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TITLE: DRAFT RECOMMENDATION T.130 - AUDIO-VISUAL CONTROL FOR MULTIMEDIA CONFERENCING: ARCHITECTURE AND OVERVIEW

REAL TIME AUDIO-VISUAL CONTROL FOR MULTIMEDIA CONFERENCING

ARCHITECTURE & OVERVIEW

Draft Recommendation T.130

Summary

This recommendation defines the Audio Video Control System architecture that is designed to operate alongside and in support of T.120 based conferences. It provides enhanced facilities to manage the real time components of interactive communications involving two or more participants on and between a variety of different networks.

This recommendation describes the system model showing the inter-relationships between its constituent parts. It provides an overview of each of the recommendations which collectively define the control of audio and video communication within a T.120 conferencing environment.

Draft Recommendation T.130

AUDIO-VISUAL CONTROL FOR MULTIMEDIA CONFERENCING: ARCHITECTURE & OVERVIEW

CONTENTS

Real Time Audio-Visual Control for Multimedia Conferencing: Architecture & Overview

1. Scope

This Recommendation introduces a set of standards that collectively support management and control of real time streams and services within a multipoint communication environment.

This Recommendation describes the system architecture and its functional elements and illustrates the relationship with other parts of the T.120 series and underlying multimedia control protocols. It also provides an introduction to and functional description of the recommendations that comprise the AVC system.

This Recommendation defines the criteria for compliance when AVC is used in a conferencing or group-working environment.

2. Normative References

The following Recommendations and other references contain provisions which, through reference in this text, constitute provisions of this Recommendation. At the time of publication, the editions indicated were valid. All Recommendations and other references are subject to revision: All users of this Recommendation are therefore encouraged to investigate the possibility of applying the most recent edition of the Recommendations and other references listed below. A list of the currently valid ITU-T Recommendations is regularly published.

- ITU-T Recommendation T.120 (1996), *Transmission Protocols for Multipoint Data Conferencing.*
- ITU-T Recommendation T.121 (1996), *Generic Application Template*
- ITU-T Recommendation T.122 (1993), *Multipoint Communication Service for audiographics and audiovisual conferencing service definition.*
- ITU-T Recommendation T.123 (1994), *Protocol Stack for Audiographics and Audiovisual Teleconference Applications.*
- ITU-T Recommendation T.124 (1995), *Generic Conference Control.*
- ITU-T Recommendation T.125 (1994), *Multipoint Communication Service protocol specification.*
- ITU-T Recommendation T.132 (199x), *Audio-Video Control: Infrastructure Management*
- ITU-T Recommendation T.133 (199x), *Audio-Video Control: Service Management*
- ITU-T Recommendation T.RDC (199x), *Remote Device Control*

3. Definitions

For the purposes of this Recommendation, the following definitions apply:

Adjacent Node: A node that forms one of a pair of nodes that are connected and thus associated by a real time link.

Application Protocol: Any standard or non-standard protocol specification that makes use of T.120 services.

Application Protocol Entity: The instantiation of an Application Protocol in a terminal or MCU.

Application Protocol Session: A group of peer Application Protocol Entities communicating with each other.

AVC Network Element: A node that provides AVC Services, either on its own or in conjunction with other AVC Network Elements.

AVC Terminal: A node that makes use of AVC Services.

Controllable Device: A device that has the capability to be controlled remotely in a conference environment.

Communications Port: A physical interface at a node that possesses AVC media capabilities and is able to provided a connection to a real time link.

Device: An entity which provides a specific function, or set of functions, to the conference. Some devices such as cameras and microphones are capable of generating a source to the conference. Other devices provide control and processing functions for streams.

Gateway (GW): A Gateway is a Network element which provides for real-time communication between terminals on different underlying networks.

Inter-MCU-Link: A real time link that interconnects two adjacent MCU nodes.

Logical channel: A communications path within a real time link that carries a single stream between adjacent nodes.

MCU (Multipoint Control Unit): A device used to interconnect multiple terminals and/or further MCUs to allow multiple participants to be connected to single conference.

Multipoint Controller(MC): An entitity which provides for the control of terminals participating in a multipoint conference.

