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Contents

Foreword

This ETSI Technical Report (ETR) has been produced by the Network Aspects (NA) Technical Committee of the European Telecommunications Standards Institute (ETSI).

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

This ETR defines the types of multimedia services that can be provided to customers using communications networks.

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1 Scope

This ETSI Technical Report (ETR) defines the types of multimedia services that can be provided to customers using communications networks. This ETR proposes one possible method of specifying new multimedia services independently of implementation.

2 References

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

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

[3]   ETS 300 389: "Integrated Services Digital Network (ISDN); Circuit-mode multiple-rate unrestricted 8 kHz structured bearer service category; Service description".

[4]   ETR 084: "Terminal Equipment (TE); Multimedia & Hypermedia Information Retrieval Services (M&HIRS); Investigation of candidate architectures for M&HIRS".

[5]   ETR 160: "Human Factors (HF); Human Factors aspects of multimedia telecommunications".

[6]   ITU-T Recommendation F.740: "Audiovisual interactive services".

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

[8]   CCITT Recommendation G.722: "Testing signal-to-total distortion ratio for 7 kHz audio-codecs at 64 kbit/s Recommendation G.722 connected back-to-back".

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

[10]   ITU-T Recommendation H.221: "Frame structure for a 64 to 1920 kbit/s channel in audiovisual teleservices".

[11]   ITU-T Recommendation H.242: "System for establishing communication between audiovisual terminals using digital channels up to 2 Mbit/s".

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

[13]   ITU-T Recommendation I.113: "Vocabulary of terms for broadband aspects of ISDN".

[14]   CCITT Recommendation I.130: "Method for the characterization of telecommunication services supported by an ISDN and network capabilities of an ISDN".

[15]   CCITT Recommendation I.140: "Attribute technique for the characterization of telecommunication services supported by an ISDN and network capabilities of an ISDN".

[16]   ITU-T Recommendation I.210: "Principles of telecommunication services supported by an ISDN and the means to describe them".

[17]   ITU-T Recommendation I.211: "B-ISDN service aspects".

[18]   ITU-T Recommendation I.362: "B-ISDN ATM adaptation layer (AAL) functional description".

[19]   ITU-T Recommendation I.374: "Framework Recommendation on "network capabilities to support multimedia services"".

[20]   ITU-T Recommendation X.210: "Information technology - Open systems interconnection - Basic reference model: conventions for the definition of OSI services".

[21]   ISO/IEC JTC1/SC29/WG12: "Coded Representation of Multimedia and Hypermedia Information Objects", MHEG Working Draft, Version 0.0, December 1992.

[22]   RACE Common Functional Specification C110: "Methods for the Specification of IBC Services", Issue D, December 1993.

[23]   RACE Common Functional Specification C210: "Service Components", Issue D, December 1993.

[24]   RACE Common Functional Specification C220: "Service Control Elements", Issue D, December 1993.

[25]   RACE Common Functional Specification C230: "IBC Service Tasks", Issue D, December 1993.

[26]   RACE Common Functional Specification C300: "IBC Services", Issue D, December 1993.

3   Definitions, symbols and abbreviations

3.1   Definitions

3.1.1   User information handling

Information of any type always enters a telecommunications system via an input device. Information input automatically leads to information representation. This process usually requires some kind of coding. In the case of a human user, the request for the presentation of this information can usually can be assumed. The presentation device will be selected among the available terminal equipment. Information will always be entered into the telecommunications system for communication or post-processing purposes. In the latter case it needs to be stored somewhere. This can be done inside the terminal equipment or in distributed storage devices.

Figure 1 shows the above user information handling functions. The arrows indicate the direction of the information flows between functions.
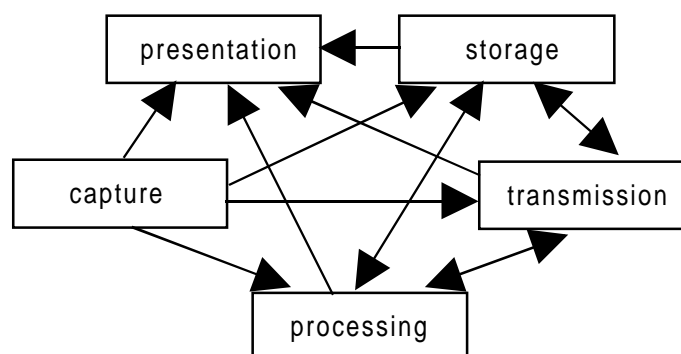

Figure 1: User information handling functions

3.1.2 Media

This subclause contains definitions relating to individual media or types of media.

media: The means by which information is perceived, expressed, stored or transmitted. The term should be accompanied by one of the following expressions: perception media, representation media, presentation media, storage media and transmission media. These types of media are shown in figure 2.
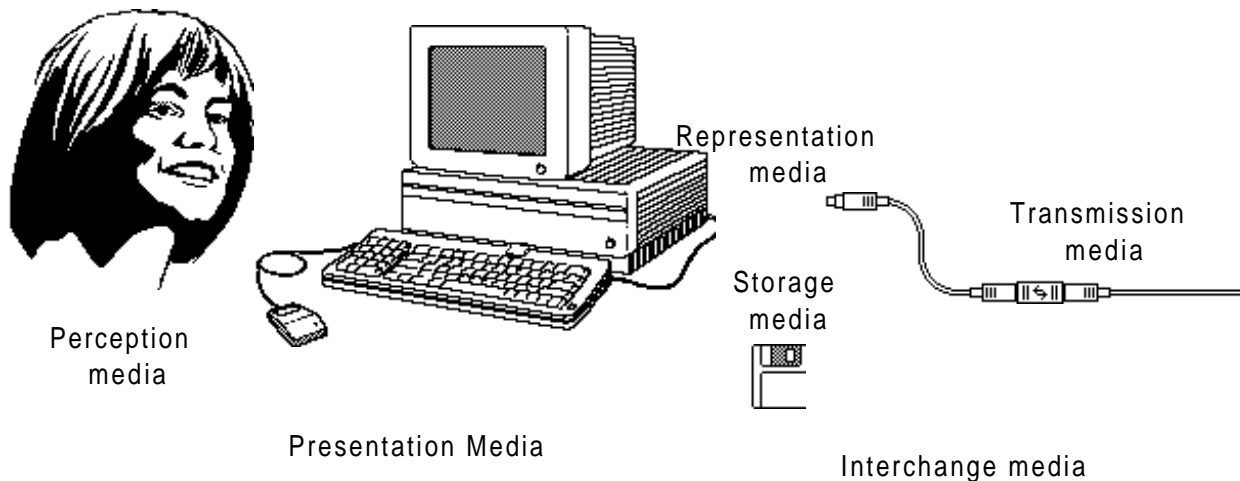

Figure 2: Different types of media

perception media: The nature of the information as perceived by human users (e.g. speech, noise, music, text, drawings, moving scenes).

presentation media: The means used to reproduce information to human users (output device) or to acquire information from human users (input device).

representation media: The type of interchanged information which defines the nature of the information itself as described by its coded form.

interchange media: The means used to interchange information between systems, which can be either a storage medium, a transmission medium or a combination.

storage media: The means used to store the information.

transmission media: The means used to transmit the information.

