EETS 8393
STUDENT PRESENTATION

H.323 & SIP
Overview/Comparison

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- SIP Overview
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Introduction

- Different signaling approaches have been considered by various standards organizations for multimedia applications such as voice, data and video over IP. Two of the primary standards in use today are H.323 and SIP.
- This presentation provides an overview and comparison of the operation and capabilities of these protocols.

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H.323 Overview

• Established by ITU as first communications protocol for real time multimedia communication over Packet switched networks.

• Is an umbrella standard that provides a well-defined architecture and implementation guidelines for call set-up, call control, and the media used for transmitting voice, data and video.

• Provides for multimedia and bandwidth management for point-to-point or multipoint conferencing.

• Takes a more telecommunications-oriented approach for the exchange of multimedia over IP.

• Architecture is peer-to-peer communications without a centralized controlling entity.

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H.323 Overview

- Call information is written in binary code, with a defined set of translations for each code.
- Supports data sharing using the T.120 standard.
- Is platform and application independent.
- Allow multimedia transmission using RTP/RTCP.
- support for voice is mandatory, video and data are optional.
- Uses Abstract Syntax Notation.1 (ASN.1) messaging scheme.
- Originally designed for multimedia conferencing on a LAN.
- Uses expensive MCU for multimedia conferencing.
- Used in MS NetMeeting application.
- Deployment started earlier than SIP.

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H.323 Components

- **Terminals:** endpoint devices on the network. Support three functionalities: signaling and control, real-time communication and Codec. Must support Audio, video & data are optional.
- **Gateways**: provide bridging functionalities for communications with other networks.
- **Gatekeepers:** used for address translation, admission control, bandwidth management and routing capabilities.
- **Conferencing bridges (MCU)**: used for joining 3 or more users in a conference setup.

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H.323 Signaling and Control Protocols

• **Q.931** for call signaling. Used to setup connections between terminals.

• **H.245** for call control including capability exchange, mode changes, flow control, commands, indications and others. Provides the ability to open logical channels on the network.

• **H.225.0 RAS** for providing registration, admissions and status signaling functions. Used between endpoints and gatekeepers. RAS communications include: Gatekeeper discovery, endpoint location, endpoint registration and others.

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Other H.323 Umbrella Specifications

AUDIO CODECS

•**G.711:** PCM, 64 kb/s μ/A-Law audio

•**G.722:** 7 kHz audio coding within 64 kb/s

•**G.723:** Dual rate speech coders at 5.3 and 6.3 kb/s

•**G.728:** Coding of speech at 16 kb/s

•**G.729:** Coding of speech at 8 kb/s

VIDEO CODECS

•**H.261:** Video codecs for audiovisual services at p x 64 kb/s

•**H.263:** Video coding for low bit rate communication

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Other H.323 Umbrella Specifications

- **RTP/RTCP**: For real-time multimedia transport
- **H.235:** Security and encryption for H-Series multimedia terminals
- **H.246:** Interworking between H.323 and other H.xxx standards
- **H.332:** Large group conferences
- **H.450:** Support of supplementary services in H.323

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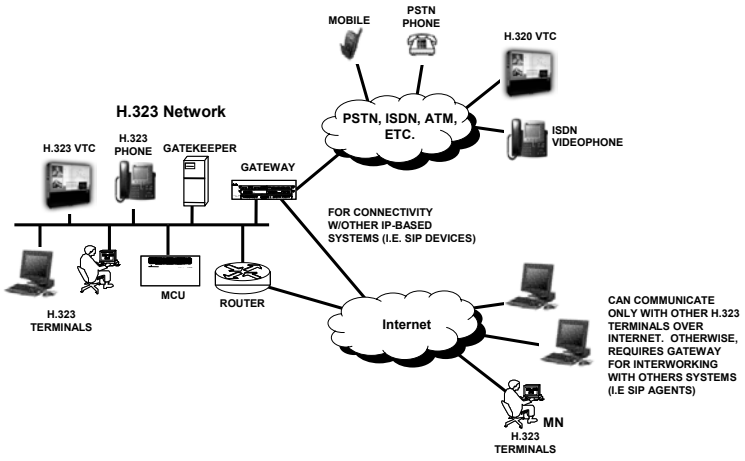
H.323 Network Diagram



