5.

A generic service usually leads to several specific services defined by different profiles. This means that new specific services may be defined by simply adding new profiles, usually derived from a new script. This mechanism will provide an efficient means for describing new services rapidly, without requiring the long drafting process of a new Recommendation.

NOTE – Although scripts are the preferred means for describing the users' needs, difficulties which may arise in deriving them or in submitting them to the user community should not unduly delay the drafting and approval of the service Recommendations. If necessary, knowledge of a service or its usage may be derived through other means, such as field trials, implementation of specific instances of the service or of similar services.

3.7 Intercommunication among service categories

Intercommunication is a desirable feature in many cases. At the lowest level, it is achieved between terminals and allows a user to make different types of calls or answer different types of calls from the same terminal. It allows the user to avoid having several terminals which are cumbersome and expensive. A possible limitation may be the increased cost and complexity of the terminal or its insufficient quality. For instance, the screen for the basic conversational service of a low bit rate videophone could display text, but not with a sufficient quality for reading a commercial document.

At a higher level, the intercommunication between services may allow the user to combine the functions offered by different types of services and thus increase the range of possible applications. For instance, retrieving a document through a retrieval service is a useful enhancement to a conference service.

ANNEX A

Media components descriptions

A.1 Media component audio

A.1.1 Definition

The media component audio allows for the capture and representation of information, its transfer from originating user(s) to destination user(s), its presentation to human user(s), processing, filing and retrieval. Audio includes speech, usually transmitted in real-time, i.e. at the speed at which it was produced and with a limited delay.

A.1.2 Description

A.1.2.1 General description

In the media component audio, a source produces an audio signal which then may be coded, compressed, stored and transmitted. At the other end, the signal is decoded and presented to a human user. Depending upon the type of service, five levels of quality are defined:

- A(-1): sound signal with minimum quality to allow the presence of the speaker to be detected;
- A0: minimum sound quality, sufficient for understanding speech from various speakers; the quality should be at least as good as that obtained with G.711 or G.728 codecs;
- A1: 7 kHz speech quality, at least equivalent to that of a G.722 codec operating at 48 kbit/s;
- A2: 15 kHz broadcast quality sound/speech, at least equivalent to that of a J.41 codec;
- A3: 20 kHz hi-fi or CD quality.

Option: The sound may optionally be stereo, including two sound signals for the right and left ears (note that the two signals are not independent and that some coding schemes might use the redundancy to reduce the bit rate). Level A3 usually entails multiple sound channels.

A.1.2.2 Additional facilities

Various auxiliary features may be offered either as an inherent part of the media component or as a specific function of the terminal. They include:

- auxiliary or multiple audio sources (e.g. multiple microphones in a teleconference room);
- audio tape recording/transmission or other audio recording equipment;
- various information on the source of the sound, e.g. identification of the speaker in a conference;

- audible tones or announcements related to the service or the application, for instance for user guidance.

Audio muting may be possible in specific cases. A visible indicator of muting shall appear on the muted terminal.

This short list is not exhaustive and may be extended due to the needs of specific services or applications.

A.1.2.3 Requirements for various audiovisual services

The levels of audio quality required for various services are the following:

Service	A0	A1	A2	A3
PSTN videotelephone	X			
Mobile videotelephone	X	X		
ISDN videotelephone	X	X		
Desktop videotelephone	X	X		
Audiographic conference	X	X	X	
Videoconference		X	X	
Video surveillance	X	X		
Audio/video distribution			X	X
Multimedia retrieval	X	X	X	X

This table is not exhaustive; its main purpose is to illustrate the use of the different levels of quality, and particularly the fact that a given service may be offered at different quality levels.

A.1.3 Quality aspects

A.1.3.1 Audio quality

The minimum audio quality for most audiovisual/multimedia services is that of ordinary telephony, i.e. the quality that allows a reasonable ease for understanding speech from a variety of possible speakers. This must be maintained even in interworking or intercommunication situations. For most services, however, the audio quality objectives are generally much higher, ranging from a good comfort for listening to speech to the highest quality in reproducing music or other sounds. The requirements will be specified according to the desired quality level.

A.1.3.2 Echo

Echo occurs in bidirectional audio connections and may seriously impair the audio quality. Efficient echo control should therefore be provided in bidirectional equipment. Interworking/intercommunication situations should also be considered because different terminal design and/or transmission parameters may cause additional difficulties for echo suppression.

A.1.3.3 Overall delay

The overall delay is defined as the sum of the transmission delay and the characteristic delay of the terminals (and of other equipment such as transcoders or MCUs when applicable). This delay should be kept within specific limits in accordance with the specific services.

A.1.4 Intercommunication

The various audiovisual/multimedia services should as much as possible be able to intercommunicate, particularly when they are used for the same type of applications. This is usually achieved by a fall-back mechanism that retains only the common media components and for each of them the lower quality level.

Intercommunication should be achieved at least between levels used for the same types of applications and/or services, namely between levels A0, A1 and A2 for speech, and between levels A2 and A3 for high quality audio. Intercommunication should also be possible between different implementations of the same level (for instance, between the same services offered on different networks).

A.2 Media component video

A.2.1 Definition

The media component video for the capture and representation of information, its transfer from originating user(s) to destination user(s), its presentation to human user(s), processing, filing and retrieval. The requirement is that under normal conditions for the service there is adequate representation of fluid movement. Thus the required temporal performance depends upon the amount of movement in the usual type of scene handled by the service. Similarly, the required resolution is dependent upon the type of picture usually transmitted for the service.

A.2.2 Description

A.2.2.1 General description

In the media component video, a video source produces a video signal carrying a moving picture, which may be then coded, compressed, stored and transmitted. At the other end, the signal is decoded and presented on a screen. Depending upon the type of service, the following levels of quality are defined:

- V(-1): video signal sufficient to allow movement to be detected;
- V0: minimum videophone quality, sufficient for showing the head of one person so that his identity and his facial expressions may be recognized; the amount of movement that can be tolerated without degraded temporal performance is very limited; the corresponding range for spatial resolution is from SQIF to QCIF (Note 2);
- V1: basic videophone quality, sufficient for showing a head and shoulder view of one person while being able to observe the lips movements; the amount of movements is limited to those of a seated person in a normal conversation (Note 1); the corresponding maximum spatial resolution is QCIF, Quarter Common Intermediate Format (Note 2);
- V2: basic videoconference quality, allowing a small group of three seated persons to be shown simultaneously; the amount of movements is limited to those of a normal discussion; the corresponding maximum spatial resolution is CIF, Common Intermediate Format (Note 2);
- V3: television broadcasting quality (ITU-R Recommendation BT.601);
- V4: high definition television quality.

NOTE 1 – The smoothness of the movement in the displayed image depends on the ability of the system to convey rapid changes; the amount of information which has to be transmitted will of course increase with the area of the picture affected and the speed of the movement. It is generally considered that in a normal videophone or videoconference environment, only part of the picture will be moving and that any fast movement will be limited to a very small portion of the image. Some degradation of the picture quality such as jerkiness, blurring or other artifacts may be allowed during the brief and exceptional instants when these conditions are not met.

NOTE 2 – A CIF video signal provides a spatial resolution of 288 lines with 352 picture elements per line for the chrominance, and 144 lines with 176 picture elements per line for the luminance; a QCIF video signal provides a spatial resolution of 144 lines with 176 picture elements per line for the luminance, 288 lines with 352 picture elements per line for the chrominance; a SQCIF video signal provides a spatial resolution of 96 lines with 128 picture elements per line for the luminance, 48 lines with 64 picture elements per line for the chrominance.

