CCITT SGXV
Working Party XV/1
Experts Group for ATM Video Coding

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SOURCE : WPXVIII/5 (Melbourne meeting, 2-13 December 1991)
TITLE : LIAISON STATEMENT TO EXPERTS GROUP FOR ATM VIDEO CODING IN SGXV
SUBJECT: Network Capabilities for the Support of Multimedia Services

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SOURCE: Special Rapporteur Broadband and Multimedia Services

TITLE: Liaison Statement to Experts Group for ATM Video Coding in SGXV

QUESTIONS : 3.4/XV, 2, 13, 22/XVIII

SUBJECT : Network Capabilities for the Support of Multimedia Services

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1. Introduction

WPXVIII/5

~~Study Group XVIII~~ reviewed the liaison received from the Expert's Group for ATM Video Coding in SGXV. SGXVIII has recently commenced the development of a Recommendation relating to network capabilities for the support of multimedia services and a copy of the current draft of this document is attached for your information and comment.

It is intended that the information contained in Draft Recommendation I.37y "Network Capabilities for the Support of Multimedia Services" provide an initial description of the nature of the possible synergism between multimedia information coding and network capabilities. SGXVIII is of the opinion that the text relating to multimedia service support in I.37y and the IVS Baseline document is essentially complementary and notes the scope for fruitful interactions between the editing groups responsible for each document.

2. Interworking User Multiplexed Signals from the 64 kbit/s ISDN with those of VC Multiplexed Signals in the B-ISDN

IN ASSOCIATION WITH WPXVIII/2

Studies of network and service interworking have commenced in SGXVIII, however the issue of interworking multiplexed signals incorporating user-user signalling has yet to be addressed. It is therefore not yet possible to advise on the preferred arrangements. One observation is that if the cost of network adaptation for such services precludes such an adaptation on a per-terminal basis, it is possible that shared interworking resources could be located within the network. This issue is for further study and is not included in the scope of Draft Recommendation I.5xx "General Arrangements for Interworking between B-ISDN and 64kbit/s based ISDN".

For the longer term, Section 5.2 of I.37y refers to the possibility of supporting user-user signalling through the call controller. This issue is for further study within SGXVIII.

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3. Resource Allocation Renegotiation Arrangements

TO BE PROVIDED BY WPXVIII/8-7, together with the observation that further study is required to determine the resource allocation performance required across a range of possible multimedia services. This requirement has been noted in both the IVS Baseline document and Draft Recommendation I.37y. The note has been made in terms of both the specific needs of the Experts Group on ATM Video Coding and the more general requirements of other groups developing coding for multimedia services.

4. Multimedia Synchronisation.

IN ASSOCIATION WITH WPXVIII/8

SGXVIII is also considering the implications of cell based media multiplexing, as shown in Section 6.2 of Draft Recommendation I.37y. This is not the only option under consideration within SGXVIII and it is possible that distributed service logic could require the simultaneous support of a multiple multiplexing approaches.

Several issues related to media multiplexing are raised in the SGXV liaison:

• *the use of virtual paths to ensure zero cross media delay* : Recommendation I.150 describes B-ISDN ATM functional characteristics, including the QOS concepts applicable to Virtual Channel and Virtual Path connections. While a Virtual Path may carry Virtual Channels of various QOS classes, the Virtual Path QOS is always that of the most demanding Virtual Channel. This means all services must be supported at the QOS required by the most sensitive service. No cross media delay arises however, since all media use a common physical path to cross the network.

• *the requirement for bounded cross media delay* : using network intelligence to associate and manage the various components of a multimedia communication provides greater flexibility and potentially greater user efficiency in managing media. The need for a bounded cross media delay and the associated requirement to provide associated management of all components of a multimedia call has been noted in I.37y. Further study is required however to determine the means by which such call and service management might be achieved and its relationship to other networking concepts e.g. Intelligent Network (IN) approaches.

• *media identification at call establishment and possible in-call modification* : further study is required to determine the exact mechanisms for media identification. In respect of possible approaches to compatibility checking, however two general observations can be made -

1. At call establishment and during in-call modification it will be possible to identify the individual media components of a multimedia call. In the case of the B-ISDN, for example, each media component could be associated with an specific Virtual Channel/Virtual Path identifier.