Multipoint Processor(MP): An entity whch provides for centralised processing of audio,video, and/or data streams in a multipoint conference.

Multipoint Service: One or more functions that are provided and managed by MCUs.

Network Element: An AVC capable node with multiple real time links that provides management of multipoint conferencing or bridging/processing of real time streams. MCUs, MCs and Gateways are examples of Network Elements.

Network Specific Control Entity: The entity at a node responsible for directly controlling the operation of a real time link. Typically an NSCE provides capability exchange and link configuration functionality.

Node: Any entity in the network that runs the AVC protocols. This includes both terminal equipment and network elements such as routers and bridges (otherwise known as MCUs).

Real Time Link: A connection between two adjacent nodes used for the transfer of real time information in a single direction. A real time link may provide one or more communication paths (termed logical channels), each of which conveys a single stream between the two nodes.

Source: The origin of a real time media stream.

Stream: A flow of real time information of a specific media type (e.g. audio) and format (e.g. G.722) from a single source to one or more destinations.

Video Processor: A device that modifies the content of video streams, e.g. a transcoder, continuous presence processor.

Virtual MCU: Term used to describe the collection of MCUs within a real time conference which present a single logical interface to terminals.

User Application: The instantiation of an Application Protocol in a terminal or MCU.

Zone: A collection of AVC resources (real time links and nodes) under the control of a single AVC Network Element.

4. Abbreviations

APE	Application Protocol Entity
AVC	Audio-Visual Control
ATM	Asyncronous Transfer Mode
B-ISDN	Broadband Integrated Services Digital Network
GCC	Generic Conference Control
ISDN	Integrated Services Digital Network
LAN	Local Area Network
MCS	Multipoint Communication Service
MCU	Multipoint Control Unit
NE	Network Element
PDU	Protocol Data Unit
PSDN	Packet Switched Digital Network

PSTN	Public Switched Telephone Network
TCP	Transmission Control Protocol
MCS	Multipoint Communication Service
MCU	Multipoint Control Unit
PDU	Protocol Data Unit
SAP	Service Access Point

5. Overview of Multipoint Audio and Video Communications

Traditionally, telephony services have been constrained to point-to-point operation. In order to support group activities such as meetings and conferences involving physically separated participants, there is a requirement to join together more than two locations; the term *multipoint communication* simply describes the interconnection of multiple terminals. Normally, a special network element known as a Multipoint Control Unit (MCU), or more simply a bridge, is required in order to provide this function. Much of the functionality specified by the T.130 set of Recommendations relates to or depends upon such network elements for its provision.

The term Multipoint Control Unit (MCU) is used to describe a piece of equipment that provides interconnection and management of two or more terminals for the purpose of interactive communication. This communication may involve audio and/or video and/or data and is commonly termed multimedia communications. MCU functionality may extend to bridging across different networks.

MCU functionality can be classified as follows-

- Multipoint Control & Management (MC)
- Mutipoint Processing & Routing (MP)
- Network Bridging (Gateways)
- Conference Resource Management (CRM)

In some environments such as Local Area Networks (LANs) the MCU functionality may be distributed between a number of separate Network Elements (NE); in such cases T.130 protocols should be present in the elements that provide conference control and resource management.

A multipoint multimedia conference involves a number of suitably equipped conference terminals inter-connected via one or more Network Elements. Conferencing terminals may take a number of different forms. A common form of video conference terminal is room based. It may consist of one or more video displays, with one or more video cameras to capture face images, possibly supplemented by document cameras and other video sources. One or more microphones capture the speech. More formal environments may dictate the use of individual microphones for participants. Another form of conference terminal is the 'personal or 'desk-top' terminal which typically supports a single participant. T.130 protocols aim to provide a uniform service to participants irrespective of the type of terminal or network in use.

6. Introduction to the Audio Video Control System

The Audio Video Control (AVC) extensions to T.120 consist of a suite of recommendations that encompass the necessary mechanisms to establish a generic platform to support real time multimedia communications applications. The T.130 series build on existing ITU-T conferencing recommendations that have gained wide acceptance. These include the H.320 audio-visual conferencing series and the T.120 series of collaborative data conferencing recommendations.