A.2.2.2 Additional facilities

Various auxiliary features may be offered either as an inherent part of the media component or as a specific function of the terminal. They include:

- higher resolution still pictures or graphics;
- split-screen techniques;
- auxiliary or multiple video sources (e.g. multiple cameras in a videoconference);
- videotape recording/transmission or other video recording equipment;
- far end source control, e.g. zooming and/or panning of a far end camera;
- self view (for some services, means must be provided for displaying the outgoing picture, either permanently or by substituting it on the screen to the incoming picture);
- various information on the source of the picture, shown for example as text below the picture.

Suspending the video image should be possible in all conversational and conference services, i.e. any participant should be able to prevent his or her image from being transmitted. A suspended image should be replaced by an adequate notice.

This list is not exhaustive and may be extended due to the needs of specific services or applications.

If there are several local image sources, then an indication should be given of which one is sent out.

A.2.2.3 Requirements for various audiovisual services

The levels of video quality required for various services are the following:

Service	V0	V1	V2	V3	V4
PSTN videotelephone	X				
Mobile videotelephone	X	X	X		
ISDN videotelephone		X	X		
Desk-top videotelephone		X	X		
Videoconference		X	X	X	
Video surveillance		X	X	X	
Video distribution				X	X
Video retrieval				X	X

This table is not exhaustive; its main purpose is to illustrate the use of the different levels of quality, and particularly the fact that a given service may be offered at different quality levels.

A.2.3 Quality aspects

A.2.3.1 Video quality

Video 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, but other parameters may also be relevant (e.g. distortion, signal loss or errors). The requirements will be specified according to the desired quality level.

Aspect ratio should be described together with the spatial resolution.

The number of possible different colours must still be studied.

A.2.3.2 Recovery time

The recovery time is the time necessary for a picture to build up when the video source is changed. It is an important parameter for multipoint conference services and should be kept low enough so as not to disturb the meeting.

A.2.3.3 Overall delay

The overall delay is defined as the sum of the transmission delay and the characteristic delay of the terminals, i.e. the delay introduced by the terminals when there is no movement or only very small movements in the transmitted image (e.g. when only the lips and eyes of the users are moving). The subjective effect of this delay on the quality of service has to be taken into account because an excessive value may impair user acceptability. The requirements depend on the specific service.

A.2.4 Intercommunication

The various audiovisual/multimedia services should as much as possible be able to intercommunicate, particularly when they are used for the same type of application. This is usually achieved by a fall-back mechanism to the lower quality level.

Intercommunication should be achieved between levels V1 and V2, and between levels V3 and V4.

Levels V0 and V1 are both used for videophone services, and therefore intercommunication is desirable.

A.2.5 Description of the static aspects

For further study.

A.2.6 Description of the dynamic aspects

For further study.

A.3 Media component text

A.3.1 Definition

The media component text allows for the capture and representation of information, its transfer from originating user(s) to destination user(s), its presentation to human user(s), processing, filing and retrieval.

A.3.2 Description

A.3.2.1 General description

Text is a representation medium consisting of formatted characters. It is stored and transmitted as a sequence of codes. Although it may be displayed on the same screen as video and still pictures, it requires decoding into specific fonts for presentation to the user, whether on the screen or on paper. The input is through a keyboard. The output may be a printer or a screen.

The following levels of quality are defined:

T0: minimum quality, basic alphabet and punctuation, no formatting or choice of font;

T0 *bis*: videotex quality, basic alphabet and punctuation, basic graphic character set, no formatting or choice of font;

T1: Usable text conversation quality characterized by:

Font support for ISO-10646-1 Language area Latin-1 plus the target language area for the implementation.

No more than 1 corrupted, dropped or marked missing character per 100.

Delay from character input in the transmitter to display in the receiver shorter than 2 s.

- T2: Good text conversation quality characterized by:
- Font support for all characters in ISO-10646-1.
 - No more than 1 corrupted, dropped or marked missing character per 500.
 - Delay from character input in the transmitter to display in the receiver shorter than 1 s.

A.3.2.2 Additional facilities

The user may be given control over text through editing and presentation functions. He may also be able to insert graphics, still pictures or animated pictures within the text.

A.3.2.3 Requirements for various audiovisual services

When text is the support for conversational services, the timing aspects of text entry and display are critical. Text may be transmitted and displayed in near real time, as text is entered. It may also be transmitted only after specific end-of-sentence action or on a specific send request. In a conversation between two users, the near real-time conversation is important for optimized benefit of the conversation. For multi-user conferences, a sentence based transmission may be more relevant in an open discussion, while for a subtitled speech, the real-time text transmission is preferred.

For retrieval services, it may be accepted to transmit and display a whole page of text in one operation.

For conversation, editing may be reduced to "new line", "erase last character", while the editing for information retrieval should contain a possibility to replace text anywhere on the page and add various formatting effects to any part of text. Annotations that stand out distinctly are also desirable.

The levels of text quality required for various services are the following:

Service	T0	T0 bis	T1	T2
Telex	X			
Videotex		X		
Text telephony			X	X
Total Conversation				X
Messaging services			X	X
Retrieval services			X	X

A.3.3 Quality Aspects

The quality of text depends mainly upon the capabilities for formatting and using different types of fonts and special characters. When no error correction is made, for instance in conversation, text quality is also measured in terms of corrupted characters, dropped characters and characters replaced by the missing text marker (see ITU-T Recommendation T.140).

A.3.4 Intercommunication

The characters with their formatting may be decoded and assembled into bit maps which can then be handled as still pictures, e.g. as facsimile pages.

A.4 Media component graphics

A.4.1 Definition

The media component graphics allows for the capture and representation of information, its transfer from originating user(s) to destination user(s), its presentation to human user(s), processing, filing and retrieval. This media component allows graphic pictures to be captured and transmitted as

geometrical objects whose positions, shapes and colours are coded so that they can be reproduced in a distant terminal.

A.4.2 Description

A.4.2.1 General description

Graphics is a representation medium consisting of geometrical objects featured by their positions, shapes and colours. It is stored and transmitted as a set of codes and parameters. Although it may be displayed on the same screen as video and still pictures, it requires decoding into specific geometrical figures for presentation to the user, whether on a screen or on paper.

The input may be through a graphics tablet, an electronic pencil, some other two-dimensional transducer or a dedicated graphic software on a microcomputer or workstation. The output device may be a printer or a screen.

A.4.2.2 Additional facilities

For further study.

A.4.2.3 Requirements for audiovisual services

For further study.

A.4.3 Quality aspects

The intrinsic quality of the graphic depends on the number and the complexity of the objects that can be generated, the precision of their dimensions and positions, the number of possible colours. The overall quality perceived by the user depends also on the resolution of the input and output systems.

A.4.4 Intercommunication

The graphic objects may be decoded and assembled into bit maps which can then be handled as still pictures.

A.4.5 Description of static aspects

For further study.

A.4.6 Description of dynamic aspects

For further study.

A.5 Media component still pictures

A.5.1 Definition

The media component still picture allows for the capture and representation of information, its transfer from originating user(s) to destination user(s), its presentation to human user(s), processing, filing and retrieval.