This ETR is only concerned with the presentation and representation media (the form in which these media are perceived by the user are the concern of ETR 160 [5]). Examples of representation media according to ISO/IEC JTC1/SC29/WG12 [21] are shown in table 1.

Table 1: Examples of representation media

Nature of information	Possible coded forms
characters or text	IA5, ASCII, EBCDIC
graphics	CEPT, NAPLPS (videotex), CAPTAIN (videotex), CGM, etc.
audio	CCITT G711, MIDI, Motion Pictures Experts Group (MPEG) audio standard, etc.
still picture	Joint Photographic Experts Group (JPEG) standard, etc.
audiovisual sequence	CCIR Recommendation 601 + associated audio, MPEG standard, etc.

3.1.3 Combination of media

This subclause contains definitions relating to the combination of media.

multimedia object: A composite object containing objects of at least two different representation media ISO/IEC JTC1/SC29/WG12 [21]. Compare with **Monomedia object**: an object carrying information from only one type.

multimedia representation: The property of handling several types of representation media (ISO/IEC JTC1/SC29/WG12 [21]).

multimedia service: A service in which the interchanged information consists of at least two different information types.

multimedia communication: Communication involving at least two different types of information.

multiple media communication: Communication involving at least two different information types or instances of the same type of information *(awaiting clarification with ISO/IEC JTC1/SC29/WG12 [21])*.

3.1.4 Multimedia services

This subclause contains definitions related to multimedia services. It applies to all classes of services as defined in ITU-T Recommendation I.211 [17]. These can be described using a number of basic elements.

A generic Service Component (SC) is provided for each information type as shown in table 2. Information types are characterised by their basic elements. Basic elements are the smallest parts of information that can be processed separately. Other information types are for further study.

Service Component (SC): A SC provides the communications capabilities for a single information type.

Table 2: SCs related to information types

Information type	Basic element	Service component
character text	character	text
audio (including speech)	tone	audio
geometric graphics	geometric symbol	graphics
raster image	pixel	picture
moving images	picture	video
binary data	binary digit (bit)	data

To be used as part of a service definition, a SC should also have a quality level associated with it. There can be many specific SCs of each type. For example, specific video SCs may be defined with qualities corresponding to the following coding standards:

ITU-T Recommendation H.261 [12] - for p*64 kbit/s;
MPEG1 - up to 1,5 Mbit/s;
MPEG2 - 1,5 to 60 Mbit/s;
MPEG4 - low bit rate video coding < 64 kbit/s.

Service Task (ST): A group of SCs that are handled together as a unit.

STs constitute the first level of decomposition of a multimedia service into modules which can be individually manipulated by the user and/or the service provider. A ST is a means of grouping strongly related SCs into a more efficiently manipulatable entity.

STs are those parts of a telecommunication service which deal with the communication related aspects, rather than the administrative aspects (such as charging), or those related to information type (quality of video signal, etc.).

STs can be used to represent complex information types where synchronisation is required between media. Examples of synchronisation requirements include:

- speech and video   lip synchronisation, location related synchronisation;
- audio and video   lip synchronisation, location related synchronisation;
- text and speech   voice synthesis;
- text and video/pictures/graphics   subtitles synchronised with images.

Examples of STs are given in clause 4.

Service Control Element (SCE): A set of primitives that allow a user to control a telecommunications service.

Examples of SCEs which apply to all services are:

SETUP/RELEASE   (an instance of a service, i.e. a call);
ACTIVATE/DEACTIVATE   (a ST);
ALLOCATE/DEALLOCATE   (a SC);
MODIFY   (SC attribute value(s));
REPORT   (on failure situations, by the service provider to the user);
INVOKE   (a supplementary service).

Other SCEs could be identified for specific services.

3.2   Abbreviations

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

B-ISDN   Broadband Integrated Services Digital Network
CIF   Common Intermediate Format
GIF   Graphic Interchange Format
HDTV   High Definition Television
ISDN   Integrated Services Digital Network
JBIG   Joint Bilevel Image Group
JPEG   Joint Photographic Experts Group
MMMS   Multimedia Mail Service
MPEG   Motion Pictures Experts Group
SC   Service Component
SCE   Service Control Element
SRTV   Standard Resolution TV
ST   Service Task
TIFF   Tag Image File Format

4 Multimedia services description

A multimedia service can be described at 3 levels, as shown in figure 3. Services are composed of STs. STs are used to group SCs.
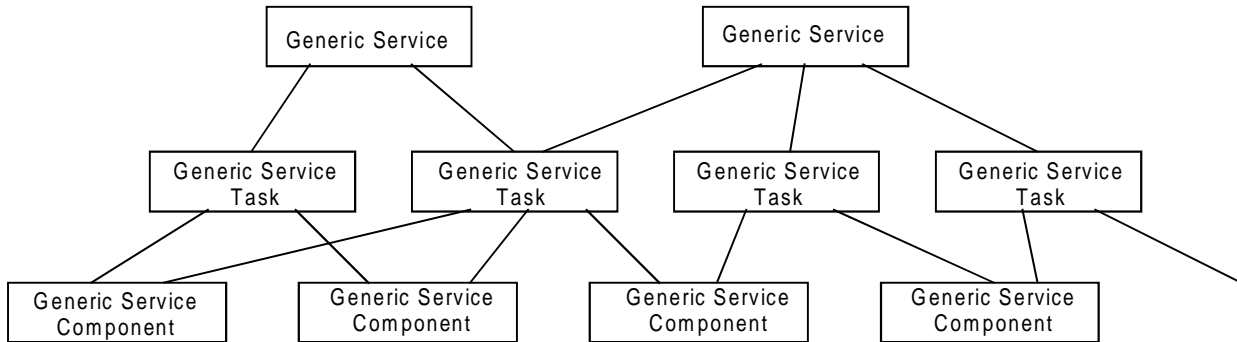
```
┌──────────────────┐                    ┌──────────────────┐
│ Generic Service  │                    │ Generic Service  │
└──────────────────┘                    └──────────────────┘

┌──────────────┐  ┌──────────────┐  ┌──────────────┐  ┌──────────────┐
│Generic Service│  │Generic Service│  │Generic Service│  │Generic Service│
│    Task       │  │    Task       │  │    Task       │  │    Task       │
└──────────────┘  └──────────────┘  └──────────────┘  └──────────────┘

┌──────────────┐  ┌──────────────┐  ┌──────────────┐  ┌──────────────┐
│Generic Service│  │Generic Service│  │Generic Service│  │Generic Service│
│  Component    │  │  Component    │  │  Component    │  │  Component    │
└──────────────┘  └──────────────┘  └──────────────┘  └──────────────┘
```

Figure 3: Building blocks of multimedia service description

4.1 Generic and specific services

Generic services are related to the process of service creation. Generic services are so general that they cannot be directly executed. Consequently, they will not be offered to users. They contain the basic definitions, the pre-defined interrelations, and the methods for the manipulation of the objects they consist of. They are the raw material from which specific services can be derived.