The T.130 series comprises a set of recommendations that establish an architecture and procedures to support the use of real time streams and services in a multimedia conferencing environment. They define a versatile management & control protocol that allows Network Elements to communicate and co-operate in the provision a conference service to their endpoints.

The value of the T.130 suite is found in the unique problems that it solves. These can be categorised as follows:

- Uniform control of real-time streams in a network and platform independent manner
- Facilities for cross network bridging of data stream protocols.
- Facilities for using processing elements as part of the network infrastructure.
- Delivering Quality of Service to multimedia communications applications.

- Adaptable distributed management philosophy

Each of these features are described below:

6.1. Uniform Control of Real-Time Streams

Currently there are several standardised methods for managing real time streams within a conferencing environment. For ISDN H.320 systems, H.242 and H.243 provide limited multipoint control functionality, whilst on PSTN (H.324), ATM (H.310) and LAN (H.323), H.245 offers a point-to-point control mechanism.

AVC co-exists with and co-ordinates use of these protocol engines to provide a single uniform platform independent control mechanism for management of real time streams over multipoint connections.

6.2. Network Independent Stream Control Protocols

Most network boundaries require protocol bridging elements that currently have no standard methods for control. This means that it is difficult to embrace such connections seamlessly in a communications session. AVC defines a control protocol to enable streams to be routed across network boundaries, whilst providing the capability to match communication characteristics.

6.3. Processing Elements As Part of the Network Infrastructure

Processing elements are key components which may be used to bridge between nodes which support a common media type (e.g. video), but different format. For example, an MPEG based video service cannot communicate directly with an H.320 terminal that uses H.261 for its video coding. However, by inserting a transcoding element in the communication path between these nodes, they can both operate within the range of their capabilities, and communicate with each other. AVC provides management services to establish real time communications paths with routing via processing elements, as required. These paths allow terminals to communicate in environments that previously had no support for functionally different terminals. Effectively AVC provides a protocol that can operate across network boundaries without requiring Gateways to map functionality between different protocols. Within the constraints of the underlying network, AVC attempts to provide a consistent and uniform service across all networks.

6.4. Quality Of Service in Multimedia Communications

Most Quality of Service (QoS) mechanisms available prior to AVC provide some means to request and receive communication paths with an associated QoS. The use of these mechanisms requires the application to have knowledge of the network and of the specific details of the codecs that create the streams flowing through the network. Applications desire the capability to request a certain audio or video usage requirement, and the exact communication QoS requested from the network to be hidden. When streams cross network or functional boundaries, the QoS shall be arbitrated amongst all applications wishing to share the same resources. Mechanisms to support this are provided in AVC by Resource Management services that handle the translation of generic QoS requests from applications and manage other QoS interfaces and events that occur during the use of a dynamic real-time network. All this is done in such a way that the application need only be concerned that its audio/video requirements will be fulfilled.

6.5. Distributed Management

All of the services above are defined in a way that will allow distributed management. If desired, networks can be configured and managed such that a node only need be concerned with the communication paths that it will use. The remainder of the network can be ignored. If desired, the network can also be configured with a more centralised control to allow tighter control of valuable communication resources.

6.6. Relationship with Existing Multimedia Control Protocols

The AVC protocols are designed to be used in conjunction with existing multimedia control protocols such as H.242/3 and H.245, leveraging the functionality of these underlying protocols where appropriate and making use of the flexibility of the T.120 infrastructure to provide enhancements when required. AVC introduces multipoint control functionality to H.245 based systems and enhances the operation of H.242/3 based systems; it also replaces some of the optional H.243 features which are more appropriate to realise within the T.120 environment.

AVC defines mechanisms to co-ordinate operation of independently controlled point-to-point links within a multipoint environment to allow end-to-end audio and video communications to be established and managed.

For each network, a network specific mapping defines the interaction between AVC and the underlying multimedia control protocol engine.

7. Real-time Architecture for Multimedia Conferencing.

The T.13x recommendations provide a uniform control protocol for management of real time audio and video streams and define a range of services that allow flexible manipulation of real time streams in a variety of ways.