A.5.2 Description

A.5.2.1 General description

Still pictures is a pixel-based representation medium. They are initially digitized as bit maps, i.e. as one or several bits allocated to each pixel and coding for its colour. The simplest bit map has one bit per pixel indicating whether it is black or white; several bits per pixel are required to code for grey levels, and for a colour picture, each of the three basic colours has to be coded for. Because of the large volume of data generated, the data is then usually compressed by using the correlation between different parts of the picture and often by accepting a limited amount of degradation through loss of

information. Depending upon the application, the same types of transducers as for video may be used (cameras, screens), or scanners and printers. Two types of standards exist presently:

- facsimile standards which in the basic versions have only two levels, black and white (1 bit per pixel before compression), but can be extended to grey levels or to colour;
- general still pictures coding schemes such as T.81 (ISO-JPEG) and T.82 (ISO-JBIG) with various possible sets of parameters or profiles.

The contents of the still pictures may also be text and graphics, and basic facsimile is indeed designed for that purpose, but the patterns in the picture are not identified as such and thus cannot be modified. It should also be noted that at the final presentation stage, whether on screen or on paper, text and graphics are usually converted to a bit map, i.e. to a still picture.

A.5.2.2 Additional facilities

Pointer – A pointer facility allows a small graphic object to be superimposed on the picture; the size, shape and colour of this object may be fixed, or chosen between predetermined models or transmitted when opening the facility; it may be moved on the picture by one of the users and its position is sent in real-time to the distant terminal(s) for display. The interface through which the presenter moves the pointer is an implementation matter (for instance, a mouse, a joystick, an electronic pen, etc.). The role of the presenter is allocated to one terminal at a time, but may be moved from one terminal to the other.

A.5.2.3 Requirements for various audiovisual services

For further study.

A.5.3 Quality aspects

The quality of the picture may be defined by the number of pixels and the number of possible colours. If the picture is compressed for storage or transmission, then defects may be generated that will degrade the quality of the picture. The assessment of the resulting quality is for further study.

A.5.4 Intercommunication

Intercommunication with video: a still picture may be repeated and handled as a video sequence.

Intercommunication with text: if the still picture represents characters, it may be converted into text by character recognition software.

A.5.5 Description of static aspects

For further study.

A.5.6 Description of dynamic aspects

For further study.

A.6 Media component data

A.6.1 Definition

The media component data allows for the capture and representation of information, its transfer from originating user(s) to destination user(s), its presentation to human user(s), processing, filing and retrieval. Data consists of a sequence of bits. It is often organized in files, i.e. in finite sequences.

A.6.2 Description

A.6.2.1 General description

Two types of files may be defined depending upon their contents:

- software files, used to store or to download software;
- data files, i.e. finite sequences of bits arranged according to a set of rules and associated with a given software, which is needed to generate it, modify it or use it.

Data files are not a media component according to the F.700 definition, because they are not associated with any unique perception medium, but they may support various types of media components for storage and transmission purposes. They are commonly used for text or graphics, but they may also support still pictures or short sequences of sound or moving pictures. They may also contain data for various applications.

A.6.2.2 Additional facilities

Local facilities

The associated software is usually able to perform various functions such as generating, modifying, deleting parts, etc.

Remote operations

Specific software may also allow remote operation, such as cooperative data handling or retrieval in a remote database.

A.6.2.3 Requirements for various audiovisual services

For further study.

A.6.3 Quality aspects

For further study.

A.6.4 Intercommunication

Media components may be converted into data files through an appropriate software. Conversely, these files may be converted back into the original media component or to another media component. For instance, text or graphics may be converted into a bit map, i.e. a still picture. A still picture may also be extracted from a file containing a short video sequence.

A.6.5 Description of static aspects

For further study.

A.6.6 Description of dynamic aspects

For further study.

ANNEX B

Communication tasks descriptions

B.1 Communication task conversing

B.1.1 Definition

The generic communication task conversing provides for point-to-point real-time (isochronous) exchange of information between two users. The users may be humans or machines. The information may be monomedium as well as multimedia.

B.1.2 Description

The communication task conversing provides the basic means for a conversation between two users in different locations. In the case of human users, it uses the media component audio and, when required by the service, the media component video, each of them with different possible levels of quality. When both of them are present, they may be synchronized so that visual and aural perception of events will appear to the distant user as fitting together naturally, and in particular so that the movement of the lips will match the sound of the voice. Other synchronization requirements are supported as well.

The communication is usually symmetrical, but this is not mandatory. For instance, when one of the users wants to show the details of some object, he may transmit pictures with a higher quality level than he receives, if the system supports this configuration.

B.1.3 Quality aspects

B.1.3.1 Audio and video quality

The quality levels for each media components are defined separately (see Annex A). The correlation between them results from the requirements of the application and the limitations of the system (for instance, a fixed overall bit rate may impose a choice between audio and video quality).

B.1.3.2 Synchronization

When video and audio are present, they should be synchronized, in particular in order to ensure apparent lip synchronization. The required precision of the synchronization depends upon the quality levels of the service components and is of the order of a few tens of milliseconds. The exact values are for further study.

When the overall delays are different for various media components, they have to be aligned on the longer delay.

When the differential delays in various parts of the connection are implementation dependent, they should be aligned separately within each part, or the relevant information should be transferred for final adjustment in the receiving terminal.

NOTE – In applications where synchronization is not essential, the user should be able to disable the mechanism.

B.1.4 Intercommunication

Intercommunication is achieved at the media component level, independently for each of them but without destroying their synchronization. Media components may be dropped if they are not available in both terminals.

B.1.5 Static aspects

The static aspects of communication tasks are described using the following attributes in Table B.1.

Table B.1/F.700 – Communication task conversing attributes

Attribute	Value
Configuration	Point-to-point
Symmetry	Bidirectional
Response time	Real-time, near-real-time
Time continuity	Isochronous
Mandatory media components	All are possible, and an option is none
Optional media components	All are possible, and an option is none
Media component interrelation	– Synchronization between: <ul style="list-style-type: none">• audio and video (lip synchronism, location related synchronism)• audio and text (voice synthesis)• text and video/picture/graphics (subtitles synchronized with images)

B.2 Communication task conferencing

B.2.1 Definition

The generic communication task conferencing provides for multipoint real-time exchange of information among multiple users. The users may be humans or machines. The information may be monomedium as well as multimedia. It includes the control functions required for chairing a conference or controlling the use of a facility.

B.2.2 Description

B.2.2.1 General description

The communication task conferencing provides the basic means for various types of meetings of groups of users distributed in two or more locations. In the case of human users, it will usually use the media component audio, and optionally video and/or other media components, each of them with different possible levels of quality. When video is present, it is synchronized with audio from the same location so that visual and auditory perception of events will appear to the distant user as fitting together naturally and, in particular, so that the movement of the lips will match the sound of the voice.

The use of this communication task for computer conferences is for further study.

B.2.2.2 Operation of the various media components

B.2.2.2.1 Audio

The sounds from the various terminals may be mixed, switched, or a combination of both. In the mixing mode, each terminal receives the sound from all other terminals except its own sound (thus avoiding echo). When many terminals are present, it is advisable for users to mute their microphones (i.e. prevent the sound from being transmitted) when they are not speaking in order to reduce the addition of noises and the risk of unwanted perturbations. For the same purpose, some systems may limit, possibly to one only, the number of audio sources simultaneously received by a terminal. How the sources are selected is described in a subsequent subclause.

B.2.2.2.2 Video

In the basic mode, the video is switched so that only one picture is transmitted to each terminal. In more elaborate modes, several pictures are used. They can be separate pictures, or combined as several windows on the same screen. In the "continuous presence" mode, all locations can be viewed permanently. The number of locations can then be at most equal to the number of available windows plus one. If the number of locations is larger, this mode of operation is not possible and some switching is necessary for selecting the sources of the pictures displayed in each location.