Specific services are services which are offered to a user for invocation. They can be defined in such a way that they provide more or less flexibility to their users. Services which do not allow for any change by the user, and should be taken as they are, are called rigid specific services. Services where a user can choose at least once between different options are called flexible specific services.

4.2 Multimedia service attributes

The static properties of services, STs and SCs can be described using attributes as recommended in ITU-T Recommendation I.210 [16]. However, this needs to be extended to provide tables of attributes at each of the three levels of the structure shown in figure 3. The related lists of attributes are the same for the generic and specific versions of services, STs and SCs.

The static description of a generic service consists of the three attribute lists: one for the service as a whole, one for the STs and one for the SC. All possible values are listed for each attribute.

The static description of a specific service consists of the same three attribute lists. However, each attribute is assigned only a subset of the possible values. These are the subset which the service provider has agreed to provide for the service.

For a rigid specific service all attributes are assigned exactly one value. No change of values is possible. Flexibility is provided by assigning more than one value to at least one attribute and by providing the user with the means to choose between or alter them. Maximum flexibility is provided by a specific service which has all the attribute values of the related generic service. However, this remains a specific service.

The application of this process can lead to the provision of services which exactly meet user requirements.

The attributes at each of the 3 levels are listed below.

> NOTE: Charging principles are outside the scope of this ETR.

Service level:

- mode of establishment (permanent, reserved, on demand);
- operation and maintenance;
- interworking with other services;
- list of supplementary services provided;
- access control;
- list of STs;
- ST interrelations;
- maximum number of each type of optional ST which can be established (multiallocation degree).

ST level:

- symmetry (unidirectional, bi-directional symmetric, bi-directional asymmetric);
- information flow controlling entity (source, sink, source & sink);
- configuration (point-to-point, point-to-multipoint including broadcast and multicast, multipoint-to-point, multipoint-to-multipoint);
- list of SCs;
- SC interrelations;
- maximum number of each type of SC which can be established (multiallocation degree);
- time aspect (real-time, non real-time).

SC level:

- information type;
- traffic descriptor (information transfer rate);
- quality of service descriptor.

> NOTE: The quality attributes at the service and SC levels have to be clarified.

The dominant attributes for STs are symmetry, information flow controlling entity and configuration. This has given rise to the definition of six categories of STs:

1) **Conversing** (bi-directional, source & sink controlled, point-to-point).
   For basic telephony, videotelephony, multimedia Conversing, data communications;

2) **Sending** (unidirectional, source-controlled, point-to-point).
   For data transmission, facsimile, (multimedia) document transfer, etc.;

3) **Receiving** (unidirectional, sink-controlled, point-to-point).
   For data retrieval, (multimedia) library retrieval, video (TV) retrieval;

4) **Distributing** (unidirectional, source-controlled, point-to-multipoint).
   For audio multicasting, facsimile distribution, (multimedia) document distribution, video (TV) distribution;

5) **Collecting** (unidirectional, sink-controlled, point-to-multipoint).
   For surveillance, simultaneous polling (e.g. in a TV programme), etc.;

6) **Conferencing** (bi-directional, source & sink controlled, multipoint).
   Primarily for services where conferencing is the main issue.

Following ITU-T Recommendation I.210 [16], STs and SCs can be mandatory or optionally supported by a service. Mandatory STs are automatically activated at service set up but do not have to be present for the duration of the call. Optional STs can be requested and subsequently activated and deactivated at any time during a call. Mandatory SCs are automatically allocated at ST activation time but do not have to be present throughout the period the ST is activated. Optional SCs can be allocated and deallocated at any time during a call.

4.3 Dynamic service description

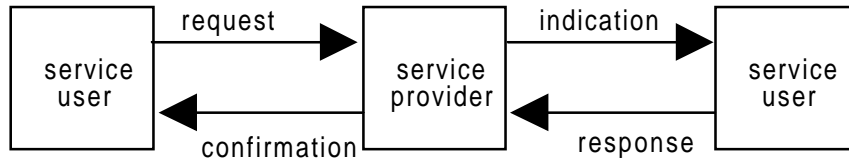The user can interact with the service provider by exchanging SCE primitives as shown in figure 4.

Figure 4: SCE primitives

5 Network capabilities to support multimedia services

There are a number of options for providing a multimedia service. The required network capabilities in terms of bit rates and signalling capabilities should be available to support these services. The options are described in subclauses 5.1 to 5.3.

5.1 A separate connection per SC

The benefit of providing multimedia services using Integrated Services Digital Network (ISDN) is that a separate connection can be used to provide the transfer capabilities for each SC required for the service. Each connection can be of a different connection type and therefore have a different transfer capability. This is shown in figure 5.
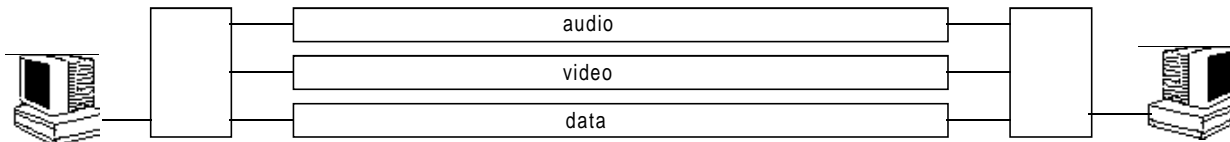

Figure 5: A multimedia service provided using a separate connection for each SC

The quality levels of each information type can be varied independently of the quality levels of the other information types in a multimedia call by varying the SC used. This may result in a change of connection type used for the information type, because the capabilities of that connection type (e.g. maximum bit rate) may be exceeded.

There may be problems with this approach:

1) synchronisation may be required between media. For example: the audio and video streams may require to be synchronised so that lip synchronisation is maintained. If two separate connections are set up for the two media then they may take different routes to the destination and so delays may be considerably different;

2) when a SC is deallocated and a new component allocated, a new connection with the correct capabilities may not actually be available, or may have a different delay to the previously allocated connection.

These problems make synchronisation more difficult to maintain in separately allocated connections.