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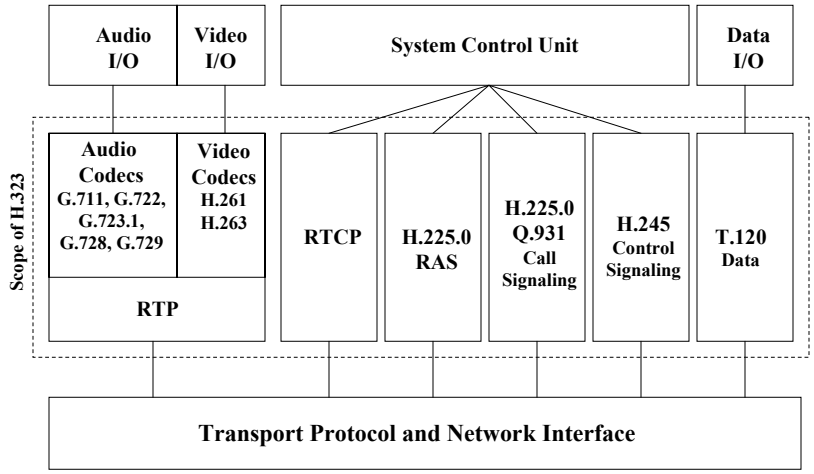
H.323 Protocol Stack



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SIP Overview

- IETF approach for voice, data and video over IP.
- Defined by IETF RFC 2543.
- Only defines the initiation of a session.
- SIP takes an Internet-oriented approach.
- Not as strictly defined as H.323. Many aspects of the SIP architecture are left open to interpretation.
- Is a text-based protocol designed to work hand in hand with other core Internet protocols such as HTTP, SMTP.
- Many functions in a SIP-based network rely on complementary protocols (IP, RTP, SDP, RTSP, SAP, PINT, SPIRITS, etc.).
- Application layer protocol used for establishing, modifying and terminating interactive communication sessions over IP.

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SIP Overview

- More scalable, faster and easier to implement than H.323.
- Uses telephone number or URI for addressing.
- URI based addresses are translated by DNS to an IP address. Address resolution can also involve ENUM or Location server Lookup.
- Negotiates features and capabilities at session establishment using SDP.
- Supports Unicast and Multicast configurations.
- Can use IP Multicast for multipoint conferencing.
- Used in MS Windows Messenger on Windows XP.

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SIP COMPONENTS

- **Sip Endpoints:** Devices that understand the SIP protocol. There are two types:
  - User devices: such as PC, PDA, Phones, etc.
  - Gateways: for connection with external networks.
- **User Agent**: Application software on endpoint devices. May operate as Client (UAC) or server (UAS).
- **Servers:** There are three types:
  - **Proxy**: Forwards requests on behalf of client to servers that can provide requested service. Can be Stateful or Stateless.
  - **Registrar:** Records SIP URIs and associated IP addresses.
  - **Redirect:** Redirects clients request to another address where request should be retried.
- **Location Server**: A database that may contain routing information about the SIP network.

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SIP Complementary Protocols (RFC 3261)

- **SDP**: Session Description Protocol (RFC 2327)
- **RTP**: Real-Time Transport Protocol (RFC 1889)
- **RSVP**: Resource Reservation Protocol (RFC 2205)
- **RTSP**: Real-Time Streaming Protocol (RFC 2326)
- **SAP**: Session Announcement Protocol (RFC 2974)
- **PINT**: PSTN & Internet Telephony Services (RFC 2848)
- **SPIRITS**: Servers in the PSTN Initiating Requests to Internet Servers (RFC 3136)
- **TRIP**: Telephone Routing over IP (RFC 3219)

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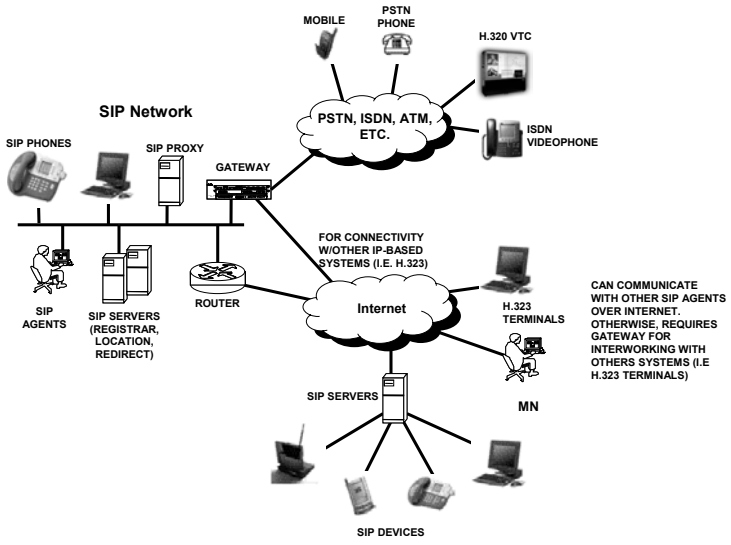
SIP Network Diagram