B.2.2.2.3 Other media components

Data channels may be used to transmit still pictures, text, graphics, or other types of data. Circuit-oriented data channels only allow point-to-point transmission between terminals of the conference or broadcasting from one terminal at a time. Packet-oriented channels are more flexible; they may be shared by several sources at a time and with different types of data simultaneously. Limitations may however also occur from other resources that cannot be shared or from saturation of the transmission channel when the amount of data transferred takes up a large part of the available bit rate. Creation, presentation, representation and processing of these information types may be done using either the same or different functions and devices.

B.2.2.3 Control functions

The control functions required for managing the conference are described in C.1, middleware service element conference control.

B.2.3 Quality aspects

B.2.3.1 Media components quality

The quality levels for the various service components may be defined separately. The correlation among them results from the requirements of the application and the limitations of the system (for instance, a fixed overall bit rate may impose a choice between audio and video quality, and reduce the quality when transfer of several information types occurs).

B.2.3.2 Synchronization

When video is present, it should be synchronized with the audio from the same source, in particular in order to ensure apparent lip synchronism. The synchronism should be maintained over the various paths that the signals may follow to reach the different terminals in the conference. When the differential delays in various parts of the connections are implementation dependent, they should be aligned separately within each part, or the relevant information should be transferred for final adjustment in the receiving terminals.

B.2.4 Intercommunication

Intercommunication is achieved at the media components level, independently for audio, video and data. Audio is always present, the video and other media components may be dropped if they are not available in all terminals. When audio and video are present, synchronization should be maintained between them with audio.

Alternately, different status may be given to the terminals: a primary status to those terminals supporting the media components and functions selected for the conference with the appropriate quality levels, a secondary status for terminals that do not meet these requirements and will then only be able to participate with some of the components and functions.

B.2.5 Description of the static aspects

The static aspects of communication tasks are described using the following attributes in Table B.2.

Table B.2/F.700 – Communication task conferencing attributes

Attribute	Value
Configuration	Multipoint-to-multipoint
Symmetry of information flow	Bidirectional
Response time aspect	Real-time or near-real-time
Time continuity	Isochronous for audio and video Non-isochronous for other media components
Mandatory media components	All are possible, and an option is none
Optional media components	All are possible, and an option is none
Media components interrelation	– Synchronization between: <ul style="list-style-type: none">• audio and video (lip synchronism, location related synchronism);• audio and text (voice synthesis);• text and video/picture/graphics (subtitles synchronized with images);• synchronization between audio and graphics.

B.3 Communication task distributing

B.3.1 Definition

The communication task distributing provides for the transfer of information from one user to (more than one) other users with the information source being the controlling entity. The users may be humans or machines. The information may be monomedium as well as multimedia.

B.3.2 Description

B.3.2.1 General description

The communication task distributing provides the basic means to support all kinds of point-to-multipoint applications by providing the capabilities to transmit information to more than one other user or to storage.

The information distributed to other users or storage (representing the information sinks) may be monomedium as well as multimedia, thus meaning that the use of one or some or all of the media components described in Annex A may be required. Requirements for any interrelation between any of them, e.g. any synchronization requirements, will be supported.

The communication, i.e. the exchange of user information (user plane) is unidirectional, whereas necessary control information (control plane) may be exchanged in both ways.

B.3.2.2 Operation of the various media components

B.3.2.3 Control functions

B.3.3 Quality aspects

B.3.3.1 Media component quality

The quality levels for each media component are defined separately (see Annex A). The correlation between them results from the requirements of the application and the limitations of the system (for instance, a fixed overall bit rate may impose a choice between audio and video quality).

B.3.3.2 Synchronization

When video and audio are present, they should be synchronized, in particular to ensure lip synchronization. The required precision of synchronization depends on the quality levels of the media components and is of the order of a few tens of milliseconds. The exact values are for further study.

When the overall delays are different for various media components, they have to be aligned on the longer delay.

When differential delays in various parts of the connection are implementation dependent, they should be aligned separately within each part, or the relevant information should be transferred for the final adjustment in the receiving terminal.

B.3.4 Intercommunication

Intercommunication is achieved at the media component level, independently for each but without destroying synchronization. Media components may be dropped if they are not available in all terminals.

B.3.5 Static aspects

The static aspects of communication tasks are described using the following attributes in Table B.3.

Table B.3/F.700 – Communication task distributing attributes

Attribute	Value
Configuration	Point-to-multipoint
Symmetry	Unidirectional
Response time	All are possible
Time continuity	All are possible
Mandatory media components	All are possible, and an option is none
Optional media components	All are possible, and an option is none
Media component interrelation	Synchronization possible

B.4 Communication task sending

B.4.1 Definition

The generic communication task sending provides for point-to-point real-time and non-real-time transfer of information from one user to another with the information source being the controlling entity. The users may be humans or machines. The information may be monomedium as well as multimedia.

B.4.2 Description

B.4.2.1 General description

The communication task sending provides the basic means to support all kinds of messaging applications by providing the capabilities to transmit information to another user or to storage.

The information sent to the other user or to storage (representing the information sink) may be monomedium as well as multimedia, thus meaning that the use of one or some or all of the media components described in Annex A may be required. Requirements for any interrelation among any of them, e.g. any synchronization requirements, will be supported.

The communication, i.e. the exchange of user information (user plane) is unidirectional, while the necessary control information (control plane) may be exchanged in both ways.

B.4.2.2 Operation of the various media components

B.4.2.3 Control functions

B.4.3 Quality aspects

B.4.3.1 Media component quality

The quality levels for the various service components may be defined separately (see Annex A). The correlation among them results from the requirements of the application and the limitations of the system.

B.4.3.2 Synchronization

When video and audio are present, they should be synchronized, in particular in order to ensure apparent lip synchronicity.

When the overall delays are different for the various information types, they have to be aligned on the longer delay.

When different delays in various parts of the communication are implementation dependent, they should be aligned separately within each part, or the relevant information should be transferred for final adjustment in the receiving terminal.

B.4.4 Intercommunication

Intercommunication is achieved at the media component level independently for each media component but supporting synchronization and other interrelation requirements. Media components may be dropped if they are not available in all terminals.

B.4.5 Static aspects

The static aspects of the communication task sending are described using the following attributes in Table B.4.

Table B.4/F.700 – Communication task sending attributes

Attribute	Value
Configuration	Point-to-point
Symmetry	Unidirectional
Response time	All are possible
Time continuity	All are possible
Mandatory media components	All are possible, and an option is none
Optional media components	All are possible, and an option is none
Media component interrelation	Synchronization possible

B.5 Communication task receiving

B.5.1 Definition

The generic communication task receiving provides for point-to-point transfer of information from one user to another user with the information sink being the controlling entity. The users may be humans or machines. The information may be monomedium as well as multimedia.

B.5.2 Description

B.5.2.1 General description

The generic communication task receiving provides part of the basic means to support any kind of retrieval aspects of an application by providing the capabilities to get information from some kind of store into which some other user has previously put the information using the communication tasks sending or distributing (see Annex B).

The information received from the store (representing the information source) may be monomedium as well as multimedia, thus meaning that the use of one or some or all of the media components described in Annex A may be necessary. Requirements for any interrelation among any of them, e.g. synchronization with media components audio or video and text, or any kind of conditional relation, will be supported.

