VIDEOCONFERENCING

Video class

Introduction

- What is videoconferencing?
  - Real time voice and video communications among multiple participants
- The past
  - Channelized, Expensive
  - H.320 suite and earlier schemes
  - Not as pervasive as many expected
- The future
  - Packetized, Cheap
  - H.323 suite or SIP
  - Expected to become commonplace, may be an important broadband driver

Introduction

- Technology considerations
  - Bandwidth
    - Full rate video creates millions of bits per sec
  - Encoding and Compression
    - Reduce BW needs to accommodate delivery mechanism
  - Delivery
    - POTS or ISDN
    - Satellite
    - DSL or CM
    - LANs
  - Synchronization/multiplexing
  - **Transporting the media efficiently**
  - **Locating endpoints**
  - **Session establishment, modification, and termination**

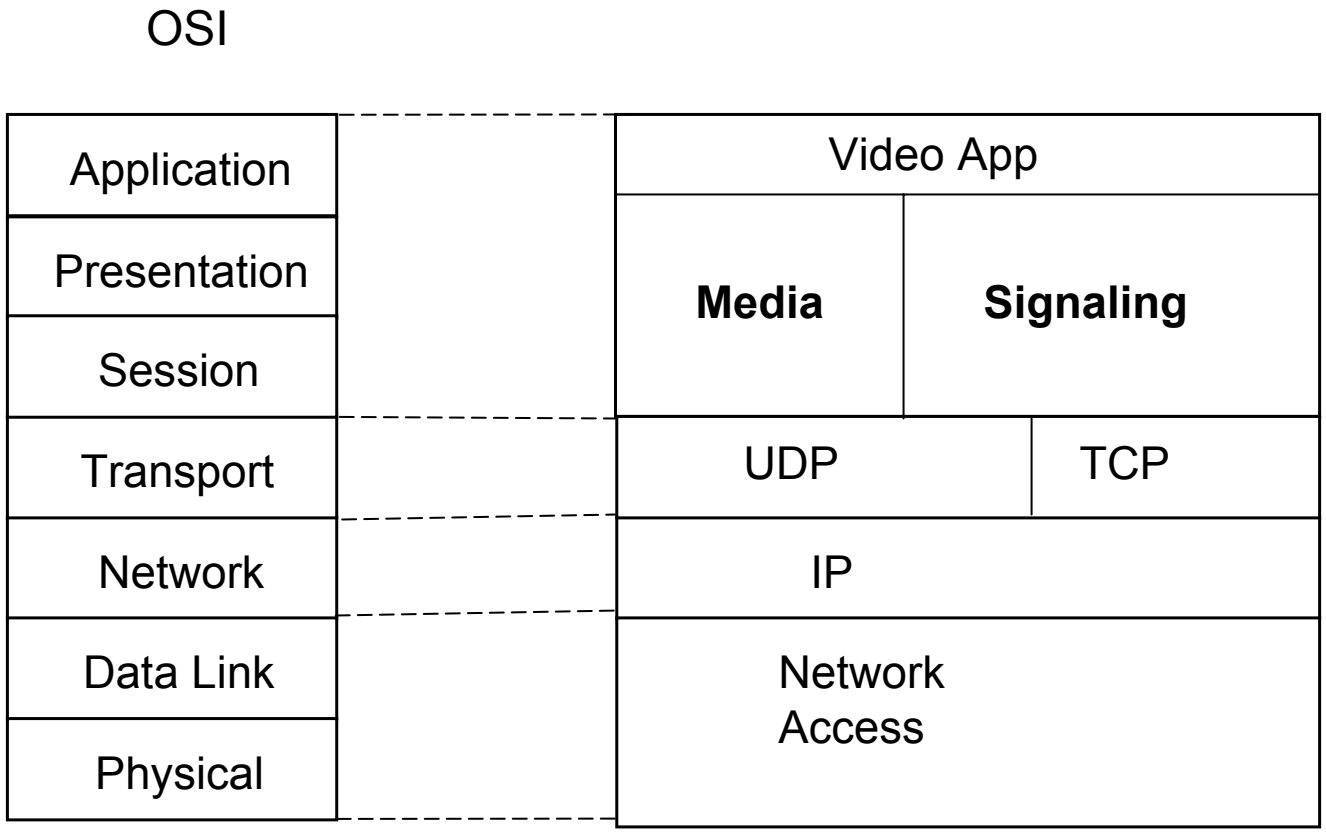
Introduction

- Videoconferencing is emerging from the ISDN world to that of the IP world.
  - H.320 suite (ISDN) is being replaced by H.323 (IP)
  - SIP is emerging as an alternate signaling scheme.
- ISDN still makes up the majority of “formal” videoconferencing
- In the IP space we have applications like NetMeeting gaining in popularity
  - Note that Microsoft is moving from H.323 to SIP