AVC has provisions for:

- Establishing a real time stream control infrastructure
- Capability exchange and distribution
- Establishing and managing communication paths to transport real time streams
- Quality of service management to preserve the integrity of real time streams
- Stream access control and registration
- Interaction with existing network specific multimedia control protocols
- Remote device control
- Multipoint network based services

Nodes that do not support AVC may still participate in an AVC conference if another node offers a proxying service. The method of operation of such a service is outside the scope of this recommendation.

The AVC set supports multiple real time stream sources (transmitters) and sinks (receivers) at each node and allows each node to send and receive multiple streams, with no requirement for symmetry.

7.1. T.13x System Model

The infrastructure to support the manipulation of real time streams (switches, mixers, transcoders etc) typically exists within network elements (such as MCUs, Gateways, MCs, MPs and Conference Servers), as does the processing power and intelligence required to perform and co-ordinate the manipulation of such streams. By contrast, terminals have limited stream processing capabilities (codecs) and processing power. The T.13x recommendations reflect these differences by adopting a Client-Server like model with minimal terminal complexity.

Nodes which make use of AVC services are termed AVC Terminals; the primary rôle of an AVC Terminal is to initiate requests for AVC services on behalf of the user. Nodes which participate in the management and provision of AVC services are termed AVC Network Elements; they are responsible for arbitrating access to AVC Services and for managing the associated resources. Communication between AVC Network Elements to realise AVC services is transparent to the AVC Terminals. Figure 2 illustrates the type of interactions between AVC-capable nodes.

AVC Terminals implement a limited subset of AVC Network Element functionality, since in a point-to-point conference, one of the terminals is required to perform some of the duties of an AVC Network Element.