2. Extensions of existing compatibility checking concepts suggest a call will be accepted only after checking a number of conditions. Such conditions could include screening of incoming calls, terminal compatibility, codec compatibility. The degree of compatibility checking required is for further study.

• *the support of low bit rate services using VC based multiplexing* : SGXVIII notes the concern of SGXV that low bit rate, delay sensitive services could be disadvantaged by cell based multiplexing. While partial filling of cells is a possible solution, it is recognised that the cost effectiveness of this solution is strongly dependent on the manner in which administrations charge for communication facilities. It is not possible to comment on the relative cost of bandwidth and control for individual Virtual Channels, responsive and cost effective support of low bit rate, real-time information streams may require some degree of user multiplexing. Study Group XV's concern has been noted in both the IVS Baseline document and draft Recommendation I.37y. This subject is for further study.

4 -30- TD

Draft Recommendation I.37y

"Network Capabilities to Support Multimedia Services"

Version - December. 1991

* This material has been partially sourced from the Dec1990 Multimedia Baseline document

" Network Capabilities to Support Multimedia Services"

Version : December 1991

1.Introduction

Multimedia services involve the integrated delivery and control of multiple information types within a single service e.g. video, audio, graphics and text. Multimedia communication will become increasingly important as multimedia applications become more prominent in workstation and personal communications environments.

The network capabilities identified in this recommendation represent those considered necessary for the support of multimedia communications within the Broadband Integrated Services Digital Network (B-ISDN). Detailed call and service definitions will appear in other recommendations. The capabilities described in this recommendation are in principle applicable to any network, however their implementation will strongly reflect the nature of the underlying network technology.

Broadband ISDN (B-ISDN) will be required to support the integrated delivery of interactive and distribution services in the 1990's and beyond. B-ISDN will enable network providers to offer many new services. This network is characterised by :

- flexible transmission and switching of a diverse range of services
- integrated support and delivery of services based on commonality of transport, switching and control
- cell-based information transfer

Interest in multimedia services has been stimulated by rapid developments in information technology, and resulted in experimentation with proprietary multimedia services supported by private networks. Interconnecting these multimedia islands, without impairing the quality, range or flexibility of the multimedia services requires the network capabilities of the B-ISDN to be matched to the functions required.

2.Definition of Terms

2.1 General

Multimedia services are those involving at least two different information types.The following concepts apply in relation to network capabilities required for the support of multimedia services.

- *Range of service types :* The extension of the communications network to accommodate many new types of services commonly used in a multimedia environment results in the need to support a very wide service range. Aspects of service range and diversity include : service type (e.g. interactive, distribution) and configuration (e.g. symmetrical, asymmetrical)

- *Association between services :* the presentation of information in a multimedia form implies some linkage between the component parts of a service and this requirement may have a significant impact on the functionality required of a telecommunication network. An obvious example is the need for synchronisation between associated audio and video channels.

- *Distributed Service Logic :* in achieving multimedia services, "service logic" could be distributed between the user terminal and the network. Network capabilities for multimedia services must reflect possible diversity in the distribution of service logic.

• *Service Component* : a part of a service which describes a monomedium communication related to a single information type.

A multimedia service contains one or more service components. Such telecommunications services can have a predefined set of service components (e.g. teleservices, bearer services) corresponding to a particular type (e.g. telephony, videotelephony, TV, data) or can have any new combination of service components (teleapplication) to develop new applications (e.g. teleshopping, publicity). It should be possible for users to invoke service components separately. The rules for assembling service components within a service are specific for each teleservice.

Three types of service component are : Audio, Video and Data.
An example of a telecommunication service : Videotelephone

Service Component	Transfer Capability
Video component	(Peak BR, Mean BR, ref no., max delay...), VCI/VPI
Audio component	(CBR BR, ref no, max delay...), VCI/VPI
Data component	(Peak BR, Mean BW, ref. no., BER, ..), VCI/VPI

In this example video and audio components are mandatory and data is optional. Optional service components can be added or deleted during the call. However, the mandatory service components are setup during call establishment and cannot be deleted during the call. Since a videotelephone is defined with a set of service components, a single component of audio can be selected during call establishment for interworking with a voice-only telephone.