The multimedia service shown in figure 5 can be provided in a number of ways:

a)   by providing a multimedia "teleservice". Here layers 4-6 and all media synchronisation capabilities are provided as part of the service, although the processing functions may actually be carried out in the terminal or in the network. If a change of information type or quality level requires a new connection to be set up, then this will be done as part of the multimedia service. The call remains the original call, and is not cleared down and a new call set up. The signalling capabilities need to be available in the network to support this;

b)   by providing three separate bearer services, one for each medium. Each bearer service has to provide appropriate information transfer capabilities for the corresponding medium at the required quality level. Capabilities have to be provided in the terminals to process and re-synchronise the individual media streams. If a change of information type or quality level requires an increase in transfer capability, then the corresponding bearer service needs to be cleared down and a new bearer service established. No network signalling is required to be defined. Signalling can be carried out in band or as user-to-user signalling;

c)   by providing three separate teleservices, one appropriate to the transfer of each medium. For example, a telephony service may be used to provide the transfer capability for the audio channel if it has sufficient quality, and a packet data service may be used to provide the transfer capability for the data channel. Here, layers 4-6 are provided as part of each teleservice, but capabilities for re-synchronisation of media streams still have to be provided in the terminal. If a change of information type or quality level means that the corresponding teleservice can no longer support the information type, then one of the calls needs to be cleared down and a new call established. The user will not necessarily be aware of a change of call as this may be carried out entirely by the terminal.

5.2   A separate connection per ST

Rather than providing a separate connection per SC, a separate connection may be provided per ST. This is shown in figure 6. SCs are grouped into STs specifically to provide synchronisation and related aspects, and so this is an appropriate allocation.
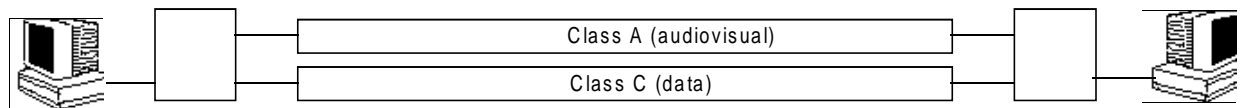

Figure 6: A multimedia service using a separate connection for each ST

This service can be provided using any of the 3 options described in subclause 5.1. One problem with this approach is that the audio and video components can no longer be varied independently. The connection needs to be changed to accommodate new requirements.

5.3   A single connection for all SCs

A multimedia service can also be supported using a single connection for all media, as shown in figure 7. This single connection can actually be composed of a number of similar connections (e.g. a number of 64 kbit/s ISDN channels) used to provide the bit rate required for the connection.
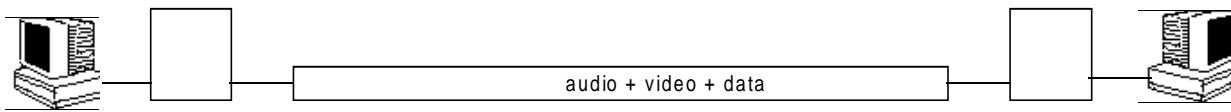

Figure 7: A multimedia service supported using a single connection for all media

An appropriate bearer service is provided. The media are multiplexed and demultiplexed in the terminals or the terminal adapters. The network simply has to provide the bit rate and response times necessary to support the media "bundle".

The bearer service needs to provide one of the following options:

a)   provide the network capabilities to handle the most demanding combination of media likely to be required by the user or application. This is likely to be the most expensive solution for the user, as network capabilities may have to be provided which are never used;

b)   only allow changes to media types and quality levels that will result in combinations of bit rates up to a set limit. This may not meet user or application requirements, and if this happens, the user or application will have to clear down the service and set up a new one with higher maximum bit rate limits;

c)   be able to change to a new bearer with new capabilities, if a change of user or application requirements results in a change of information type or quality level. In this case the bearer needs to be cleared down and a new bearer established. This is similar to the situation in 1b, but is more likely to be apparent to the user because it will affect all media, not just those being changed. The time taken by the terminal to clear down and establish a new bearer may exceed the buffering capacity in the terminal for media streams that are already established. This may, for example, result in a break in the audio or video transmission while a new bearer is established;

d)   provide a true variable bit rate capability, where the bit rate can be varied dynamically to meet application requirements.

Option d) may provide the most flexible solution to meeting a wide range of user and application requirements.

Annex A: Scenario for the use of the ST as part of a service description

A.1 Scenario from the user's viewpoint

User A and user B both have multimedia terminals:

a) user A calls user B using a multimedia service. User B answers the call.

b) after a few minutes talking (using audio only), user B asks user A: "Can we switch to videotelephony?". User B agrees and they switch to both way videotelephony (audio and video).

c) after further discussion, user A asks: "Have I shown you the video from my last summer holidays?". User B says "no" and agrees to see it. Some more facilities are added by pressing some buttons on their multimedia terminals and suddenly, in the top left corner on user B's screen, where user A's picture used to be, the first pictures of her videotape appear. This contains audio (including speech and music) and video. While watching the video they continue talking to each other.

d) at the end of the videotape, user A pushes a button, and the window on user B's screen disappears.

e) user A comes to the reason for the call: "I'm planning my next holiday. If I show you another video, could I browse through your holiday database? I need some information on holiday destinations." user B agrees and asks: "Are you able to browse the database by yourself?". User A agrees that she can browse user B's database without help. Therefore, they say good bye for now and the videotelephony part of the call stops.

f) user A now uses multimedia retrieval functions which are part of the multimedia service to access user B's database.

g) some time later, user B's multimedia terminal alerts again. User A says: "I've finished now. I found all the information I needed. Thank you very much".

h) they say good bye and user A clears down the call.

A.2 STs and SCs used in this scenario

Figure A.1 shows the sequence of activation of STs and allocation of SCs during this call, as described below:

a) user A called user B. The SETUP SCE was used to establish the call. This included the activation of the CONVERSING ST (the configuration is point-to-point, the information flow is controlled by both sink and source) using the AUDIO SC only, at the beginning;

b) some time later, the VIDEO SC was added to the CONVERSING ST (using the ALLOCATE SCE). The AUDIO and VIDEO SCs required synchronisation which was dealt with "inside" the CONVERSING ST;

c) when user A showed user B the video of her holidays, a second ST was activated (ACTIVATE SCE), namely the SENDING ST (point-to-point configuration, information flow controlled by the source) using the AUDIO and VIDEO SCs, with synchronisation requirements again. The CONVERSING ST was also active throughout the viewing of the videotape;

d) at the end of the video, the DEACTIVATE SCE was used to deactivate the SENDING ST;

e) when they agreed that user A could browse user B's database, the CONVERSING ST was deactivated;

