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Video Teleconferencing (VTC) Technology at the National Institutes of Health (NIH) v1.0

Status of this Memo

This memo provides information for Video Teleconferencing (VTC) Technology at the National Institutes of Health (NIH). Distribution of this memo is unlimited.

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1 Introduction

The intent of this document is to provide information on the VTC practices at NIH, a background on the International Telecommunication Union -Telecommunications Standardization Sector (ITU-T) Recommendations and the business drivers for utilizing NIH's VTC infrastructure. Ultimately, it will be used as supplemental information for a separate VTC technology standard.

2 Business Objectives for a Standardized VTC Technology Architecture

NIH has adopted specifications and standards for VTC endpoints that work most efficiently and effectively with the VTC infrastructure.

Business objectives for adopting and implementing VTC technology standards include the following:

- Enable successful passing through of the NIH border firewall
- Allow VTC administrators to remotely manage endpoints
- Provide a standard naming convention for all endpoints
- Supply dedicated telephony services
- Certify capability with endpoints to the NIH VTC infrastructure and the NIH network in general
- Comply with International Telecommunication Union – Telecommunications Standardization Sector (ITU-T) defined recommendations for VTC

3 Video Teleconferencing (VTC) Technology at the National Institutes of Health (NIH)

3.1 Introduction

In order to ensure the successful integration of new VTC technology infrastructure, primarily supported by the Center for Information Technology (CIT), organizations implementing VTC technology should understand the established endpoint specifications in use within the VTC infrastructure. An **endpoint** is a terminal, gateway or multipoint control unit (MCU).

Terminals are the conference rooms on the local area network (LAN) that provide real-time, two-way video and audio communications. These specifications were determined through market and independent research.

3.2 Current VTC Practices within NIH

Currently, there are two services provided by CIT's VTC infrastructure: Internet Protocol (IP) Videoconference – ITU-T Recommendation H.323 – and Integrated Services Digital Network (ISDN) – ITU-T Recommendation H.320. IP Videoconference is performed on more of an ad hoc basis while ISDN primarily concerns scheduling VTC technology services.

ITU standards describe the protocols, services and equipment required for VTC communications including video, audio, and all other data on networks that does not possess guaranteed Quality of Service (QoS). CIT complies with this standard with its IP Videoconference services.

Both H.323 and H.320 are ITU-T Recommendations. Recommendations are standards that define how telecommunication networks operate and interwork.

CIT has a heterogeneous, H.323 and H.320, multi-vendor enterprise video teleconferencing infrastructure. A **Gatekeeper** is an optional component in the H.323 system which is used for admission control and address resolution.

The H.323 Recommendation (IP Videoconference) is comprehensive, yet flexible, and can be applied to voice-only handsets and full multimedia video-conferencing stations, among others. H.323 applications are set to grow into the mainstream market for several reasons:

- H.323 establishes multimedia standards for the existing infrastructure (i.e. IP-based networks). Designed to compensate for the effect of highly variable LAN latency, H.323 allows customers to use multimedia applications without changing their network infrastructure.
- IP LANs are becoming stronger. Ethernet bandwidth is migrating from 10 Mbps to 100 Mbps, and Gigabit Ethernet is making headway into the market.
- By providing device-to-device, application-to-application and vendor-to-vendor interoperability, H.323 allows customer products to interoperate with other H.323-compliant products.
- PCs are becoming stronger multimedia platforms due to faster processors, enhanced instruction sets, and better multimedia accelerator chips.
- H.323 provides standards for interoperability between LANs and other networks.
- Network loading can be managed. With H.323, the network manager can restrict the amount of network bandwidth available for conferencing. Multicast support also reduces bandwidth requirements.
- H.323 has the support of many computing and communications companies and mainstream organizations. The efforts of these companies will generate a higher level of awareness in the market.
- H.323 is not tied to any hardware or operating system. H.323-compliant platforms will be available in many sizes and shapes, including video-enabled personal computers, dedicated platforms, IP-enabled telephone handsets, cable TV set-top boxes and turnkey boxes.
- Many users want to conference from a LAN to a remote site. For example, H.323 establishes a means of linking LAN-based desktop systems with ISDN-based group systems. H.323 uses common codec technology from different videoconferencing standards to minimize transcoding delays and to provide optimum performance.

H.320 Recommendation (ISDN) describes the protocols for establishing videoconferencing over a digital telephone connection. Typically an ISDN videoconference unit is purchased from a commercial vendor and is then connected using either ISDN2 lines or channels patched from an ISDN30 bearer. High quality videoconferencing today can be achieved on as little as 256Kbps (fair quality), 384kbps (which is industry default) or up to 1152kbps, which includes data sharing, i.e. using a PowerPoint™ presentation.