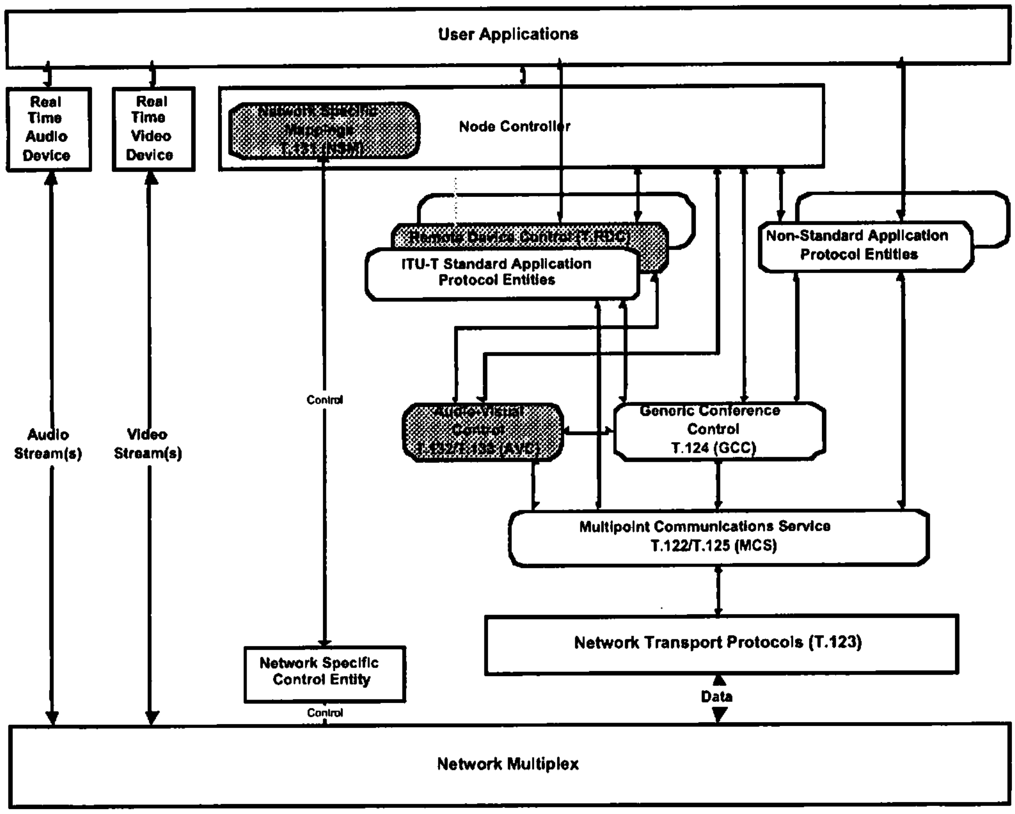

FIGURE 1/T.130

Audio-visual control architecture

Figure 1 shows both the scope of the T.130 suite of recommendations (indicated by the dark shaded background) and the relationship between each of the recommendations and other components in the system. This model applies equally to Terminals and Network Elements, which differ in the complexity of their Node Controller and AVC implementations.

AVC has two components: infrastructure management (T.132) and service management (T.133)

T.132 specifies mechanisms for the management and control of the infrastructure used to provide real time audio-visual services in a multipoint conference. It specifies mechanisms for multimedia capability exchange at the start of and during communications in conjunction with the underlying multimedia control protocol. It also defines procedures for arbitrating access to and configuring the audio-visual infrastructure in support of the audio-visual control services defined in companion recommendation T.133.

T.133 defines a number of versatile conference services such as stream routing, audio mixing and video switching. Each service encapsulates the functionality required to provide a specific type of operation in a complete and comprehensive manner to conference participants. These services can be regarded as a toolkit from which functionality may be selected as appropriate for any given conference requirement.

The intelligence in an AVC-capable node resides in the Node Controller. Terminal Node Controllers process AVC service requests from users whilst Network Element Node Controllers are responsible for arbitrating access to and delivering AVC services and are consequently more complex.

T.131 defines Network Specific Mappings to allow the network independent AVC protocol to co-exist with and utilise existing network specific multimedia control protocols. This function is performed by the Node Controller which is also responsible for controlling the underlying multimedia control protocol engine (Network Specific Control Entity).

Whilst the T.130 protocols are conveyed within T.120 data channels (i.e. MCS channels), the audio and video streams themselves are transported in independent *logical channels* due to the transmission requirements of real time information flows. The T.130 suite is compatible with systems such as H.323 where audio and video is distributed independently of control (T.120) data as well as systems which transport all media types within a common multiplex (e.g. H.320, H.324).

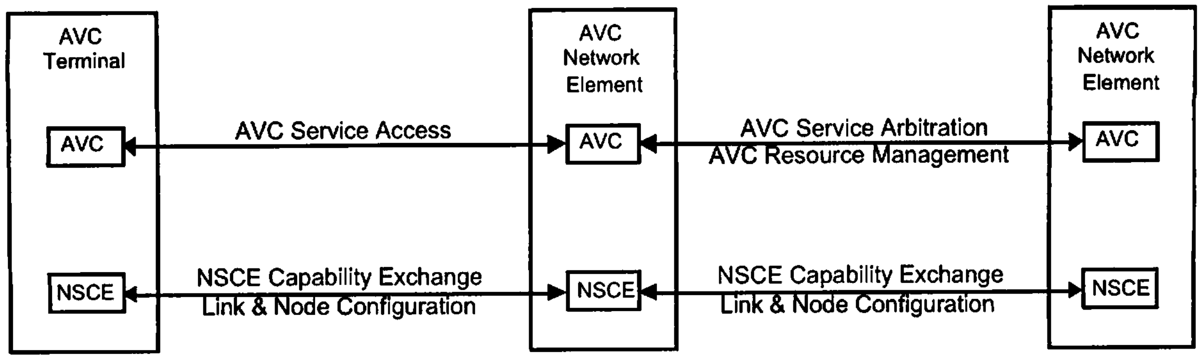

FIGURE 2/T.130

Interactions between AVC nodes

7.2. T.132 Audio-Video Control: Infrastructure Management

Key to the provision of a viable multimedia conferencing service is the ability of AVC to support effective management of the infrastructure used to distribute audio and video. The AVC infrastructure includes real time links used to transport media streams between nodes, as well as processing elements within nodes such as codecs, mixers, switches, transcoders. It excludes devices such as cameras and VCRs which source or sink media streams; control of such devices is addressed with T.RDC.