f) the RETRIEVE ST was activated (point-to-point configuration, information flow controlled by the source) using all types of SCs because user B's database was a multimedia one. Those SCs which were needed at a certain point in time were allocated using the ALLOCATE SCE and deallocated using the DEALLOCATE SCE;
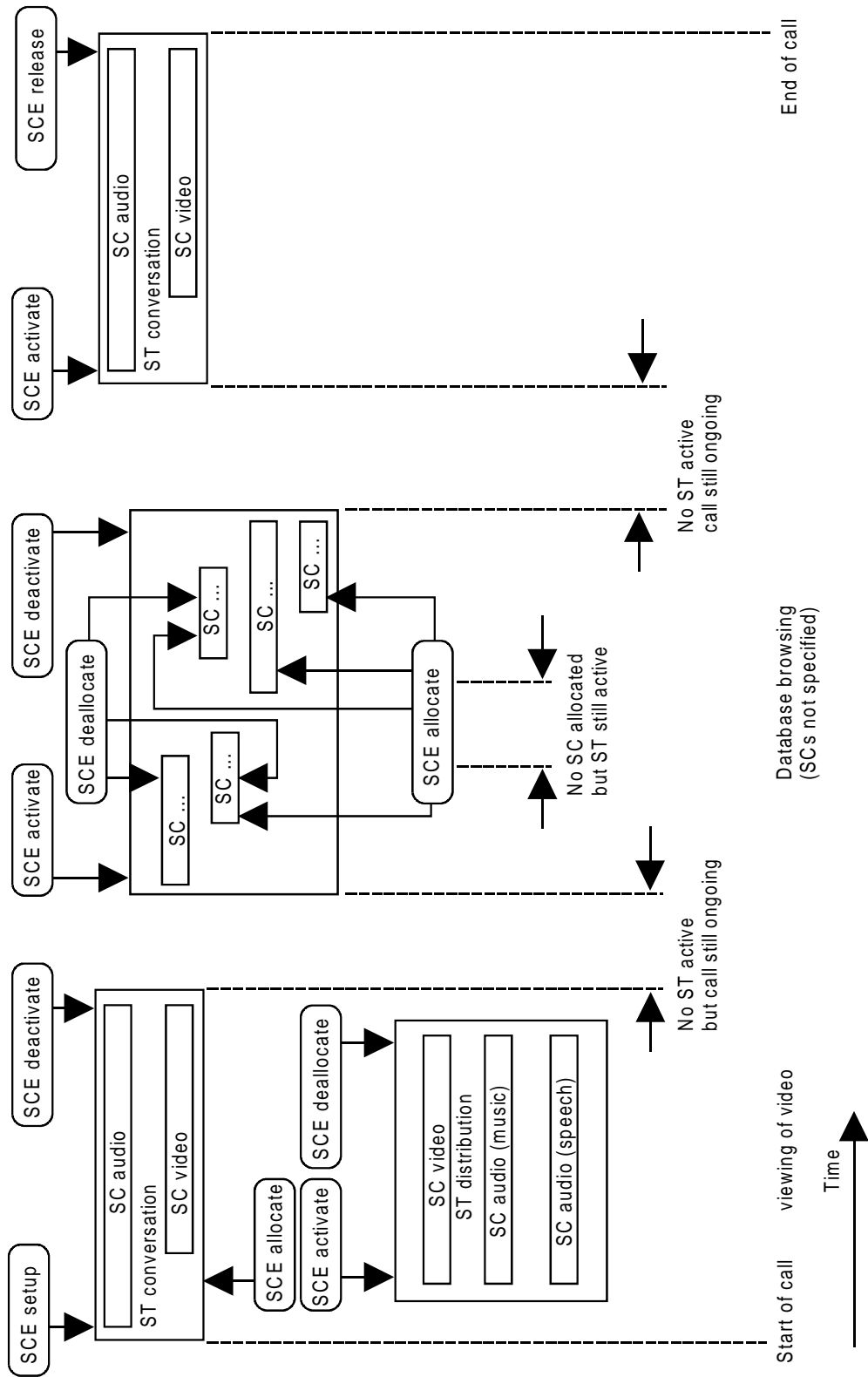
Figure A.1: Sequence of STs and SCs

g)   when user A finished browsing, she deactivated the RETRIEVE ST using the DEACTIVATE SCE. The CONVERSING ST was activated again in order to say thank you and good bye to user B. In this case, both AUDIO and VIDEO SCs were allocated automatically when the ACTIVATE SCE was used because they were mandatory for the CONVERSING ST;

h)   at the end, the whole call was cleared down using the RELEASE SCE. This included the deallocation of the AUDIO and VIDEO SCs and the deactivation of the CONVERSING ST to which they belonged. Charging was completed.

Annex B: Examples of SCs, STs and party types

B.1 Examples of generic SCs

B.1.1 Audio

Prose definition and description.

The Audio SC provides the communications capabilities required for information of the type audio. Audio includes speech and music.

Static aspects (static description):

- information type: Audio (including speech);

- traffic descriptor: for further study;

- quality of service descriptor: for further study;

- coding standards:

 - CCITT Recommendation G.711 [7];
 - CCITT Recommendation G.722 [8];
 - CCITT Recommendation G.728 [9];
 - ISO/IEC CD13818-3 (MPEG 2 audio);
 - MQ;
 - NICAM;
 - MUSICAM;
 - 16 bit/sample at 44 kHz;
 - 16 bit/sample at 48 kHz.

Dynamic aspects (dynamic description).

The Audio SC is controlled using the following SCEs:

- **Allocate:** which allows the user to add another SC to an existing ST;
- **Deallocate:** which allows the user to delete a SC from a ST;
- **Modify:** which allows the user to change a value of a SC attribute.

B.1.2   Video

Prose definition and description.

The Video SC provides the communications capabilities required for information of the type video.

Static aspects (static description):

- information type: video.

- traffic descriptor: for further study.

- quality of service descriptor: for further study.

- coding standards:

    - ITU-T Recommendation H.261 [12]:
            Common Intermediate Format (CIF): 352 x 288 pixel;
            Quarter CIF: 176 x 288 pixel;
    - MPEG1;
    - MPEG2:
            Generic: 214 x 214 pixel;
            High: 1 920 x 1 152 pixel;
            High 1 440: 1 140 x 1 152 pixel;
            Main: 720 x 576 pixel;
            Low: 352 x 288 pixel;
    - CCIR 601.

Dynamic aspects (dynamic description).

The Video SC is controlled using the following SCEs:

-   **Allocate** which allows the user to add another SC to an existing ST;
-   **Deallocate** .which allows the user to delete a SC from a ST;
-   **Modify** which allows the user to change a value of a SC attribute.

B.1.3   Text

Prose definition and description.

The Text SC provides the communications capabilities required for information of the type character text.

Static aspects (static description):

- information type: character text;

- traffic descriptor: for further study;

- quality of service descriptor: for further study;

- coding standards:

    - SGML-86 (Standard Generalised Markup Language);
    - ODA-88 (Office Document Architecture and Interchange Format) *IS8613 from PIRA report*;
    - DTAM (Document Transfer, Access and Manipulation).

Dynamic aspects (dynamic description).

The Text SC is controlled using the following SCEs:

- **Allocate** which allows the user to add another SC to an existing ST;
- **Deallocate** .which allows the user to delete a SC from a ST;
- **Modify** which allows the user to change a value of a SC attribute.