The communication, i.e. the exchange of user information (user plane) is unidirectional, whereas necessary control information (control plane) may be exchanged in both ways.

B.5.3 Quality aspects

B.5.3.1 Media component quality

The quality of each media component is defined separately (see Annex A).

B.5.3.2 Synchronization

Synchronization requirements and their required precision depend on the application to be supported by the multimedia service requiring the communication task receiving.

Overall delays may be different for the various information types. They will be aligned on the longer delay.

When different delays in various parts of the communication are implementation dependent, they should be aligned separately within each part, or the relevant information should be transferred for final adjustment in the receiving terminal.

B.5.4 Intercommunication

Intercommunication is achieved at the media component level independently for each media component but supporting synchronization and other interrelation requirements.

B.5.5 Static aspects

The static aspects of the communication task sending are described using the following attributes in Table B.5.

Table B.5/F.700 – Communication task receiving attributes

Attribute	Value
Configuration	Point-to-point
Symmetry	Unidirectional
Information control entity	Sink
Response time	All are possible
Time continuity	All are possible
Mandatory media components	All are possible, and an option is none
Optional media components	All are possible, and an option is none
Media component interrelation	Synchronization possible

B.6 Communication task collecting

B.6.1 Definition

The communication task collecting provides for the transfer of information from (more than one) users to one user with the information sink being the controlling entity. The users may be humans or machines. The information may be monomedium as well as multimedia.

The information sources are anticipated to be machines whereas the controlling information sink may be a person or a machine. The user information may be monomedium as well as multimedia.

B.6.2 Description

B.6.2.1 General description

The generic communication task collecting provides part of the basic means of supporting any polling system but providing the capabilities to get information from some kind of store into which other users have previously placed the information, possibly using the communication tasks sending or distributing (see Annex B).

The information received from the store (information source) may be monomedium as well as multimedia, thus meaning that the use of media components described in Annex A may be required. Requirements for any interrelation among any of them will be supported.

With regard to each of the relations between the information sink and one of the information sources, the communication, i.e. the exchange of user information (user plane) is unidirectional, whereas the necessary control information (control plane) may be exchanged in both ways.

B.6.2.2 Operation of the various media components

B.6.2.2.1 Audio

When the collecting user is simultaneously collecting audio information from more than one information source, it should be possible to present the collected information.

B.6.2.2.2 Video

When the collecting user is simultaneously collecting video information from more than one information source, it should be possible to present the collected information.

B.6.2.3 Control functions

B.6.2.3.1 General aspects

Requests for transmission of information are issued by the information sink to the information source, which is expected to send an immediate response indicating whether the information is available.

In the conducted mode, a positive response is immediately transferred into a message initiating the information transfer.

B.6.2.3.2 Navigation

Navigation functions allow the collecting user to select the information to be transferred from the information offered. This requires further study.

B.6.3 Quality aspects

B.6.3.1 Media component quality

The quality levels for each media component are defined separately (see Annex A).

B.6.3.2 Synchronization

Synchronization requirements and their required precision depend on the application to be supported by the multimedia service requiring the communication task collecting. Overall delays may be different for the various information types. They may need to be aligned on the longer delay.

When differential delays in various parts of the communication are implementation dependent, then they should be aligned separately within each part, or the relevant information should be transferred for final adjustment in the receiving terminal.

B.6.4 Intercommunication

Intercommunication is achieved at the media component level, independently for each media component but supporting synchronization and other interrelational requirements.

B.6.5 Static aspects

The static aspects of the communication task sending are described using the following attributes in Table B.6.

Table B.6/F.700 – Communication task collecting attributes

Attribute	Value
Configuration	Multipoint-to-point
Symmetry	Unidirectional
Information controlling entity	Sink
Time aspects	All are possible
Time continuity	All are possible
Mandatory media components	All are possible, and an option is none
Optional media components	All are possible, and an option is none
Media component interrelation	Synchronization possible

Middleware service elements descriptions

C.1 Middleware service element *Conversation Control*

C.1.1 Definition

The generic middleware service element *Conversation Control* provides the control functions for point-to-point real-time exchange of information between two users

C.1.2 Description

The generic middleware service element *Conversation Control* provides the basic means for managing various types of conversations. It is related to the generic communication task conversing described in B.1. It controls the operation of the various media components, allowing appropriate channels to be opened and used between the terminals.

C.1.3 Control functions

At the beginning of the call, the terminals exchange information on their capabilities and a common mode of communication is chosen. This is usually an automatic process, but the users may intervene when several modes are available or if they want to avoid the use of one or more media components (for instance a user may not want his image to be sent out, or he may want to limit the bandwidth in order to reduce the cost).

During the course of the communication, a change of mode may also be initiated, adding or suppressing a media component or changing the bandwidths allocated to the various media components.

C.1.4 Implementation

There are two possible levels of complexity for the control functions:

- Level 1 uses only the basic signals in the control channel of the multiplex, with limitations in the capacity of the channel and in the available commands.
- Level 2 uses a packet-oriented data channel with a multilevel protocol defined in the T.120 series of Recommendations on which control data and user data are multiplexed; it is more flexible and offers enhanced control capabilities for optional functions.

NOTE – For ISDN, the level 1 channel is defined in Recommendations H.221 and H.230, supporting the procedures of H.242. On other networks equivalent Recommendations are H.222.0 and H.245.

C.2 Middleware service element *Conference Control*

C.2.1 Definition

The generic middleware service element *Conference Control* provides the control functions for multipoint real-time exchange of information among multiple users. It includes the control functions required for chairing a conference or controlling the use of a facility.

C.2.2 Description

C.2.2.1 General description

The middleware service element *Conference Control* provides the basic means for managing various types of meetings of groups of users distributed in two or more locations. It is related to the generic communication task conferencing described in B.2. It controls the operation of the various media components, allowing each terminal to transmit them when appropriate and deciding how they will be combined, multiplexed or switched for transmission to each terminal. To this end it elaborates the

control and indication signals exchanged among the terminals and MCUs, and it sends them to the appropriate site.

The use of this MSE for computer conferences is for further study.

C.2.2.2 Operation of the various media components

The operation of the various media components is described in B.2.2.2. It depends upon the type of medium, the available transmission channels and the capabilities of the MCUs for combining the signals. The control functions vary accordingly.

C.2.3 Control functions

C.2.3.1 General aspects

In a multipoint configuration, several terminals are liable to transmit or try to transmit at the same time, and control functions are required to arbitrate between them whenever limitations exist on the number of signals simultaneously handled by various parts of the system. Requests for transmission (explicit or implicit) are received by the control system of the conference, which takes appropriate action in response.

Two modes of control are defined:

- 1) An unconducted mode in which all actions are automatic responses from the system: All terminals then have equal rights for transmitting on the channels allocated to the various media and for issuing commands to the control system; they may however temporarily acquire exclusive rights for using a given facility (e.g. by requesting an appropriate token from the control system, or by starting to use the facility while it is free, or otherwise).
- 2) A conducted mode in which some of the requests are forwarded to a specific terminal (the control terminal) and action is taken according to the commands from that terminal: This mode is only optional, but its availability is desirable for the management of conferences with many participants or with elaborate terminals. Control terminals may be conferred three types of privileges, either separately or jointly:
 - a) access control, i.e. management of the conference call (call control); this function belongs to the service level and is described in Recommendation F.702;
 - b) chair control, i.e. management of the media audio and video components in order to give the floor to the various participants;
 - c) facility control, i.e. management of a facility and the related corresponding data channel and resources.