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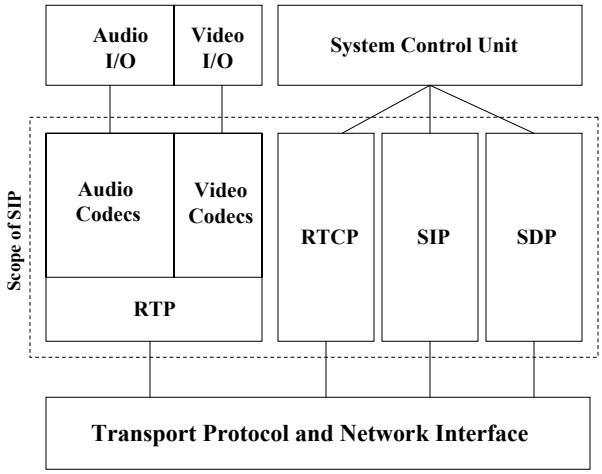
SIP Protocol Stack



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SIP vs H.323 Comparison

ENCODING

- **SIP**: Textual (results in higher bandwidth overhead; but is easy to debug, extend and process)
- **H.323**: Binary

ARCHITECTURE

- **SIP**: Modular (covers basic call signaling, user location and registration. Other features provided by complementary protocols)
- **H.323**: Covers almost every service (conference control, basic signaling, capability exchange, registration, etc.)

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SIP vs H.323 Comparison

COMPLEXITY

- **SIP**: Adequate (HTTP-like protocol)
- **H.323**: High (Use of different protocols)

ADDRESSING

- **SIP**: URI and Telephone Type
- **H.323**: Flexible addressing mechanisms, including URLs and E.164 numbers.

TRANSPORT

- **SIP**: TCP or UDP (mostly UDP transport for signaling)
- **H.323**: TCP or UDP (mostly TCP transport for signaling)

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SIP vs H.323 Comparison

SECURITY

- **SIP**: supports authentication, encryption and digital signatures.
- **H.323**: Defines security mechanisms and negotiation facilities via H.235, can also use SSL.

PROTOCOLS

- **SIP**: See Slide 14
- **H.323**: See Slides 7 & 8

CAPABILITY EXCHANGE

- **SIP**: Uses SDP
- **H.323**: Uses H.245

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Additional Comparison Notes

- The main difference between H.323 and SIP specifications is how the call signaling and control is achieved.
- Each protocol handles call set up, call control, and media in different ways. H.323 defines all of these; while SIP defines call set up and uses other protocols for call control and media.
- SIP has been designed as a general transaction protocol for setup and tear down of generic sessions. Voice and multimedia are only possible example applications of SIP.
- H.323 has been designed as a control protocol suite with the focus on multimedia applications, including telephony. The range of applications for H.323 is not as wide as for SIP.

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Additional Comparison Notes

- SIP is extremely flexible and can adapt to a number of implementations. SIP allows for the use of established protocols from other applications, such as HTTP and HTML. It's easier to add applications like Instant Messaging, Presence or Web conferencing.
- H.323 standards specify a complete framework and detailed protocols, state machines, and message flows for multimedia communication.
- For developers, SIP allows use of a variety of existing building blocks for applications that will interoperate with other Internet applications. Allow new services creation by using CPL, SIP Servlets and SIP CGI.

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Additional Comparison Notes

- H.323 allows better interoperability, network management, and call control.
- SIP follows a philosophy where systems and applications are formed by combining generic modules.
- H.323 defines conferencing as part of the standard, including both centralized and decentralized conferencing.
- SIP has no definition for conferencing, but there is a process within SIP for conferencing that is similar to H.323.
- SIP integration to the Web and other Internet services.
- SIP is faster than H.323 and requires less code to implement than H.323.

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Additional Comparison Notes

• H.323 terminals exchange configuration information using the Terminal Capability Set messages. In SIP, this information is exchanged in the Invite and 200:OK messages. Separate messages are not required.

• H.323 elements must all maintain state information. In SIP only the UA is required to do so. In some cases, the Proxy server may be required to maintain states.

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Conclusions

- Both protocols provide comparable functionality using different mechanisms and provide similar quality of service.
- SIP is more flexible and scalable.
- While SIP has been designed as a generic transaction protocol for session initiation not bound to any specific media such as audio or video, the focus of H.323 has been to handle voice and multimedia calls, including supplementary services.
- SIP is the equivalent of RAS and the Q.931-like protocol in H.323. SDP is the equivalent of H.245.
- The differences between the two protocols are diminishing with each new version.

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Conclusions

- Presently, both of them, including complementary protocols, are necessary to provide support for IP-based multimedia enhanced services.
- SIP is emerging as the protocol of choice for establishing multimedia, telephony, conferencing, and other types of communication sessions over the Internet.
- H.323 had an early start; there is a large installed base of H.323 equipment.
- It can be assumed that H.323 and SIP convergence is expected in the near future. Almost every H.323 based product has migration plans to SIP. Some H.323 products today support SIP.

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Questions

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