•*Transfer capability* - each service component of a telecommunications service is associated with transfer capability information. Transfer capability is handled at an interface between two adjacent nodes (including UNI), in the form of Transfer capability parameters. If the Transfer capability parameters cannot be supported within a part of the network, the call will not be accepted.

Transfer capability also includes connection information for Low Layer Compatibility between terminals. For service component connectivity one major parameter is the VCI/VPI value used to identify the link which carries the service component.

Typical transfer capability parameters for an ATM connection are :

- Telecommunication service class — Service Class / Telecom Service
- Peak Bit Rate
- Mean Bit Rate — Network Resources
- Burstiness
- Max. BER/Cell loss
- Max delay — QOS — Transfer Capability
- Max delay/variation
- Symmetrical/asymmetrical connection
- Reference number associated with the service component

•*Service Control Elements* : the primitives needed to control a multimedia service, for example to start a call, to add or release an optional service component.

•*Call controller* : the user in overall charge of a multimedia call

•*Media controller* : the user in charge of a specific media during a multimedia call

Transfer of control between users during a multimedia call is for further study.

The Relationship Between Service Components and Transfer Capability is important. Under normal conditions it would be expected that a one-to-one mapping relationship applied i.e. a service component would use a single transfer capability for a given call. However it is possible that the characteristics of the ATM Virtual Channel at the user network interface may differ from those used within the network for the same service component. One example is the need to indicate and use a local transfer rate which may exceed the actual throughput rate required globally in the network.

Example of the Structure of a Telecommunications Service^

To aid in understanding the concepts of service component and transfer capability an example of the structure of a telecommunication service is provided.

A telecommunication service is identified by a bearer service, a teleservice and the network bearer service capabilities represented by the information element types "Low Layer Compatibility", "Higher Layer Compatibility" and "Bearer Capability". When such parameters are mapped to ATM technology, they correspond to a set of Service Components, a Telecommunication Service and a Transfer Capability (associated with Virtual Channels) to be identified with connection elements. In this Recommendation, Telecommunication Service corresponds to any user/service-provider defined set of service components with negotiated transfer capability for each of the service components.

2.2 Multimedia Service Definition and Attributes

Medium (plural media) # - a means by which information is perceived, expressed, stored or transmitted.

The term "media" has many meanings depending on the context in which it is used. For unambiguous usage the term should always be accompanied by one of the following expressions : perception medium, representation medium, presentation medium, storage medium, transmission medium.

Perception medium# - the nature of the information as perceived by the user

Representation medium# - the type of the interchanged data.

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^ This material has been sourced from the December 1990 Multimedia Baseline document.

= This term or definition is shared with other CCITT and ISO/IEC groups active in the field of multimedia standardisation.

Presentation medium[=] - the type of physical means which is used to reproduce information to the user (output device) or the acquired information from the user (input device).

Interchange medium[=] - the type of means to interchange data between systems can be either a storage medium, a transmission medium or a combination.

Storage medium[=] - the type of physical means to store data

Transmission medium[=] - the type of physical means to transmit data.

Multimedia[=] - the property of a piece of information, an application, a user equipment, ...to handle several types of data.

Multimedia is an adjective and must be attached to a noun in order to define a precise context e.g. multimedia service, multimedia network, multimedia application.

Multimedia Services: a service in which the interchanged information consists of more than one type (e.g.video, data, voice, graphics).

In this document, multimedia is used in the sense of multiple information types supported within what the user sees as a single call. The distinction between user and network perceptions of a multimedia service is significant since multimedia services can involve the accessing multimedia information by the interaction of explicit links (i.e. hypermedia systems). The linked data types (e.g. images, sound, video sequences) need not be physically co-located but could be on different terminals, systems or networks. Thus a single user call could result in multiple calls within and between networks.