In the simpler systems, these functions may be merged, but it is preferable to keep them separate. They can usually be transferred from one terminal to another through a token or by some other method.

C.2.3.2 Audio and video

The control of audio and video signals uses various schemes depending on the mode for each component. In the continuous presence mode, audio and video from all other locations are permanently available on each site and no control is needed for these two components. In all other cases, selection is necessary for one component or for both. The criteria for this selection are the requests sent by the terminals and the level of the sounds from these terminals, which is monitored when automatic switching is performed.

1) *Unconducted mode*

In basic systems, each terminal receives the sounds from all other terminals and only one video signal. The video channels are then voice switched, i.e. the image from the terminal with the loudest sound (the speaker) is broadcast to all other terminals. A suitable delay

and/or threshold avoid repeated switching which would be uncomfortable for the users, especially if the codec requires some time for building up a new picture. The speaker may receive the video from the previous speaker, or cyclically the video from the other terminals, or he may be able to select the picture he wants to receive, depending on implementation.

Any participant may optionally make a request to select the video from a specific source, and if the system supports this function, he will receive it when available (limitations may arise from the conference system or from the transmission paths).

Any participant can have his video broadcast to every terminal, provided there is no similar request active. This overrides all previous commands for selecting the video received, but subsequent requests for video selection will be accepted, only subject to availability of the requested signals.

If the system is able to simultaneously convey the video from several terminals, then various schemes are possible. For instance, the latest speakers may be displayed, or only the present speaker with other pictures selected by the user, or any other combination. This is left to the implementor, but the picture of the present speaker should always be included unless the user expressly makes another choice.

If voice is also switched, then it is submitted to the same rules.

2) *Conducted mode: chair control*

The chairman controls who has the floor: if one or both of the audio and video signals are switched, he decides whose picture and/or voice will be broadcast. When a participant wants to speak, he has to send a request for the floor which the conference control system forwards to the chairman, who may send back commands to grant it or deny it. Giving the floor to a terminal means that the system broadcasts to all other terminals those of the video and audio signals that are switched. Another terminal may request signals from some specific source to be sent to it instead, and the system will comply whenever possible; reasons for denial might be that this function is not supported by the system, that it has been prohibited (for instance, a buyer in an auction sale may want to be identified only by the auctioneer), or that the requested signal is not available.

If the signals from several sources can be transferred and presented simultaneously, then usually only one of them is controlled by the chairman; the other one(s) may be, for instance, allocated to the previous speaker(s), or to the chairman or selected by the user.

In the continuous presence mode, there is usually no chair control on the audio and video because there is no switching, although the chairman might be able to mute a distant terminal.

C.2.3.3 Other information types

Control of transmission of other information types is dependent on the type of channel that supports it: on a circuit-oriented channel, only one terminal can transmit at a time and control of the channel is required; packet-oriented channels are more flexible and control functions are already embedded in the associated protocol, but control of other resources may still be required. Thus, three modes may be defined: two with allocation of resources and one with shared resources.

1) *Unconducted mode with allocation of resources*

Only one terminal at a time is able to transmit (or possibly a limited number of terminals). To resolve possible conflicts between terminals, the control system allocates resources to one terminal at a time (or to a limited number of terminals). Terminals may send requests for transmission to the control system of the conference, which allocates in response the appropriate resources if they are available (this process may be implicit if the terminal itself detects the availability of resources and takes them up by starting to transmit). If the attempt

fails, the terminal may renew its request later on or the control system may set up a queuing mechanism (Note 1).

2) *Conducted mode: facility control*

The facility controller manages a given facility, which can be, for instance, still pictures, or telewriting, or file transfer; requests for its use are forwarded to him by the control system, which waits for his decision before allocating the corresponding resources. He may also interrupt the use of the facility and hand it over to another participant (Note 1).

When several information types are present, a token is allocated for each independent type; if two types of data are mutually exclusive (for instance, if they use the same fixed channel or the same equipment), then they will share the same token.

3) *Shared resources*

Terminals share a common transmission medium and other common resources which they may use simultaneously (Note 2); in this case they may transmit freely at any time. In case of congestion or if the receiving terminals are already engaged, the transmitter will have to try again, or the message may be stored and forwarded later on.

NOTE 1 – Permission to transmit may be represented by a token. In the unconducted mode, it may be acquired on request while it is free, and should be released when no longer needed. When a terminal has the token, other terminals may also be able to issue a request for it to the owner who may reject it, hand out the token or simply release it. In the conducted mode, the token is allocated by commands from the facility controller.

NOTE 2 – A common transmission medium may also be used in the other modes (with allocation of resources) where it adds flexibility for the simultaneous transfer of several information types and for the control functions.

C.2.3.4 Operational aspects

At the beginning of the conference, the default mode is usually non-conducted. Any terminal may then issue a request for taking on a control function and it will be granted.

The chairman will often also take on the role of conference controller, but there are cases when he may not be willing or able to do so (for instance, the chairman of a company will probably want to leave this task to a secretary; similarly, in the case of remote teaching or remote lecturing, the teacher or lecturer will chair the conference while the convener will control the conference and screen the participants when they call). Thus the two functions may need to be split, either in the terminal equipment when both are in the same location, or in the conference control system if they are distant. The same considerations apply to the control of the facilities.

When two or more control responsibilities are jointly allocated, it should be possible to leave some of them idle, i.e. let them revert to the unconducted mode. Control over facilities for which the chair terminal has sent no command should remain idle. This will ensure that facilities that the chairman (or controller) is not willing or able to control can still be used by other participants, in particular optional facilities not present in the chair terminal.

C.2.3.5 Private conference/conference splitting

It may be possible to split the conference into two (or more) sub-conferences, if the conference system supports it. It may also be possible to send various information types to one participant or to a group of participants inside the conference. The conditions for this are for further study.

C.2.4 Implementation

The control functions are distributed among the terminals and MCUs. Control signals are exchanged among them for this purpose. The MCU (or one of the MCUs when several are present) usually has the leading role in the management of the conference.

There are two possible levels of complexity for the control functions:

- Level 1 uses only the basic signals in the control channel of the multiplex, with limitations in the capacity of the channel and in the available commands.
- Level 2 uses a packet-oriented data channel with a multilevel protocol defined in the T.120 series of Recommendations on which control data and user data are multiplexed; it is more flexible and offers enhanced control capabilities.

NOTE – For ISDN, the level 1 channel is defined in Recommendations H.221 and H.230, supporting the procedures of Recommendation H.242 and, for multipoint operation, of Recommendation H.243. On other networks equivalent Recommendations are H.222.0 and H.245.

ANNEX D

Glossary

The sources of the definitions will be indicated as follows:

{AVI-2}	Future ISO standard on AVI scripts in ISO/SC 29/WG 12-MHEG
{F.710}	ITU-T Recommendation F.710
{F.711}	ITU-T Recommendation F.711
{F.720}	ITU-T Recommendation F.720
{F.730}	ITU-T Recommendation F.730
{F.740}	ITU-T Recommendation F.740
{I.374}	ITU-T Recommendation I.374
{MHEG}	ISO standard MHEG CD 13522-1

D.1 audiographic conference service {F.711}: Is an international service, offered by Administrations, enabling participants to conduct a real-time conference in which audio signals are exchanged together with non-voice graphics information except for motion video.

D.2 author {F.740}: The role who mainly creates and validates applications or updates and supplies them to the information manager for their distribution.

D.3 AVI audiovisual interactive: This acronym is widely used in standards work in the area of real-time interactive multimedia and hypermedia applications.

