

Monitoring APIs for Live Audio-Video Conferencing

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Abstract

Video conferencing & telepresence technology is an inexpensive enabler for companies to improve collaboration and reduce costs. As more and more companies adopt video conferencing as an integrated component of their daily business, they need a way to ensure that not only this technology, but this video conferencing service is running optimally. The Traverse comprehensive and unified monitoring platform for video and call quality in addition to the network performance allows enterprises to get faster ROI and drives lower TCO for their integrated video conferencing services. Monitoring audio video conferences helps an enterprise to manage the A-V conferences. The monitored data collected with the monitoring software guides the business processes in various decision making aspects.

Keywords

Video Conferencing, PointToPoint, MultiPoint, REST, JMX

I. Introduction

With the introduction of relatively low cost, high capacity broadband telecommunication services in the late 1990s, coupled with powerful computing processors and video compression techniques, videoconferencing usage has made significant inroads in business, education, medicine and media. Like all long distance communications technologies (such as phone and Internet), by reducing the need to travel to bring people together the technology also contributes to reductions in carbon emissions, thereby helping to reduce global warming [5]. Video Conferencing is Conducting a conference between two or more participants at different sites by using computer networks to transmit audio and video data.[6] Live Audio-Video Conferences may need to be monitored for various purposes including analysis, decision making and marketing.

II. Video Conferencing

Videoconferencing is the conduct of a videoconference (also known as a video conference or videoteleconference) by a set of telecommunication technologies which allow two or more locations to communicate by simultaneous two-way video and audio transmissions. It has also been called 'visual collaboration' and is a type of groupware.

Videoconferencing can enable individuals in distant locations to participate in meetings on short notice, with time and money savings. Technology such as VoIP can be used in conjunction with desktop videoconferencing to enable low-cost face-to-face business meetings without leaving the desk, especially for businesses with widespread offices. The technology is also used for telecommuting, in which employees work from home. One research report based on a sampling of 1,800 corporate employees showed that, as of June 2010, 54% of the respondents with access to video conferencing used it "all of the time" or "frequently". Videoconferencing differs from videophone calls in that it's designed to serve a conference or multiple locations rather than individuals [1]. It is an intermediate form of videotelephony, first deployed commercially in the United States by AT&T Corporation during the early 1970s as part of their development of Picturephone technology.

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The core technology used in a videoconferencing system is digital compression of audio and video streams in real time. The hardware or software that performs compression is called a codec (coder/decoder). The resulting digital stream of 1s and 0s is subdivided into labeled packets, which are then transmitted through a digital network of some kind (usually ISDN or IP). The use of audio modems in the transmission line allow for the use of POTS, or the Plain Old Telephone System, in some low-speed applications, such as videotelephony, because they convert the digital pulses to/from analog waves in the audio spectrum range.

The other components required for a videoconferencing system include:

- Video input : video camera or webcam
- Video output : computer monitor, television or projector
- Audio input : microphones, CD/DVD player, cassette player, or any other source of PreAmp audio outlet.
- Audio output : usually loudspeakers associated with the display device or telephone
- Data transfer : analog or digital telephone network, LAN or Internet
- Computer : a data processing unit that ties together the other components, does the compressing and decompressing, and initiates and maintains the data linkage via the network.

A. Point To Point Video Conferencing

In a Point To Point AV conference, there are only two participants.

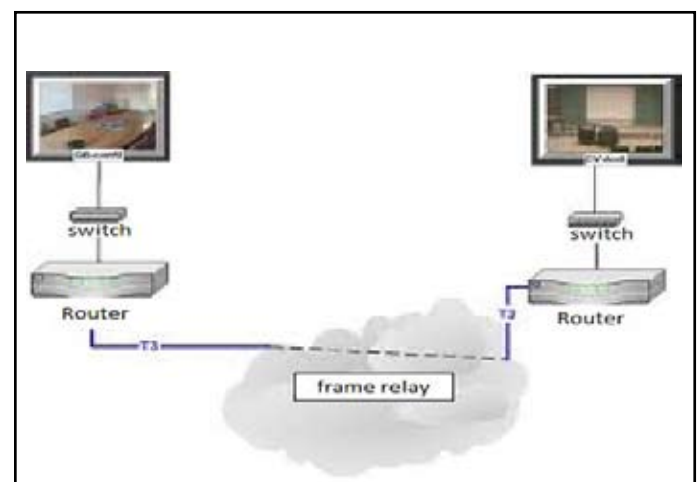


Fig. 1: Point To Point AV Conference

The video and audio signals are transmitted separately but remain synchronized with each other, with a small time delay between an event at a site and its display on the TV monitors at the other sites.

Both sites can control both main cameras, so people at either end of the call can position either camera. The video quality in point-to-point conferences approaches that of a typical broadcast signal.

B. Multi-Point Video Conferencing

In a MultiPoint AV Conference, there are more than two participants. Simultaneous videoconferencing among three or more remote points is possible by means of a Multipoint Control Unit (MCU). This is a bridge that interconnects calls from several sources (in a similar way to the audio conference call). All parties call the MCU, or the MCU can also call the parties which are going to participate, in sequence. There are MCU bridges for IP and ISDN-based videoconferencing. There are MCUs which are pure software, and others which are a combination of hardware and software.