Multiple instances of the same information type within a communications session would not be considered as a multimedia communication. However, supporting multiple instances of the same information type within a service requires the same network capabilities in terms of management and control facilities as the support of diverse information types. Supporting multiple instances of the same media can involve manipulation of features e.g. presentation conversion between image formats. The need to amend or qualify the definition of multimedia service or communication to include multiple instances of the same media is for further study.

Multimedia services have multivalued attributes which distinguish them from traditional telecommunications services such as voice or data. A multimedia service may involve multiple parties, multiple connections, the addition/deletion of resources and users within a single communications session.

To following model* is intended to clarify the relationships between the five different meanings of the term "media".

[=] This term or definition is shared with other CCITT and ISO/IEC groups active in the field of multimedia standardisation.

* This material has been sourced from MHEG Working Doc S.4, October 1991

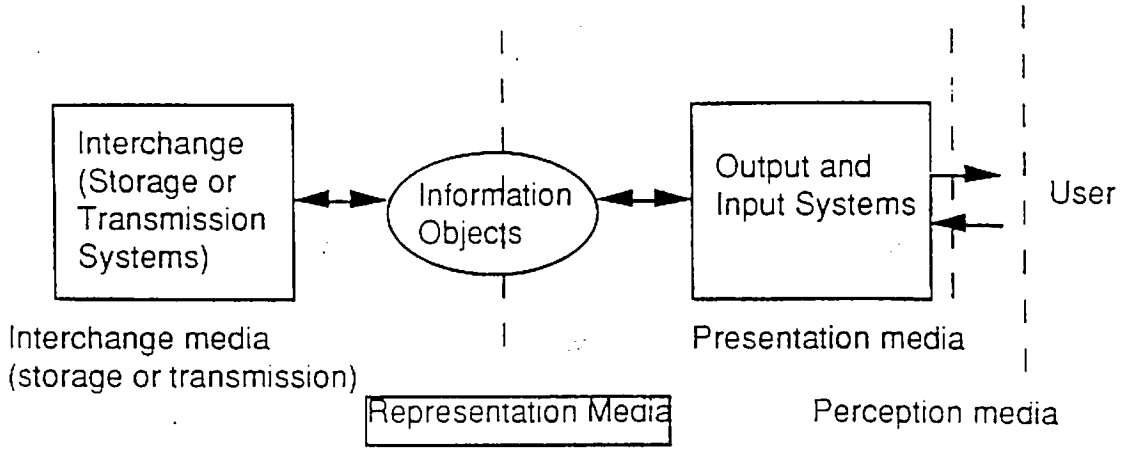

Figure 1 - Relationships between the different meanings of media.

Service Attributes~

Multimedia bearer services and teleservices supported by an ATM network may offer several virtual channels (VC), one VC for each service component. Adapted to the special requirements of the the service components to be supported, each of the VC may have particular characteristics described by particular attribute values. For the consideration of multimedia aspects most of the service attributes should be amended by sub-attributes describing the characteristics of the individual VC or service component where applicable.

Single medium services and multimedia services offering only one VC or Virtual Path (VP) for the unrestricted use including multiplexing of the user can also be described using the same description method with VC specific sub-attributes.

The following service attributes, as defined in Recommendation I.140 and I.210, are examples of attributes which could be multi-valued in a multimedia call :

- information transfer rate
- traffic type
- timing end-to-end
- structure
- symmetry
- type of user information
- higher layer protocols (layer 4 though 7 protocol functions)
- quality of service
- information access protocol

~ Portions of this text are common with proposed amendments to Recommendations I.120 and I.140

• others for further study, including additional attributes and sub- attributes characterising the service requirements on ATM-based networks.

3. Scope and Objectives of Recommendation

The study of multimedia services within the CCITT is undertaken in order to provide a consistent set of recommendations. The purpose of this Recommendation is to address B-ISDN network capabilities to support multimedia services. Also addressed are issues related to interworking B-ISDN multimedia services.

The handling and transport of service information within a network strongly influences the options for service support. ATM based networks, such as B-ISDN, provide new and enhanced opportunities for service support. For example, many of the facilities available in end-to end signalling and framing systems such as those offered by H.221 may be provided by basic ATM network functionality.