T.132 provides the following functions:

- A capability exchange mechanism which propagates the results of point-to-point capability exchanges performed by underlying multimedia control protocol engines to all AVC Network Elements. This allows AVC Network Elements to build up a picture of the nodes within a conference and the links that connect them and thus to make informed decisions when determining use of the audio-visual infrastructure. Capability exchange is performed as each node joins the conference, but may be carried out subsequently if there is a change of capabilities. There are two types of capability:

  (i) Link capabilities. These characterise the transmission (multiplex and media supported) capabilities of a real time link and are maintained in the Link Roster.

  (ii) Node capabilities. These characterise the audio/video capabilities of a node that are not dedicated to a specific real time link and are maintained in the Node Roster.

- Seamless transfer of control of existing audio-visual streams to/from the underlying multimedia control protocol. This allows AVC to inherit control of conferences in which audio-video communications are established before data communications.

- Configuration of the audio-visual infrastructure in support of AVC Services. The AVC infrastructure is partitioned into one or more zones, each of which contains an AVC Network Element designated as Zone Manager. This node is responsible for managing all resources within the zone, for fielding service requests from AVC Terminals within the zone and for co-ordinating with other Zone Managers to fulfil those requests. AVC Network Elements configure that portion of the infrastructure under their direct control and negotiate with other AVC Network Elements to configure their respective parts of the infrastructure. Where appropriate, the services of the underlying multimedia control protocol are utilised. This arrangement leads to a very light weight protocol requirement for terminals wishing to support AVC, since the majority of AVC transactions are between AVC Network Elements.

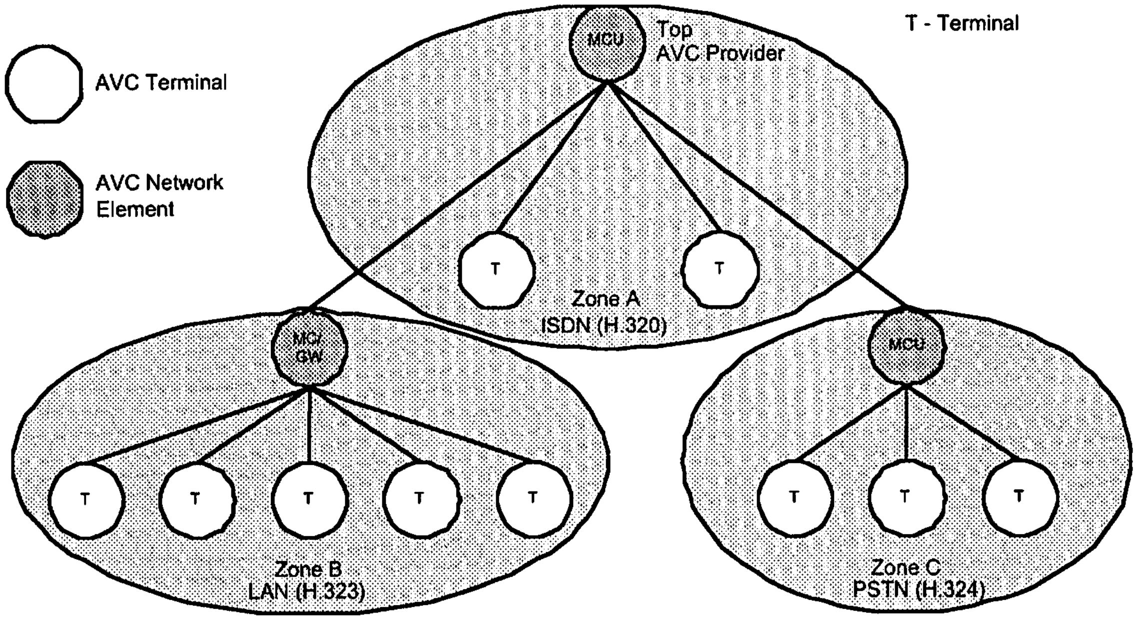

FIGURE 3/T.130

Example of partioning AVC infrastructure into zones

T.132 requires the services of MCS, GCC and a multimedia control protocol such as H.245.