B.1.4 Graphics

Prose definition and description.

The Graphics SC provides the communications capabilities required for information of the type vector or geometric graphics as opposed to bit map graphic images.

Static aspects (static description):

- information type: geometric graphics;

- traffic descriptor: for further study;

- quality of service descriptor: for further study;

- coding standards:

    - GKS-85 and GKS-88 (Graphical Kernel System and its 3-dimensional extension);
    - PHIGS-87 (Programmers Hierarchical Interactive Graphics System);
    - CGI-86 (Computer Graphics Interface);
    - CGM-87 (Computer Graphics Metafile).

Dynamic aspects (dynamic description).

The Graphics SC is controlled using the following SCEs:

- **Allocate** which allows the user to add another SC to an existing ST;
- **Deallocate** .which allows the user to delete a SC from a ST;
- **Modify** which allows the user to change a value of a SC attribute.

B.1.5 Picture

Prose definition and description.

The Picture SC provides the communications capabilities required for information of the type picture, sometimes referred to as bit-map images or raster graphics.

Static aspects (static description):

- information type: raster image;
- traffic descriptor: for further study;
- quality of service descriptor: for further study;
- coding standards:

    - facsimile group 3 & 4 (bilevel);
    - Graphic Interchange Format (GIF) (CompuServe proprietary standard);
    - Joint Bilevel Image Group (JBIG) (intended to replace Facsimile Group 3/4);
    - JPEG (colour);
    - Photo-CD (Kodak proprietary standard);
    - Tag Image File Format (TIFF).

Dynamic aspects (dynamic description).

The Picture SC is controlled using the following SCEs:

- **Allocate** which allows the user to add another SC to an existing ST;
- **Deallocate** .which allows the user to delete a SC from a ST;
- **Modify** which allows the user to change a value of a SC attribute.

B.1.6 Data

Prose definition and description.

The Data SC provides the communications capabilities required for information of the type data. The information type data covers all kind of application oriented information which is not directly perceivable by human users, i.e. the type of which is not included in audio, video, text, picture, and graphics.

Static aspects (static description):

- information type: binary data;

- traffic descriptor: for further study;

- quality of service descriptor: for further study;

- coding standards: for further study.

Dynamic aspects (dynamic description).

The Data SC is controlled using the following SCEs:

- **Allocate** which allows the user to add another SC to an existing ST;
- **Deallocate** .which allows the user to delete a SC from a ST;
- **Modify** which allows the user to change a value of a SC attribute.

B.2   Examples of generic STs

B.2.1   Conversing

Prose definition and description.

The generic ST Conversing provides the communications capabilities required for point-to-point real time exchange of information between two users. The users may be humans or machines. The information may be monomedium as well as multimedia. Depending on the choice of SCs, this ST could be used for basic telephony services, videotelephony services, multimedia conversational services, or data communications services.

Static aspects (static description):

-    symmetry: bi-directional;

-    information flow controlling entity: source & sink;

-    configuration: point-to-point;

-    mandatory SCs: all are possible;

-    optional SCs: all are possible;

-    SC interrelations:

    -    symmetry between SC of the same type to allow for bi-directionality;
    -    synchronisation between:
        -    audio and video (lip synchronism, location related synchronism);
        -    audio and text (voice synthesis);
        -    text and video/picture/graphics (subtitles synchronised with images);
    -    multiallocation degree: restricted only by access/network capabilities.

Dynamic aspects (dynamic description).

All STs are controlled using the following SCEs:

-    **Activate** which allows the user to add another ST to an already existing call;
-    **Deactivate** which allows the user to delete an existing ST from an existing call;
-    **Allocate** which allows the user to add another SC to an existing ST;
-    **Deallocate** which allows the user to delete a SC from a ST.

The generic ST Conversing cannot be controlled using any other SCE.

B.2.2 Conferencing

Prose definition and description.

The generic ST Conferencing provides the communications capabilities required for point-to-point real time exchange of information between multiple users. The users may be humans or machines. The information may be monomedium as well as multimedia. The primary use of specific STs of this type will probably be in services where conferencing is the main issue.

Static aspects (static description):

- Symmetry: bi-directional;

- Information flow controlling entity: source & sink;

- Configuration: multipoint-to-multipoint, centralised/decentralised;

- Mandatory SCs: all are possible;

- Optional SCs: all are possible;

- SC interrelations:

    - symmetry between SC of the same type to allow for bi-directionality;
    - synchronisation between:
        - audio and video (lip synchronism, location related synchronism);
        - audio and text (voice synthesis);
        - text and video/picture/graphics (subtitles synchronised with images);
    - multiallocation degree: restricted only by access/network capabilities.

Dynamic aspects (dynamic description).

All STs are controlled using the following SCEs:

- **Activate** which allows the user to add another ST to an already existing call;
- **Deactivate** which allows the user to delete an existing ST from an existing call;
- **Allocate** which allows the user to add another SC to an existing ST;
- **Deallocate** which allows the user to delete a SC from a ST.

The generic ST Conferencing can be additionally controlled using the following SCEs:

- **Main** allows for the change of the property "main user" in a conference;
- **Join** allows a user to contact the main user in order to be added to a conference;
- **Leave** allows a user who is not the main user to leave a conference;
- **Add** allows the main user to add (invite) another user to a conference;
- **Drop** allows the main user to make a user leave a conference.

B.2.3   Sending

Prose definition and description.

The generic ST Sending provides the communications capabilities required for point-to-point real time sending of information from one user to another.

Static aspects (static description):

-        symmetry: unidirectional;

-        information flow controlling entity: source;

-        configuration: point-to-point;

-        mandatory SCs: all are possible;

-        optional SCs: all are possible;

-        SC interrelations: synchronisation is possible;

-        multiallocation degree: restricted only by access/network capabilities.

Dynamic aspects (dynamic description).

All STs are controlled using the following SCEs:

-   Activate which allows the user to add another ST to an already existing call;
-   Deactivate which allows the user to delete an existing ST from an existing call;
-   Allocate which allows the user to add another SC to an existing ST;
-   Deallocate which allows the user to delete a SC from a ST.

The generic ST Sending cannot be controlled using any other SCE.

B.2.4   Distributing

Prose definition and description.

The generic ST Distributing provides the communications capabilities required for the sending of information from one user to (more than one) other users. The users may be humans or machines. The information may be monomedium as well as multimedia. This ST could be used for multicasting, facsimile distribution, (multimedia) document distribution, video (TV) distribution services.

Static aspects (static description):

-        symmetry: unidirectional;
-        information flow controlling entity: source;
-        configuration: point-to-multipoint;
-        mandatory SCs: all are possible;
-        optional SCs: all are possible;
-        SC interrelations: synchronisation is possible;
-        multiallocation degree: restricted only by access/network capabilities.