4. Network Requirements

4.1 General Concepts of Call and Connection Control

Calls should not be viewed as using static point-to-point connections, but rather as potentially complex, dynamically interacting multipoint communications. Consider for example a complex call involving multiple connections and multiple parties, as shown in Figure 1. The communicating parties within the call do not share a common set of services, and in addition, they may require the network to provide interworking for incompatible terminals and media conversion (.e.g text to voice) where requested. Requests may also be received to vary the quality of individual services, within the multiservice assembly, during a call. Improvement or reduction of individual service quality may be required on demand to allow customers to optimise service cost and performance. It must be possible to invoke in-call modification such that both services and communicating parties can be dropped from calls on demand.

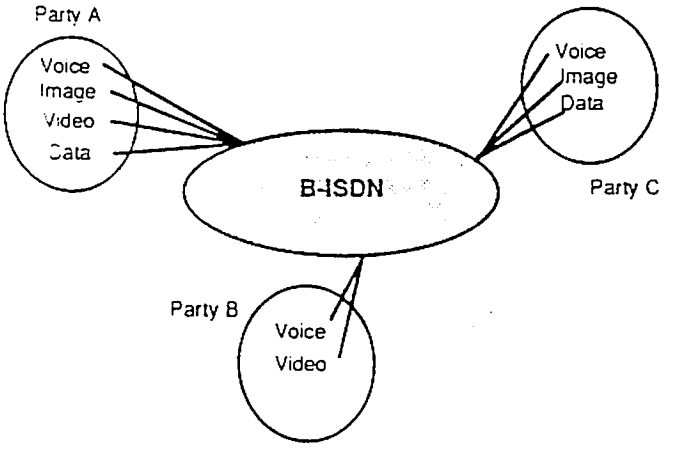

Figure 1 : An example of multimedia call involving multiple connections and multiple parties.

B-ISDN concepts offer considerable flexibility in addressing the needs of dynamic multimedia communication. The following features allow multimedia service support to be customised to meet the communication needs of individual customers:

• a common cell-based transfer of all service information

- the longer term separation of call and connection control
- support of individual media on single virtual channels, enabling the network provider to offer per-service handling within a multimedia assembly
- the ability to add/drop connections within a call
- renegotiation of connection capabilities within a call
- multicast switching to complement, or replace traditional bridging applications.

The implications of these network features must be studied in the context of network capabilities for support of multimedia services.

4.2 Target Network Capabilities for the Support of Multimedia Services

The following network capabilities have been identified as applicable to the support of multimedia services :

- a capability to support a large variety of services in an integrated and consistent manner

- a mechanism to provide for simple adaptation to changing use of services

- a minimum set of reusable actions for service handling, capable of extension to many new services and combinations of services

- support of multiconnection and multiparty calls. The concept of multiparty and multiconnection calls arise from the provision of independent call and connection control facilities within B-ISDN. Multiconnection calls refer to the ability, within a single call, to establish a number of connections which may each be associated with a specific information type. Similarly it becomes possible to associate particular sets of information types with the individual parties within a multiparty call.

It is therefore possible to distinguish three levels of multimedia service management :

- service management provided per call

- service management provided per party

- service management provided per connection.

- the representation and support of services as assemblies of standardised service elements (i.e. flexible, combinatorial approach)

- implementation independence (For example, point-to-multipoint connections may be supported by a meshed network or a chained conference)

- construction of a favourable environment for service interworking and service evolution

- allow for variable qualities of service, within a multimedia call, for cost reduction

- the possibility of decoupling access and transport parameters such that a customer may request the network to process or modify the incoming stream in some manner e.g. the customer equipment provides a video signal of HDTV quality, however the customer wishes the signal to be transported across the network at a lower quality and hence cost.

- media interaction., enabling activity in one media stream to initiate and control activity in another stream, for example the support text or voice activated graphics

- support for applications requiring shared resources. Access to shared resources may be dictated by :
  - economic considerations. (For example, sharing expensive equipment)
  - functional considerations.(For example, sharing centralised conference bridges.)
  - operational considerations .(For example, the requirement to undertake collaborative work such as joint document editing)

5. Functional Architecture

5.1 Functional Modelling of Multimedia Services

Traditionally connections, and hence services, have been handled as a single end-to-end object by the network. In principle, any complex service can be decomposed into a number of smaller service elements which can be managed as related objects by the network operator for service creation or invoked by the customer to assemble multimedia services. These service elements could correspond to either bundled complete multimedia services (e.g. videotelephone service) or individual single media services (e.g. video and audio).