H.320 suite

- Developed in the late 1980s and is still used today.
- H.320 is a protocol suite
  - H.221 multiplex audio, video and control signals
  - H.230/H.242 control
  - H.231/H.243 multipoint capabilities
  - H.261 video encoding
  - G.711 audio encoding
- We will not focus on this protocol
- Rather we will focus on IP based video applications (H.323 and SIP)

Mapping IP video to the OSI Reference Model



Media transport

- Realtime Transport Protocol (RTP)
  - Used to transport the media (the voice and video)
  - Runs over UDP
- Realtime Transport Control Protocol (RTCP)
  - Provides feedback control for the RTP endpoints
  - Monitor various aspects of delay, jitter, dropped packets …

Media Codecs

- Coder/Decoder
- Audio
  - Most video standards mandate support of G.711 (A and mu)
  - G.711 is bandwidth intensive (for audio)
  - Endpoints may negotiate other audio codec, such as G.729, G.723.1
- Video
  - H.261
    - High bit rate
  - H.263
    - Low bit rate

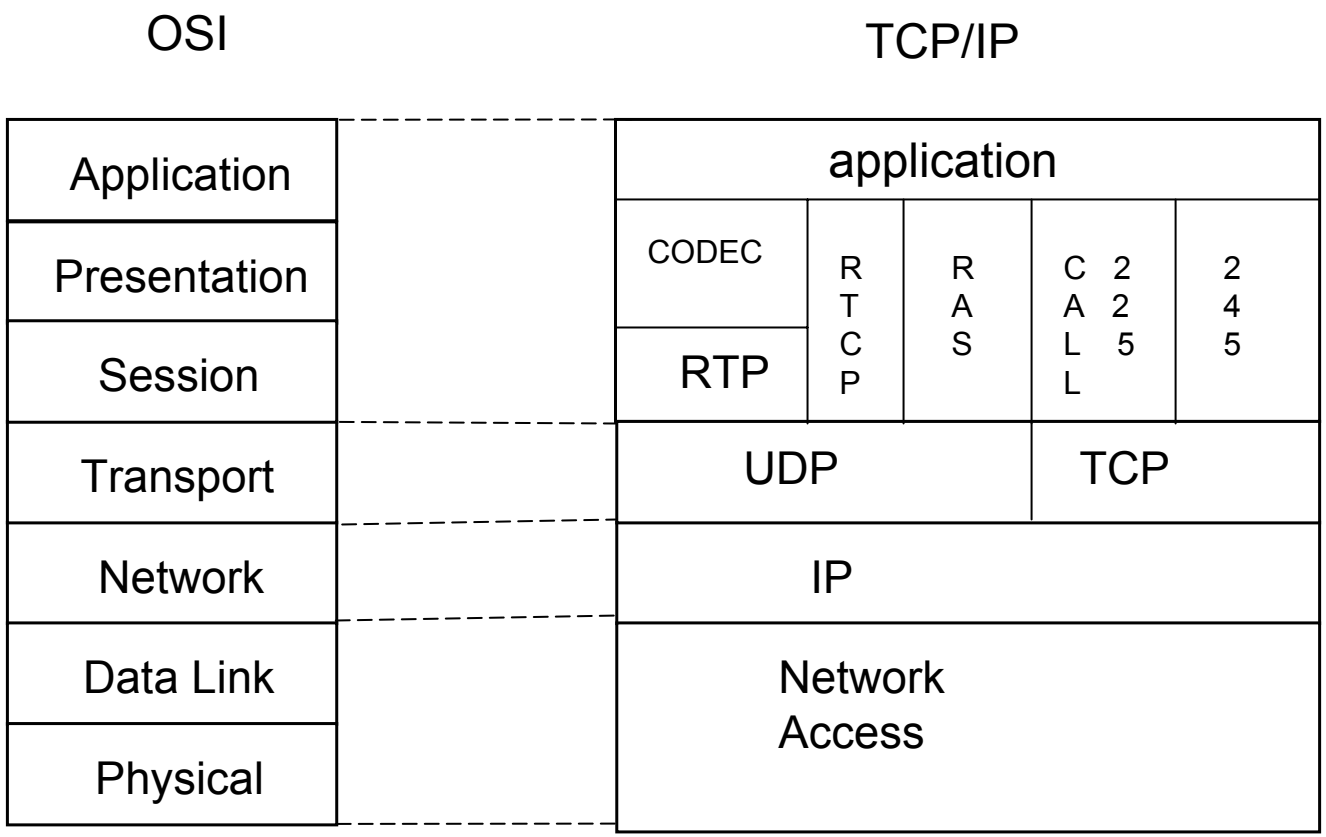
H.323

- H.323 protocol suite is a set of ITU standards
- H.323 enables the exchange of multimedia streams among endpoints
- Originally developed for LAN multimedia communications
- Precursors of H.323 exist for channelized networks (H.320)
- Version 2 is widely implemented
- Version 3 works to solve QoS and more.