Dynamic aspects (dynamic description).

All STs are controlled using the following SCEs:

- **Activate** which allows the user to add another ST to an already existing call;
- **Deactivate** which allows the user to delete an existing ST from an existing call;
- **Allocate** which allows the user to add another SC to an existing ST;
- **Deallocate** which allows the user to delete a SC from a ST.

The generic ST Distributing cannot be controlled using any other SCE.

B.2.5 Retrieval

Prose Definition and Description.

The generic ST Retrieval provides the communications capabilities required for point-to-point retrieval of information from one user to another user. The users may be humans or machines. The information may be monomedium or multimedia. This ST could be used for data transmission, facsimile, and (multimedia) document transfer services.

Static aspects (static description):

- symmetry: unidirectional;

- information flow controlling entity: sink;

- configuration: point-to-point;

- mandatory SCs: all are possible;

- optional SCs: all are possible;

- SC interrelations: synchronisation is possible;

- multiallocation degree: restricted only by access/network capabilities.

Dynamic aspects (dynamic description).

All STs are controlled using the following SCEs:

- **Activate** which allows the user to add another ST to an already existing call;
- **Deactivate** which allows the user to delete an existing ST from an existing call;
- **Allocate** which allows the user to add another SC to an existing ST;
- **Deallocate** which allows the user to delete a SC from a ST.

The generic ST Retrieval cannot be controlled using any other SCE.

B.2.6   Collection

Prose definition and description.

The generic ST Collection provides the communications capabilities required for the collection of information from one user to (more than one) other users. The users may be humans or machines. The information may be monomedium or multimedia. This ST could be used for surveillance, and simultaneous polling services.

Static aspects (static description):

- symmetry: unidirectional;

- information flow controlling entity: sink;

- configuration: multipoint-to-point;

- mandatory SCs: all are possible;

- optional SCs: all are possible;

- SC interrelations: synchronisation is possible;

- multiallocation degree: restricted only by access/network capabilities.

Dynamic aspects (dynamic description).

All STs are controlled using the following SCEs:

- **Activate** which allows the user to add another ST to an already existing call;
- **Deactivate** which allows the user to delete an existing ST from an existing call;
- **Allocate** which allows the user to add another SC to an existing ST;
- **Deallocate** which allows the user to delete a SC from a ST.

The generic ST Collection cannot be controlled using any other SCE.

Annex C: Network-dependent provision of multimedia services

C.1 Narrowband ISDN provision

The only method of providing a multimedia service using the current series of CCITT recommendations on ISDN is that described in subclause 5.3. Here a single connection is used for all media, although this can actually be composed of a number of similar 64 kbit/s ISDN channels to provide the bit rate required for the overall connection as shown in figure C.1.
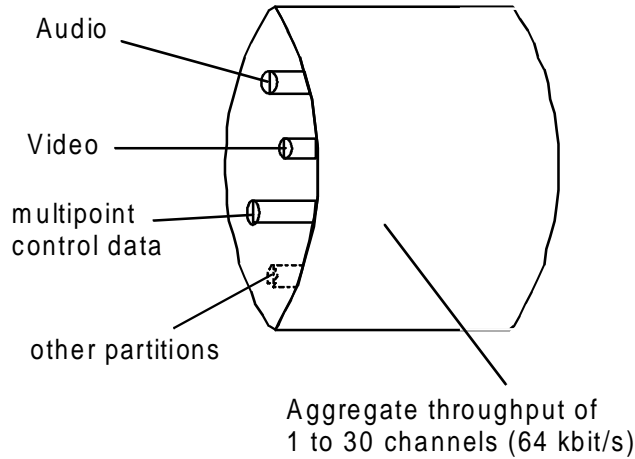

**Figure C.1: Integration of multimedia in 64 kbit/s channels framed according to
ITU-T Recommendation H.221 [10]**

A multimedia transmission capability can be provided using the CCITT H series recommendations, as shown in figure C.2. Video SCs are coded using the ITU-T Recommendation H.261 [12] video coding recommendation. Audio SCs are coded using CCITT Recommendations G.711 [7] or G.722 [8]. These are then multiplexed on to a single connection (which can be a number of 64 kbit/s ISDN channels) using ITU-T Recommendation H.221 [10].
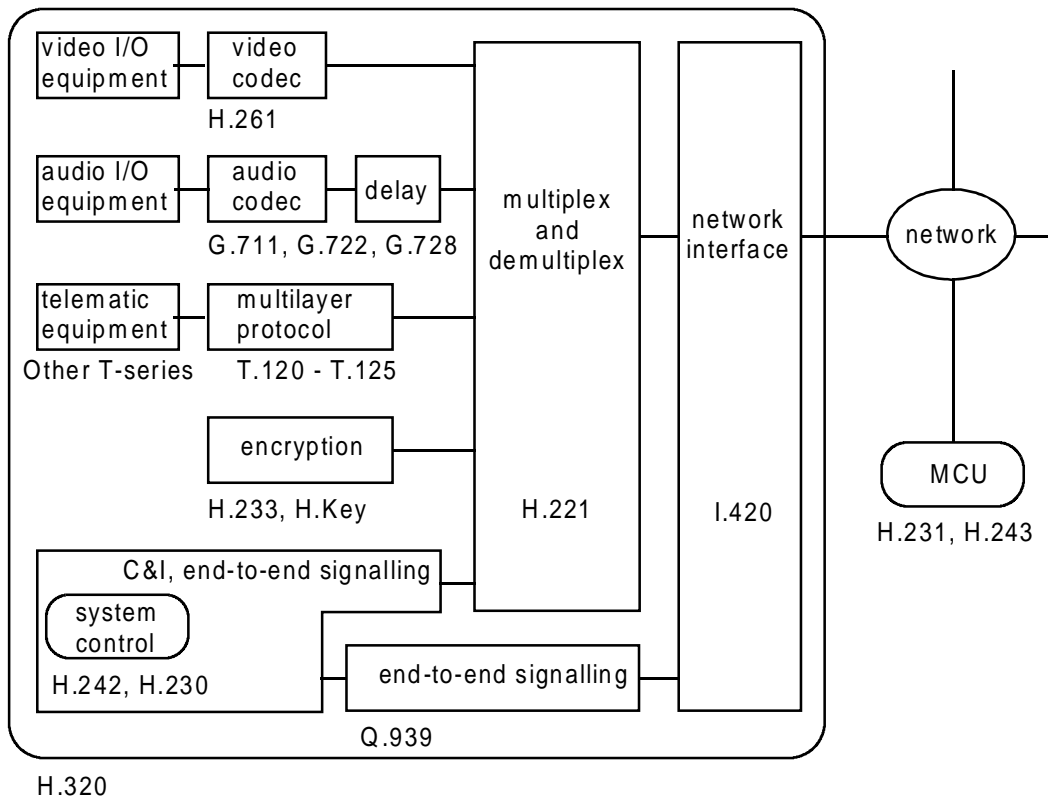

Figure C.2: ITU-T Recommendations used to provide an ISDN multimedia transmission capability

The frame structure defined in ITU-T Recommendation H.221 [10] allows:

- synchronisation of multiple 64 kbit/s channels up to 1 920 kbit/s;

- dynamic subdivision of the overall transmission bit rate into lower rates (e.g. for audio, video and data).