7.2.1. Resource Management

AVC defines mechanisms to enable Zone Managers to negotiate use of the AVC infrastructure, but does not specify how a Zone Manager arbitrates access to AVC resources within its own zone. This enables service providers to evolve their own resource management strategies without affecting interoperability or requiring changes to the protocol.

7.3. Network Specific Mappings (NSM)

AVC relies on the services of existing multimedia control protocols such as H.245 and H.242/3 to provide a range of low level functions such as point-to-point capability exchange, terminal mode selection and link configuration. To allow this to occur, each type of multimedia system requires a Network Specific Mapping which defines the interactions between the system's underlying multimedia control protocol and the generic network independent control mechanisms of AVC. The mapping is performed by the Node Controller which manages both the underlying multimedia control protocol engine and AVC. This allows AVC to seamlessly inherit control of audio-video communications established prior to it becoming active.

Network Specific Mappings specify translations and procedures for the following functions:

- Establishment and termination of an AVC Session
- Inheritance of existing audio and video communications
- Point-to-point capability exchange
- Link configuration (e.g. opening and closing logical channels)
- Use of maintenance features (e.g. loopback)

7.3.1. Network Specific Mapping for PSTN

This part specifies the interaction between AVC and H.245 in H.324 systems.

7.3.2. Network Specific Mapping for ISDN

This part specifies the interaction between AVC and H.242/H.243 in H.320 systems and identifies those parts of H.243 that are superseded by the provisions of AVC.

7.3.3. Network Specific Mapping for LAN

This part specifies the interaction between AVC and H.245 in H.323 systems.

7.3.4. Network Specific Mapping for ATM

This part specifies the interaction between AVC and H.245 in H.310 systems.

7.3.5. Network Specific Mapping for DSM-CC

This part specifies the interaction between AVC and DSM-CC in DAVIC systems

7.4. T.133 Audio-Video Control: Service Management

T.133 defines a number of commonly required network based services which manage real time streams using the underlying AVC infrastructure. The standard services provided by AVC are:

- Video switching
- Video processing (including support for continuous presence)
- Audio mixing
- Audio and video source identification
- On Air Indication
- Floor control
- Privacy

The range of AVC services (including optional enhancements) available to a conference is determined by negotiation between AVC Network Elements. Each terminal is notified by its respective Zone Manager of the services on offer; some services may be made available to all conference participants, whilst others may only be available to a subset.

AVC services are launched by Network Elements; once active, a service remains in operation until the end of the session or until it is explicitly terminated. Whilst most services are self contained, some services have dependencies (for example, the Video Switching Service relies on the Audio Mixing Service). In conducted mode, some services may restrict the functionality available to conference participants according to their rôle within the conference.

T.133 relies on the infrastructure management protocol defined in T.132 to co-ordinate use of the AVC infrastructure in order to realise AVC services. From the perspective of AVC Terminals, the group of AVC Network Elements act as a single entity, a Virtual MCU.

7.4.1. Stream Routing Service

The Stream Routing Service allows a user to request the creation of a communication path to transport a media stream from a source to one or more destinations. It identifies the infrastructure required and uses the services of T.132 and the underlying multimedia control protocol to open logical channels and configure intermediate nodes to process or switch the media stream as necessary.

Users may characterise the requirements for the communication path by specifying the media type (e.g. audio), preferred encoding format (e.g. G.728), plus any other format specific parameters. This implicitly constitutes a Quality of Service (QoS) request (e.g. an audio coding algorithm requiring a fixed bandwidth). Alternatively, QoS characteristics may be expressed explicitly in generic terms (e.g. bandwidth, latency, jitter), independent of encoding format.

The Stream Routing Service allows existing paths to be modified or destroyed and provides a monitoring service to allow interested nodes to be notified of changes in characteristics of a path.

7.4.2. Source Selection Service

The Source Selection Service allows a user to remotely select a device (e.g. camera or microphone) to source a particular media stream.