This H.320 type of videoconferencing has historically been the most popular and flexible. The standard governs communications over digital channels, similar to those a telephone uses deep within the telecommunications network. Frequently, in order to ensure a high degree of picture and sound quality, a technique called "inverse multiplexing" is used to aggregate channels for higher bandwidth.

Other applicable ITU-T Recommendations include:

- H.460.18 – ITU Standard that governs the traversal of H.323 call setup messaging through a firewall/NAT using standard H.323 signaling in a non-tunneled communication protocol.
- H.460.19 – ITU Standard that governs the traversal of all media within an H.323 call through a firewall/NAT. H.460.19 compliance requires compliance with H.460.18 as well.
- H.460.19 Multiplexed Media – an optional portion of H.460.19 standard that reduces the number of ports needed for media communications with a traversal server.

3.3 Compliant Specifications for NIH VTC Endpoints

To use the NIH VTC infrastructure, NIH organizations should adhere to the endpoint specifications listed below. This section illustrates all the specifications required to ensure seamless integration.

	H.320	H.323
Approval Date	1990	1996
Network	ISDN	IP
Video	H.261 H.263* H.264	H.261 H.263 H.264
Audio	G.711 G.722 G.722.1 G.728* AAC AAC-LD	G.711 G.722 G.722.1 G.728* G.723* G.729 AAC AAC-LD
Multiplexing	H.221	H.225.0
Control	H.230 H.242	H.245

*** Denotes Optional Standard**

The Video Standards

H.261: Supports 352x288 (CIF or FCIF) and 176x144 (QCIF). DCT-based algorithm tuned for 2B to 6B ISDN communication. Required for H.320, H.323, and H.324.
H.263: Much-improved derivative of H.261, tuned for POTS data rates. Mostly aimed at QCIF and Sub-QCIF (128x96 -- SQCIF), while providing better video than H.261 on QCIF and CIF.
H.264: Joint collaboration between the ITU and ISO. Improved video over H.263 providing similar quality at half the bandwidth.

The Audio Standards

G.711: 64 Kbps, 8K samples/sec, 8-bit companded PCM (A-law or μ-law), high quality, low complexity.
G.722: ADPCM audio encode/decode (64 kbit/s, 7 kHz).
G.722.1: ADPCM audio encode/decode (24 or 32 kbit/s, 7 kHz)
G.723: Speech coder at 6.3 and 5.3 Kbps data rate. Medium complexity.
G.723.1: 3.4 kHz dual rate speech codec at 5.3 and 6.4 kbit/s
G.728: 16 Kbps, LD-CELP, high quality speech coder, very high complexity.
G.729: 8Kbps, LD-CELP, high quality speech coder, medium complexity. G.DSVD is an interoperable subset.
AAC: Advanced Audio Coding, variations include AAC-LD (low delay) (TANDBERG endpoints: 64 or 128 kbit/s, 20kHz).

The Communications Standards

H.221: Frame Structure 64-1920 Kbps.

H.225: Media Stream Packetization and synchronization on non-guaranteed quality-of service LANs.
H.230: Frame synchronous control and indication signals for audio visual systems.
H.242: System for establishing audio visual terminals using digital channels up to 2Mbps.
H.245: Control of communications between visual telephone systems and terminal equipment on non-guaranteed bandwidth LANs.

By aligning to these VTC endpoint specifications, NIH stakeholders, including those within the Institutes and Centers (IC), will be able to acquire hardware and software that will work with CIT's VTC service and prevent incompatibility with the NIH VTC infrastructure.

4 References

For additional information about the International Telecommunication Union - Telecommunications Standardization Sector (ITU-T), please visit http://www.itu.int/ITU-T/index.html.

For a list of all the applicable ITU-T Recommendations, please visit http://www.packetizer.com/ipmc/h323/standards.html.

5 Contact

To contact the NIHRFC Editor, send an email message to EnterpriseArchitecture@mail.nih.gov.

Please contact the CIT VTC group at NIHVTCadmin@mail.nih.gov to obtain VTC information and registration/installation forms at NIH.

6 Security Considerations

Although this Informational NIHRFC details changes to security architecture procedures for video teleconferencing, the information contained in this document does not compromise security considerations at NIH.

7 Changes

Version	Date	Change	Authority	Author of Change
0.1	4/14/2008	Original Document	N/A	Matthew Amodio, NIH OCITA
0.2	5/28/2008	Added Rubin Sloan as the Technical Author	NIHRFC0001	Matthew Amodio, NIH OCITA
0.3	5/29/2008	Removed language	NIHRFC0001	Steve Thornton,

		that suggested this document as a standard.		NIHRFC Editor
1.0	06/17/2008	Document approved.	NIHRFC0001	Steve Thornton, NIHRFC Editor

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