Differential time delays between 64 kbit/s channels (e.g. caused by different routeings) of up to 1,28 seconds can be compensated. This allows multiplexing of various SCs at the sending terminal and demultiplexing at the receiving terminal without differential time delays. Synchronisation between media is therefore preserved, and any buffering necessary at the receiving terminal is minimised.

Once the 64 kbit/s network connections have been set up, synchronisation and establishment of the required subchannels can be initiated by a framing procedure. The configuration can be modified at 20 ms intervals (e.g. to add or drop SCs). However, additional delays have to be taken into account if the overall transmission rate needs to be increased. In this case additional 64 kbit/s network connections need to be set up. Table C.1 gives some examples of potential bit rate allocation.

Table C.1: Potential bit rate allocations

overall transmission rate	voice	data + video	control
64 kbit/s	16 kbit/s (3,1 kHz)	46,4 kbit/s	1,6 kbit/s
128 kbit/s	48 kbit/s (7 kHz)	76,8 kbit/s	3,2 kbit/s
128 kbit/s	16 kbit/s (3,1 kHz)	108,8 kbit/s	3,2 kbit/s

Depending on the application to be supported, the standard spatial resolution of 144 x 180 pixels can be increased to 288 x 360 pixels if this option is supported by both terminals.

According to table C.1, the remaining bit rate can be allocated for coding of the video component. If there is a lot of movement in the picture the transfer rate allocated to the video component may be too small. The result may be that pictures are discarded or distortions (artefacts) may occur.

C.2 Broadband Integrated Services Digital Network (B-ISDN) provision

Multimedia services can be provided over B-ISDN using various methods.

B-ISDN will also have more flexibility to provide variable bit-rate connections. To change the bit-rate of a B-ISDN connection will not require the clearing down of the original connection and the setting up of a new one. The bit-rate of a B-ISDN variable bit-rate connection can more easily be changed to meet new requirements. For example, in B-ISDN, if the user requires higher quality video in a multimedia service, then a Standard Resolution Television (SRTV) SC can be deallocated and a High Definition Television (HDTV) SC allocated instead. In the separate connection per SC solution (subclause 5.1) this may require the corresponding connection to be released and a new connection with the appropriate capabilities allocated instead, to ensure that the higher bit rates required are available. In the solution involving a single connection for all SCs (subclause 5.3), the use of a variable bit rate service (option d) will allow the bit rate to be increased without clearing down the original connection.

C.3 PSTN provision

The only method of providing a multimedia service using the PSTN is that described in subclause 5.3. Here a single connection needs to be used for all media and a modem used to convert digital media into analogue form prior to transmission.

All SCs listed in clause 3 can be transmitted over this type of network, up to the limitations of the available bit rate.

Annex D: Examples of generic service descriptions

D.1 Multimedia conferencing service

Prose definition and description.

The generic Multimedia Conference Service (MMCS) is a multimedia, multiparty, multitasking service that provides two or more geographically separate parties (users or groups of users) with the capability to exchange any type of information.

Users can be typically either multiple users, grouped in conference rooms with their equipment (audio and video systems, facsimile, PC, etc.) or single users with their multimedia workstations. Each user can access the service via the service provider.

This generic service will lead to a number of specific services, such as:

- audio conference;
- audiographic teleconference;
- videoconference;
- tele-education.

Static aspects (static description):

- mode of establishment: permanent; reserved; on demand following a request made by either a particular user; called main user (add-on conference); or by the conference participants (meet-me conference);

- interworking with other services: interworking with multimedia point-to-point conversational services, video mail and video retrieval services should be possible;

- list of supplementary services provided: (some of) the following (or/and other) supplementary services could be provided to the users of the MMCS:

  - direct dialling in;
  - multiple subscriber number;
  - calling user identification presentation/restriction;
  - connected user identification presentation/restriction;
  - call transfer (not by the main user);
  - call forwarding (unconditional/no reply/busy);
  - call deflection;
  - call waiting;
  - call hold;
  - completion of call/SC allocation to busy subscriber;
  - closed user group;
  - advice of charge;
  - reverse charging;
  - user hunting;

- mandatory STs: conferencing;

- optional STs: distributing, sending, conversing, retrieval, collection. Some of them may be mandatory;

- ST interrelations: sequential/simultaneous/mutually exclusive;

- multiallocation degree: maximum number of each type of ST which can be established.

Dynamic aspects (dynamic description).

The dynamic aspects of MMCS can be described by the use of the following SCEs:

- **Setup** which allows the user to set up a specific service;
- **Release** which allows the user to close down an existing specific service;
- **Activate** which allows the user to add another ST to an already existing call;
- **Deactivate** .which allows the user to delete an existing ST from an existing call;
- **Allocate** which allows the user to add another SC to an existing ST;
- **Deallocate** .which allows the user to delete a SC from a ST;
- **Main** allows for the change of the property "main user" in a conference;
- **Join** allows a user to contact the main user in order to be added to a conference;
- **Leave** allows a user who is not the main user to leave a conference;
- **Add** allows the main user to add (invite) another user to a conference;
- **Drop** allows the main user to make a user leave a conference.

D.2 Multimedia mail service

Prose definition and description.

The generic Multimedia Mail Service (MMMS) is a multimedia, multiparty and multitasking service that provides users with the capability for exchanging any type of information on a store-and-forward basis.

Users are typically single users with their multimedia workstations. Each user can access the service via the service provider.

This service uses the generic STs sending and retrieve only. The configuration is point-to-point. Multipoint effects can be achieved by some internal or hidden distribution by the service provider because a mailing list is sent to the service provider as part of the message.

Static aspects (static description):

- mode of establishment: on demand following a request made by a particular user;
- interworking with other services: interworking with the telefax service should be possible;
- list of supplementary services provided: for further study;
- mandatory STs: none;
- optional STs: Sending, Retrieval;
- ST interrelations: none;
- multiallocation degree: restricted only by access/network resources.

Dynamic aspects (dynamic description).

The dynamic aspects of MMMS can be described by the use of the following SCEs:

- **Setup** which allows the user to set up a specific service;
- **Release** which allows the user to close down an existing specific service;
- **Activate** which allows the user to add another ST to an already existing call;
- **Deactivate** .which allows the user to delete an existing ST from an existing call;
- **Allocate** which allows the user to add another SC to an existing ST;
- **Deallocate** .which allows the user to delete a SC from a ST.

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