7.4.3. Video Switching Service

The Video Switching Service provides an automated rôle based video distribution service in which conference participants receive video streams according to their current rôle. The following rôles are explicitly supported by the protocol:

- Current Speaker
- Previous Speaker

- Designated Presenter(s)
- Viewer(s)
- Conference Conductor
- Conference Convenor

Rôles may be pre-assigned (e.g. Convenor) or dynamically allocated (e.g. Current Speaker); some may also be re-allocated during a session. A number of operating paradigms (switching modes) are supported which determine if and how the rôles influence the video switch. Provision is made for the Video Switching Service to be overridden to support explicit stream routing.

Where video switching functionality is distributed between a number of nodes, the Video Switching Service co-ordinates the operation of those nodes, so that they behave as a single Virtual Video Switch.

7.4.4. Continuous Presence Video Service

Continuous presence systems allow users to view some or all conference participants simultaneously. Practical considerations may restrict the number of participants that any individual can see, particularly in large conferences. The following factors will all impact on what is achievable:-

- Throughput capacity of logical channels conveying video to/from terminals and between network elements
- Conference topology
- Number of participants on video capable terminals
- Video protocol and encoding in use

The T.133 Continuous Presence Service has the rôle of providing control and indications which are capable of supporting a variety of different continuous presence systems, although the underlying infrastructure may restrict what is realisable in some cases. The aim of this service is to provide functionality in a way that will permit the power and flexibility of the T.130 infrastructure to be utilised when the underlying networks allow. The initial objectives of this work are not to define continuous presence algorithms. *However where this work is to be done needs to be discussed.*

7.4.5. Audio Mixing Service

The Audio Mixing Service allows user control of audio mixing and supports the following modes:

- Voice Switched Mode
- Conductor Controlled Mode

7.4.6. Source Identification Service

The Source Identification Service allows the origin (e.g. location) and content (e.g. originating device or speaker name) of audio and video streams to be communicated to the conference. This information may be used, for example, to generate a caption for display with a video image, or to identify the current speaker. Network Elements that process media streams tagged with a source identifcation are responsible for generating an appropriate identification message on their output streams.

7.4.7. On Air Indication Service

The On Air Indication Service is used to notify a terminal that a particular audio or video stream it is sourcing is currently being received by another terminal, i.e. that it is 'On Air'.

7.4.8. Audio and Video Floor Control Service

The Floor Control Service allows the conference conductor to control who can speak in a conference. Participants must obtain permission from the conductor before speaking.

7.4.9. Privacy

Privacy mode is used by a terminal wishing to indicate that it has temporarily stopped sourcing audio or video to the conference. A terminal invoking privacy shall locally remove its audio and video streams. Video streams should be replaced with an alternative signal so that the change is not interpreted as a failure condition.

Privacy differs from other services as it does not require network support to operate or be useful.

7.5. Remote Device Control (RDC)

RDC is an application protocol that supports remote control of devices (such as cameras, microphones and VCRs) used to source or sink audio or video streams within a conferencing environment. Typically, such devices are resident at terminals. RDC allows:

- selection of audio and video sources
- configuration and control of devices

RDC defines a number of standard device types such as cameras and microphones, each of which has a number of associated control attributes. A number of standard device classes are available to construct a virtual device. These classes aim to address mandatory or commonly required functionality for use in support of multipoint multimedia communication and in particular conferencing. The device classes allow the construction of a device that may:

- be capable of
    - only sourcing a real time audiovisual output stream.
    - only receiving a real time audiovisual input stream.
    - both sourcing or receiving a real time audiovisual stream.
- not have any direct interaction with any real time stream but still perform a useful function.
- be capable of performing a mixing function where more than one input stream is combined to produce one output stream.
- be capable of performing a switching function that is used to control the routing of input streams to output streams.
- be capable of performing processing on a real time audiovisual stream.

RDC defines mechanisms to:

- Advertise devices and their associated attributes.
- Request exclusive access to a remote device in order to perform device control or configuration.
- Control, configure, receive event notification and obtain the status of a remote device.

RDC makes use of the services of AVC, MCS and GCC.

END OF T.130