The detailed functional modelling of multimedia service support is for further study and will provide a means of describing the impact of B-ISDN multimedia support on switching and signalling requirements. The functional model would guide the development of signalling protocols appropriate to the handling and support of multimedia services. For example, signalling may be required to indicate specific relationships between connections. A customer may indicate that the separate voice and video connections of a videotelephone call require synchronisation (this information may be required in routing the individual service elements) or that an imaging service is controlled by the information flow of an associated service, for example, text.

5.2 Service Control Elements*

The control of multimedia services by the user should provide flexibility in a well-structured manner to induce a well-organised implementation. Service control elements describe the different procedures to be performed at the calling and called sides in order to obtain a multimedia service. These elements support call control.

Call control may be supported by the signalling system. If there is no signalling system, a boot strap connection for call control may be used. The boot strap connection could communicate with called terminals and decides what on service components and bandwidth requirements..

Connection control elements include : *Setup Connection, Modify, Disconnect.*

Call set-up : covers the establishment of a call. By its execution, the calling user requests one or several media, the activation of all mandatory media is included;

Allocate : corresponds to the addition of another (optional) medium to an existing call;

De-allocate : may be invoked by the overall controller to switch off a medium;

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* This material has been partially sourced from the Dec1990 Multimedia Baseline document

Join : may be invoked in multipoint configurations (conferences) in order to add other users to the conference;

Modify : designates a new controller for the conference:

Leave : can be used by any party of a conference call to be disconnected. In the case the user to be released is the overall controller, the conference can only continue if another user agrees to become the overall controller (i.e. modify has to be invoked);

Invitation to release : related to telecommunication services where the right to release the call is asymmetric. It may be invoked by a user who is not allowed to release the call;

Re-connect : may be invoked after having sent an invitation to release if the distant end did not release it;

Call release: corresponds to the complete release of a call, including all media.

Other service control elements are for further study.

Service component control is done by the media controller. It controls a specific service component (e.g. audio, video, data). For example, the media controller controls the CODEC to compress the bandwidth of a video connection. Another example is a pointer control for the text, image, video. When a specific part of the text or image needs to be pointed or emphasized, a command is sent to the receiving end to make an appropriate mark on the screen. For such applications, the service component control may be supported by the user-to-user signalling through the call controller.

Complex Service Example - Videoconference

To be provided.

5.3 Relationship to Intelligent Network

Although detailed arrangements for service control are not the primary concern of this recommendation, any functions and information flows identified are intended to be uniformly consistent with the use of Intelligent Network service provision methods, as well as other means of service control

For further study

6. Network Capabilities

6.1 Multimedia Service Support Over Single and Multiple Networks

Multimedia services must be accessible over both single and multiple networks. It is possible that a customer may require services from several networks to achieve a single multimedia service (e.g. database on network A, video and audio stream from Network B and image stream from Network C). To achieve this objective the following network capabilities must be considered :

- standardisation of interfaces
- alignment of service access procedures and protocols

• others for further study

6.2 Media Multiplexing Options

Many of the functions previously associated with the multiplexing of of components of a multimedia connection, and embodied in end-to-end signalling and framing systems, such as Recommendation H.221, are provided by basic ATM functionality. The impact of this development is seen in the range of multiplexing options available for combining multiple media for transport and switching.

An ATM-based B-ISDN offers several options for media multiplexing :

• Cell multiplexing, in which each medium carried in a separate virtual channel.

Combined with the separation of call and connection control, this approach permits call admission and management processes to provide per-service handling within a multimedia multiplex.

This approach requires a mechanism for providing a bounded differential delay between continuous media which may travel to a common destination by either common or different paths. The responsibility for this aspect of service support lies with the call management and routing functions.