D.4 AVI script {AVI-2}: Formulation of the logical structure which defines the sequencing and semantic relationships between multimedia and hypermedia objects for the purpose of making them available to a user.

D.5 AVI scriptware {AVI-2}: Data interchange format that identifies one or several scripts together with the relevant processes, multimedia and hypermedia objects necessary for the interchange of a complete and consistent package.

D.6 AVI service {AVI-2}: Generic retrieval service which provides users with facilities for the controlled interchange of AVI scriptware. See also Recommendation F.740.

D.7 editing {F.740}: Creation of applications, including design, use of media, development, verification, modification, updating and validation before the applications become available to the users.

D.8 execution {F.740}: Application usage after installation, user interface management, monitoring usage implementation and, where appropriate, upstream connection with an information management system or directly with an editing system in case of an implementation in progress.

D.9 hypermedia {MHEG}: The ability to access monomedia and multimedia information by navigating across links.

NOTE – The specialized MHEG links defined in the MHEG standard are not general purpose document links as defined by HyperODA or HyTime.

D.10 information management {F.740}: Application management, including storage, classification, catalogue creation and management, retriever and preparer management, tariffs, monitoring usage processing, context recovery management, etc.

D.11 information manager {F.740}: The role who mainly defines or modifies user access authorization and tariffing, then provides the execution process with the applications to be executed or their updates.

D.12 interchange medium {F.740}: The type of means to interchange data; it can be either a storage, a transmission medium or a combination.

NOTE – Interchange medium can be used to indicate either storage or transmission medium.

D.13 multimedia object {MHEG}: A composed object consisting of various different types of related temporal and logical content intended for presentation to a user.

D.14 perception medium {MHEG}: The nature of the information as perceived by the user. Examples of auditory perception: speech, noise, music. Examples of visual perception: text, drawings and moving scene.

D.15 preparer {F.740}: The role who mainly selects, installs, personalizes and concatenates the applications as well as following up their execution.

D.16 rendition {F.720}: The ability of the receiving entity to reproduce motion from transmitted video.

D.17 retriever {F.740}: The role who mainly consults the application by interacting with the presentation process.

D.18 role {F.740}: Either a person who activates, or a process which has been designed by a person in order to activate a functionality of an AVI application.

D.19 teleconference service {F.710}: Is the service that provides the necessary arrangements for a real-time conferencing among single individuals or groups of individuals at two or more locations, by means of telecommunication networks.

The concept of conferencing implies that the exchange of speech signals is always provided for as a basic facility. The use of supplementary facilities, for the exchange of signals other than speech, is to be determined by the conference participants.

For the interconnection of terminal equipment at three or more locations, a specific interconnection facility is required, namely the Multipoint Control Unit (MCU), to which all locations are connected individually. The MCU provides proper distribution of the various signals among the connected locations and takes part in maintaining the proper procedures among the connected terminals.

The TCS is a real-time service which can be divided according to the following categories: audiographic conference service and videoconference service.

D.20 transmission medium {MHEG}: The type of physical means to transmit data. For example, twisted pairs, coaxial cable, optical fibres and radio link.

D.21 videoconference service {F.730}: Is an audiovisual conversational teleconference service providing bidirectional real-time transfer of voice and moving colour pictures between groups of users in two or more separate locations. The minimum requirement is that under normal conditions the picture information transmitted is sufficient for adequate representation of fluid movements of two or more persons in a typical meeting situation displayed in head and shoulders view.

Although the moving picture information is the essential part of the service, other types of information, such as high resolution still pictures, text or data may also be exchanged.

D.22 videotelephony service {F.720}: 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.

APPENDIX I

Multimedia medical consultation

I.1 Prose description

Medical consultation involves interactive multimedia communications between medical experts located at two or more separate locations. This communication is generally initiated by a doctor desiring to discuss a particular patient's case with subject matter experts and may occur between the doctor and one consultant only, or may require an interactive conference arrangement between the doctor and several consultants simultaneously.

In the course of the consultation, information may also be required from remote databases containing the patient's medical files; from one or more diagnostic test centres in the form of X-rays, sonograms, electrocardiographs or similar medical images; or from a reference library containing technical information, illustrative medical images, or other supporting material required to facilitate the consultation. This material may be textual, aural, graphical or imagery in nature and may be stored in a multimedia format.

Participants in the consultation may be located in an office or medical facility having access to the full range of broadband multimedia telecommunications capabilities; or located in a moving vehicle, on a golf course, or at some other remote location having limited communications access. In order to accommodate all eventualities, provisions for dynamic resource arbitration and allocation, both during "call" initiation and while the "call" is in progress, are required to ensure that the more important aspects of the interaction are fully satisfied.

I.2 Application scenario

This scenario is provided in two parts to better represent the wide range of communication environments within which a multimedia medical consultation could take place.

I.2.1 Full multimedia support capability

Dr. "X" is a world recognized authority on bone structure and is widely consulted by other doctors on a frequent basis. Usually, this consultation takes place in Dr. "X"'s office where he has a state-of-the-art multimedia communications terminal with a large high definition video display. A typical consultation might proceed in the following manner:

Stage 1 – Dr. "X" is called by Dr. "Y" via videophone requesting consultation regarding a patient suffering from multiple fractures of the upper foot resulting from an automobile accident. After briefly covering the nature of the injury, Dr. "Y" transmits the patient's examination chart. The full screen video image on Dr. "X"'s screen immediately changes to a two-partition representation depicting the patient's chart in the left half and a reduced video image of Dr. "Y" in the right half.

Stage 2 – Dr. "Y" is on duty in the emergency room of a local hospital and, after discussing the general aspects of the case with Dr. "X" in a face-to-face videophone presentation, switches to his handheld remote videophone camera in order to provide Dr. "X" with a visual survey of the damaged foot.

Stage 3 – With the visual inspection completed, Dr. "X" requests transmission of the X-rays depicting the damaged area taken from different orientations. The two-partition screen presentation is quickly divided into four partitions, one for each of the X-rays to be transmitted.

Stage 4 – After careful scrutiny, Dr. "X" selects the partition which gives the best view of the upper ankle area where most of the serious damage appears to have occurred. The partitioned screen is quickly replaced with a full screen, high resolution depiction of the selected image, enabling Dr. "X" to make a more detailed inspection of the area of interest.

Stage 5 – Careful examination of the tarsal bone structure indicates considerable damage to the tibialis posterior tendon and associated muscle area, a complicating factor which requires the assistance of a third specialist. With the consent of Dr. "Y", Dr. "X" initiates a videoconference call to Dr. "Z", a specialist in tendon reconstruction.

Stage 6 – After advising Dr. "Z" of the nature of the emergency, the three doctors continue discussion of the case. As the videoconference progresses, the patient's examination chart, medical files, X-rays and other reference information are brought into the conference as required, either through the transmission of additional data or recovered from local "memory" if previously transmitted.

Stage 7 – At the end of the conference, Dr. "Y" thanks Drs. "X" and "Z" for their assistance and terminates the consultation.

1.2.2 Restricted multimedia support capability

A week later, another emergency occurs, this time involving a patient whose foot has been crushed in a logging accident. Dr. "Y" again calls Dr. "X" for consultation. While Dr. "X" is available for consultation, it is his day off and all calls are automatically routed either to his home terminal or his portable terminal, depending upon the doctor's location at any particular point in time. In this case, Dr. "X" happens to be on the golf course, accessible from the portable terminal in his golf cart.