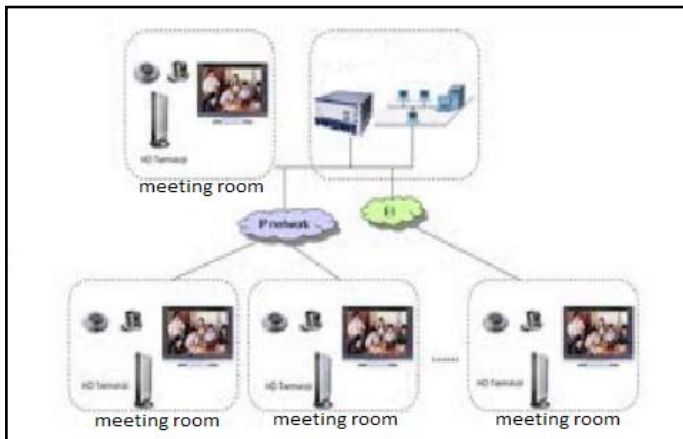


Fig. 2: MultiPoint AV Conference

An MCU is characterized according to the number of simultaneous calls it can handle, its ability to conduct transposing of data rates and protocols, and features such as Continuous Presence, in which multiple parties can be seen on-screen at once. MCUs can be standalone hardware devices, or they can be embedded into dedicated videoconferencing units.

The MCU consists of two logical components:

- A single multipoint controller (MC), and
- Multipoint Processors (MP), sometimes referred to as the mixer.

The MC controls the conferencing while it is active on the signaling plane, which is simply where the system manages conferencing creation, endpoint signaling and in-conferencing controls. This component negotiates parameters with every endpoint in the network and controls conferencing resources. While the MC controls resources and signaling negotiations, the MP operates on the media plane and receives media from each endpoint. The MP generates output streams from each endpoint and redirects the information to other endpoints in the conference.

III. Unified Communications

Unified Communications (UC) is the integration of real-time communication services such as instant messaging (chat), presence information, telephony (including IP telephony), video conferencing, data sharing (including web connected electronic whiteboards aka IWB's or Interactive White Boards), call control and speech recognition with non-real-time communication services such as unified messaging (integrated voicemail, e-mail, SMS and fax). UC is not necessarily a single product, but a set of products that provides a consistent unified user interface and user experience across multiple devices and media types.



Fig. 3: Unified Communications

A basic definition of Unified Communications would be “communications integrated to optimize business processes,” but such integration can take many forms, such as: users simply adjusting their habits, manual integration as defined by procedures and training, integration of communications into off-the-shelf tools such as Outlook, Notes, BlackBerry, Salesforce.com, and many others, or purpose-specific integration into customized applications in specific operating departments or in vertical markets such as healthcare.

Unified communications is an evolving set of technologies that automates and unifies human and device communications in a common context and experience. It optimizes business processes and enhances human communications by reducing latency, managing flows, and eliminating device and media dependencies.

Unified communications is sometimes confused with unified messaging, but it is distinct. Unified communications refers to both real-time and non-real-time delivery of communications based on the preferred method and location of the recipient; unified messaging systems cull messages from several sources (such as e-mail, voice mail and faxes), but holds those messages only for retrieval at a later time. Unified communications allows for an individual to check and retrieve an e-mail or voicemail from any communication device at anytime. It expands beyond voicemail services to data communications and video services.

IV. Proposed Approach

We are developing the Application Programming Interfaces that expose the information of a live conference contained in the objects of the conferencing software. For this purpose, we are using the REST and JMX frameworks.

A. REST: Representational State Transfer

REST is a style of software architecture for distributed systems such as the World Wide Web. REST has emerged as a predominant Web service design model. REST-style architectures consist of clients and servers. Clients initiate requests to servers; servers process requests and return appropriate responses. Requests and responses are built around the transfer of representations of resources. A resource can be essentially any coherent and meaningful concept that may be addressed. A representation of a resource is typically a document that captures the current or intended state of a resource.

REST facilitates the transaction between web servers by allowing loose coupling between different services. REST is less strongly typed than its counterpart, SOAP. The REST language uses nouns and verbs, and has an emphasis on readability. Unlike SOAP, REST does not require XML parsing and does not require a

message header to and from a service provider. This ultimately uses less bandwidth. REST error-handling also differs from that used by SOAP.

Key goals of REST include:

- Scalability of component interactions
- Generality of interfaces
- Independent deployment of components
- Intermediary components to reduce latency, enforce security and encapsulate legacy systems

B. JMX: Java Management Extensions

JMX is a Java technology that supplies tools for managing and monitoring applications, system objects, devices (e. g. printers) and service oriented networks. Those resources are represented by objects called MBeans (for Managed Bean). In the API, classes can be dynamically loaded and instantiated. Managing and monitoring applications can be designed and developed using the Java Dynamic Management Kit.

JMX is based on a 3-level architecture:

- The Probe Level
- The Agent Level
- The Remote Management Level

Applications can be generic consoles (such as JConsole and MC4J), or domain-specific (monitoring) applications. External applications can interact with the MBeans through the use of JMX connectors and protocol adapters. Connectors are used to connect an agent with a remote JMX-enabled management application. This form of communication involves a connector in the JMX agent and a connector client in the management application.

V. Conclusion

The live audio-video conferences may need to be monitored for various different purposes including management, decision making and marketing in a business enterprise. The REST and JMX frameworks provide an easy and efficient way to develop the monitoring APIs for live audio-video conferences.

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