The use of this media multiplexing technique is related to the development of charging principles which do no penalise the use of multiple virtual channels within a single call.

• User multiplexing based on multiplexing into a single multimedia stream before entering the network. Two main options have been identified :

  • multiplexing independently of cell delineation and hence including the possibility of multiple information types within a single cell.

  • message multiplexing within the ATM Adaptation Layer (AAL) and hence resulting in a single information type per ATM cell.

In both these situations the multiplexed media enter the network as a single stream supported by one virtual channel. The Quality of Service associated with the virtual channel must be that of the most demanding service.

The different approaches must be assessed in terms of their associated requirements in terms of network capabilities, with particular reference to :

• the resultant flexibility (technical and economic) of the final service offering

• the size and nature of the differential delay between media.

It is possible that the distribution of service logic between terminals and networks may result in more than one media multiplexing option being exercised within an individual service or application.

Proposals for the coded representation of multimedia and hypermedia information include mechanisms for media aggregation and synchronisation. Network capabilities required to support the interchange of synchronised multimedia objects are for further study.

6.3 Call Handling

Traditional approaches to call handling describe the call as a monolithic object to be managed by the network. Flexible multimedia service support will require call modelling approaches which allow the call to be decomposed into service elements individually managed within a call.

6.4 Signalling for Multimedia Services

Basic capabilities require to support simple multiparty, multiconnection calls include :

- capability to control ATM virtual channel and virtual path connections
- establish, maintain and release ATM Virtual Channel Connections (VCCs)and Virtual Path Connections (VPCs)
- support of point-to-point, point-to-multipoint and broadcast communication configurations
- negotiation of traffic characteristics at establishment
- renegotiation of traffic characteristics of an established communication
- symmetric and asymmetric calls
- establishment and removal of single and multiple connections within an existing call
- ability to correlate (when requested) connections composing a multiconnection call
- reconfiguration of a multiparty call, including an existing call and the splitting of the original call into more calls
- provide for the possibility of a single multimedia terminal engaging in sessions using different media with different parties e.g. an audio call with one party and a data call with another
- support for interworking between different coding schemes
- support for service interworking
- support of connections in which the call originator is not one of the endpoints of the connection
- both called and calling parties must be able to add/delete media from an existing call
- support for any combination of traffic, with no network imposed limits to the number of media combined within a single call
- service control support using the user-to-user signalling through the call control
- others for further study.

6.5 Multimedia Interaction

This refers to the ability of media within a call to control other media. It may take several forms :

- direct control . For example, voice activated video and text

- indirect control e.g. distributed database applications in which it may be necessary, within a call, for one database to initiate the establishment of a connection to a further database.

This subject area is for further study.

6.6 Multimedia Traffic Control and Resource Management

6.6.1 Connection Admission Control

In Recommendation I.311, connection admission and control functions for multimedia and multiparty services are performed for each Virtual Channel or Virtual Path connection. The signalling messages sent by the user at call establishment must convey at least the following information :

- source traffic characteristics

- required Quality of Service (QOS) class

These parameters may be difficult to determine in those cases where media is multiplexed on anything other than a virtual channel or virtual path basis.

The network implications of the addition of further media to an established call requires further study.

Traffic characteristics may require renegotiation during a call. The frequency and nature of any renegotiation of call parameters is for further study and will directly influence the network support of multimedia services.

6.6.2 Usage Parameter Control

Some networks will apply usage parameter control to ensure that traffic does not exceed that agreed at call establishment. For multimedia services, usage parameter control may be apply to :

- individual media or service components

- multimedia assemblies

The impact of usage parameter control, and agreed network action in response to traffic violating call establishment agreements, requires further study for multimedia services

6.6.3 Resource Management

6.6.3.1 Resource Allocation

For established calls, the addition of further media or parties is subject to the availability of appropriate network resources. Where the resources may not be available in the form required the following options may apply :

- maintenance of the existing call, without the additional requested functions and facilities

- clear down the existing call

- allow the customer to respecify the additional requirements e.g. select an audio-only connection rather than video and audio

- where applicable, allow the customer to renegotiate the parameters of the existing call e.g. reduce the video quality, to accommodate the additional requirements.