In general, the consultation proceeds in a manner similar to that of the previous week. However, due to size limitations placed on the portable terminal and the reduced bandwidth available through the mobile network, service expectations are modified and focused on the more important aspects of the interaction. The less important features are relegated to a nice-to-have but non-essential category. With this in mind, the consultation proceeds in the following manner:

Stage 1 – Dr. "Y" initiates a videophone call to Dr. "X" to request consultation. Since Dr. "X" is now using his portable terminal, he has elected to receive calls in the "voice only" mode. The network, complying with this service request, establishes the initial connection for voice communication only.

Stage 2 – After advising Dr. "X" of the circumstances surrounding the emergency, Dr. "Y" asks Dr. "X" to switch his terminal to videophone operation in order to visually survey the area of injury. Dr. "Y", recognizing that Dr. "X" is communicating from a portable terminal, bypasses the normal full field view camera on his videophone terminal and activates the handheld remote scanner, holding the camera steady in the vicinity of the injury to compensate for the reduced "motion" response characteristics of Dr. "X"'s portable terminal.

Stage 3 – With visual inspection completed, Dr. "X" requests transmission of an X-ray for the orientation he feels will best portray the extent of damage. To compensate for the size of the portable video display and the reduced transmission rate, Dr. "X" has purchased an enhanced storage feature for his basic portable multimedia terminal in order to capture the considerable amount of data required for high resolution X-rays. In addition, he is willing to accept longer transmission delay in order to obtain the necessary image resolution.

Stage 4 – After careful scrutiny of the damaged area, Dr. "X" requests transmission of an additional X-ray which he hopes will depict the damaged area to better advantage. He elects not to choose a split screen presentation due to the small size of the portable video display, but to take advantage of the local data storage and image manipulation features, which allow him to zoom in on areas of

particular interest and to change from one locally stored image to the other at near "office" response times.

Stage 5 – Careful examination of the injury again indicates the need for additional consultation with Dr. "Z" regarding the extensive damage which has occurred to the tendons in the vicinity of the ankle. With the consent of Dr. "Y", Dr. "X" places a voice only conference call to Dr. "Z".

Stage 6 – After advising Dr. "Z" of the nature of the emergency and that he is calling from a mobile terminal, Dr. "X" asks Dr. "Y" to initiate a three-way videoconference to further discuss the case. In order to make maximum use of the bandwidth available for the more important imagery data, Dr. "X" elects to join the videoconference in the AUDIOGRAPHICS-only mode (audio plus still image and graphics). As the videoconference progresses, X-ray and other visual information is brought into the conference as required, either through the transmission of additional data or recovered from local memory if the information had been previously sent.

Stage 7 – At the end of the teleconference, Dr. "Y" again thanks both Drs. "X" and "Z" for their assistance and terminates the consultation.

I.3 Implementation notes

I.3.1 Related applications

This Application is closely related to REMOTE MEDICAL DIAGNOSTICS, but differs with respect to the time urgency of the interaction, the terminal facilities and transmission resources available, and the principal media of information interchange.

I.3.2 Associated applications

AUTOMATED ACCOUNTING AND BILLING for the consultants' time, and a permanent record of the interaction (AUTOMATIC ARCHIVAL) are desirable adjuncts to this application.

I.3.3 Security/privacy

The communications associated with this application are privileged in nature and require access to databases containing confidential information protected by privacy laws in most locations.

I.3.4 Service flexibility

There is a need for automated service mechanisms which will allow for:

- 1) initial "call" establishment at the highest common denominator of service capabilities shared by all participants; and
- 2) the dynamic and selective modification of service parameters during "call" progress.

I.3.5 Performance trade-offs

The primary media components are VOICE and IMAGERY. Resolution requirements for the medical images take precedence over the associated increase in transmission delay. For portable terminal applications, resolution also takes precedence over the area of spatial coverage as long as mechanisms are provided for selecting the boundaries of the area to be viewed.

The consultation may be conducted in either a full-motion video or still-frame audiographic mode of operation, depending upon the terminal and transmission capabilities available to the participants.

APPENDIX II

Harmonization of multimedia services and applications

In the monomedia era, the telecommunication services, like telephony, telefax, videotelephony and videoconference, were developed. However, in the multimedia era, many kinds of applications were and will be developed and standardized by other standardization bodies, in addition to ITU-T. To facilitate end use, services and applications should be harmonized between ITU-T and other standardization bodies. In order to harmonize those services and applications, ITU-T and other standardization bodies should exchange the opinions of specific topics, concepts and technology, by liaison aspects officially or unofficially. Figure II.1 represents that process:

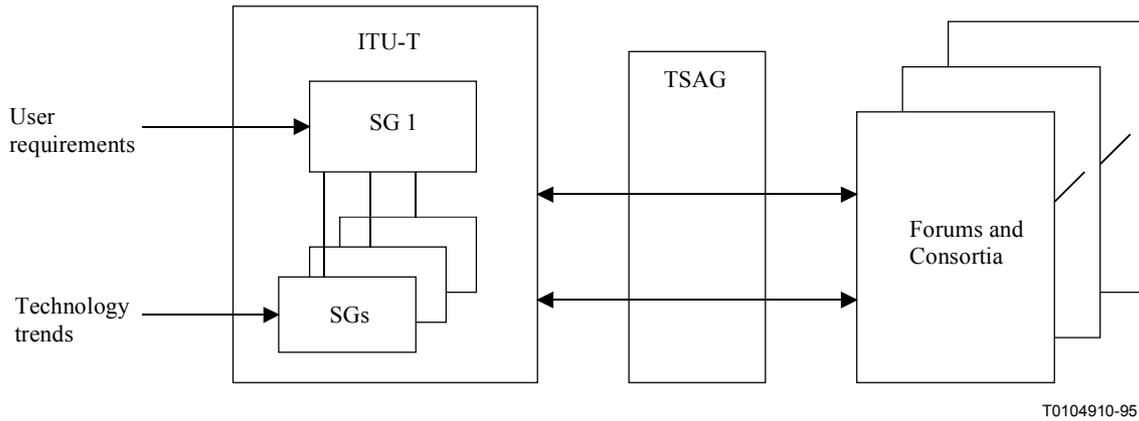


Figure II.1/F.700 – Harmonization of multimedia services and applications

ITU-T RECOMMENDATIONS SERIES

Series A	Organization of the work of the ITU-T
Series B	Means of expression: definitions, symbols, classification
Series C	General telecommunication statistics
Series D	General tariff principles
Series E	Overall network operation, telephone service, service operation and human factors
Series F	Non-telephone telecommunication services
Series G	Transmission systems and media, digital systems and networks
Series H	Audiovisual and multimedia systems
Series I	Integrated services digital network
Series J	Transmission of television, sound programme and other multimedia signals
Series K	Protection against interference
Series L	Construction, installation and protection of cables and other elements of outside plant
Series M	TMN and network maintenance: international transmission systems, telephone circuits, telegraphy, facsimile and leased circuits
Series N	Maintenance: international sound programme and television transmission circuits
Series O	Specifications of measuring equipment
Series P	Telephone transmission quality, telephone installations, local line networks
Series Q	Switching and signalling
Series R	Telegraph transmission
Series S	Telegraph services terminal equipment
Series T	Terminals for telematic services
Series U	Telegraph switching
Series V	Data communication over the telephone network
Series X	Data networks and open system communications
Series Y	Global information infrastructure and Internet protocol aspects
Series Z	Languages and general software aspects for telecommunication systems