The impact of ATM networking on the network capabilities required for multimedia support is for further study.

6.6.3.2 Dynamic Allocation of Capacity

Individual media : It must be possible for the user to renegotiate the dynamic allocation of capacity to individual media within a multimedia communication. The frequency with which capacity re-allocation may be requested is for further study.

Media multiplexes : Recommendation H.221 provides a mechanism to allow a terminal to re-allocate total capacity every 20 milliseconds. It allows the reallocation of capacity among audio, data, graphics, video or telematic service formats.

Further study is required to determine the performance limits required and acceptable for the signalling and resource management facilities provided within a network. Studies in this area must be based on the user's perception of acceptable delay in the presentation of media.

6.7 Multipoint Networking

6.7.1 Integrated Services

For further study, including the implications of offering integrated support of interactive and distributive multipoint services within a single multimedia service.

The multipoint functionality of traditional bridges may be augmented and/or replaced by the multicast capability of the ATM networks. This issue requires further study to determine the network implications in terms of providing some mixing functionality.

6.7.2 Bridging Facilities

Bridging facilities will be required to enable the establishment of multimedia conferences. The term "bridging facilities" has been chosen to reflect the possibility of the separation of the bridging and multipoint control functions.

Media specific bridges may be required and the nature of the network interaction with these bridges is for further study.

The following issues must be considered :

- some networks, such as an ATM-based B-ISDN, can provide the multipoint distribution functions of the bridge.

• audio bridging is relatively well understood, but generic audio bridging (e.g. for encrypted speech or facsimile) requires new capabilities.

• bridging procedures for non-linear media such as data and a potentially wide range of video services, beyond those of Recommendation H.140, require further study.

•bridges/networks will be required to serve both individual and multiplexed media streams

6.7.3 Broadcast Networks

The simultaneous distribution of a multimedia service from a single access point to multiple end points, for example TV distribution, is for further study.

Further study is also required to determine the need for integrated broadcast and interactive multimedia services. For example, using a broadcast multimedia source as an access mechanism for interactive multimedia communication, as in the case of selecting additional information from a broadcast news or teleshopping service.

For further study

6.8 Multimedia Service Management

6.8.1 Charging Techniques

Of particular relevance to multimedia services is the current need for customised billing systems for each new service. Widespread and frequent use of multimedia services may require a flexible and efficient billing system which reflects the combinatorial nature of many multimedia services. This may require charging systems which collect charging data on the basis of individual service elements and combine this information to produce the final charging record. Thus the charging of multimedia services may be required to reflect the same structured support of multimedia required in other aspects of B-ISDN multimedia service support.

For further study.

6.8.2 Recovery

For further study

6.8.3 Service Negotiation

For further study.

6.8.4 Synchronisation

Many multimedia services will be required to provide mechanisms to ensure that specific information types (e.g. data, image, video, audio) remain synchronised and receive the appropriate quality of service. The network must maintain, within agreed bounds, the timing relationship of the various information streams as they are transported. Different information types may experience different delay through a network because they are routed via different paths or are provided different grades of service. The problem is even more complex if multiple participants are involved, because the timing relationship among the different participants information streams must also be maintained.

The issue of synchronisation between the service components of a multimedia call is for further study. Associated issues include : -

- differential time delay between continuous media streams carried on separate virtual channels.
- inter-channel synchronisation
- compensation for transit delay between each channel (virtual and physical)

The need for other forms of synchronisation e.g. event synchronisation, is for further study.

Event synchronisation is characterised by sub-titling or user interaction, where non-continuous media are involved. For example, the insertion of subtitles being controlled by an associated video information steam.

6.9 Multimedia Interworking

6.9.1 Terminal Aspects

6.9.1.1 64 kbit/s-based ISDN

Existing Recommendations define a hierarchy of compatible terminal types and the signalling procedures required to establish compatibility between audio and audio-data/audio-visual terminals.

For further study.

6.9.1.2 B-ISDN

For further study.

6.9.2 Between Networks

Including interworking with 64 kbit/s based ISDN.

For further study.

6.9.3 Between Different Services

For further study