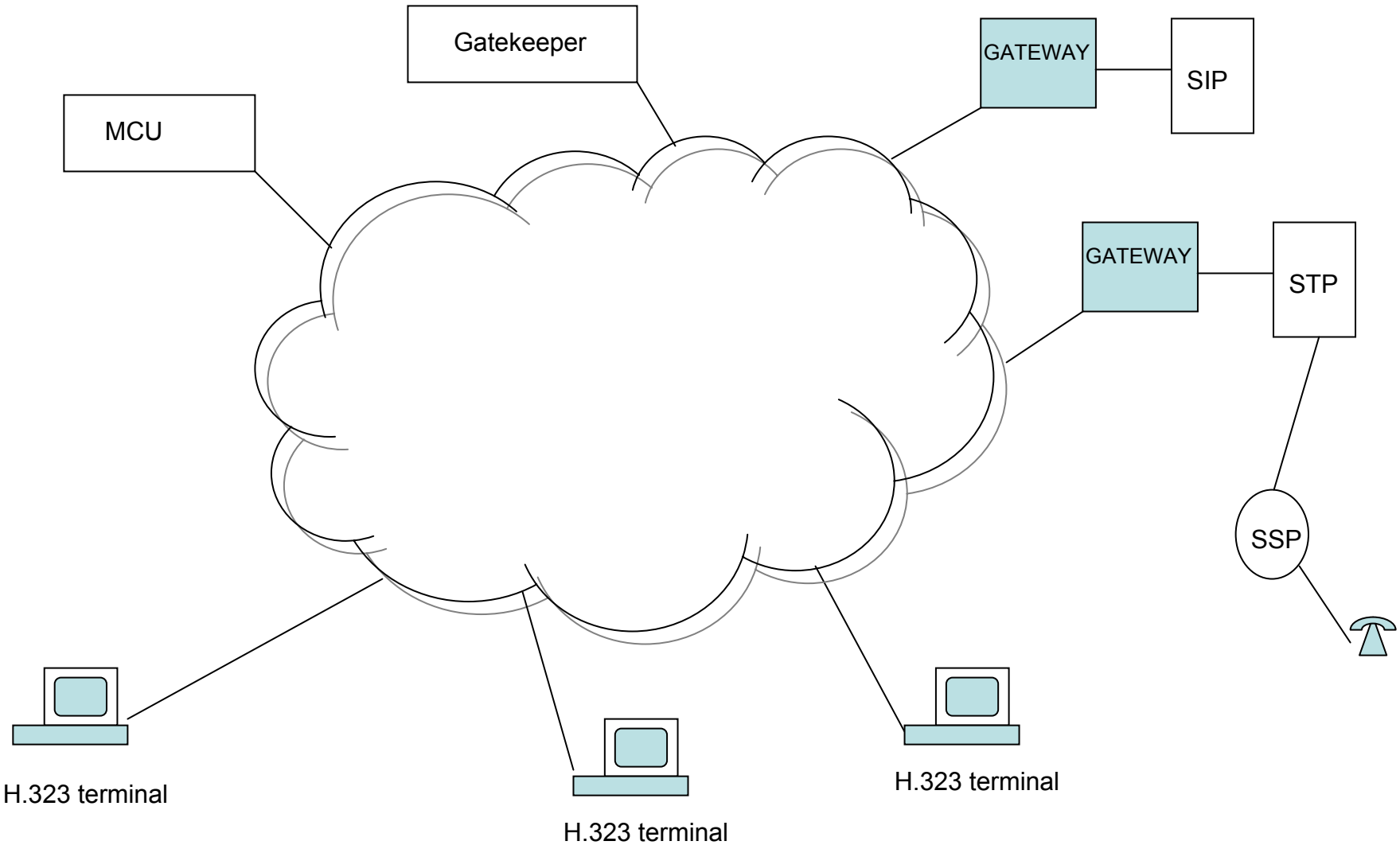
H.323 suite

- H.323 protocol suite
  - RAS (think of as pre-call control)
  - H.225 call signaling (Q.931)
  - H.245 media control (channel control)
  - H.261/H.263 video codec
  - G.711/G.729 audio codec
  - RTP/RTCP media transport
  - And others

Mapping to the OSI Reference Model



H.323 Architecture



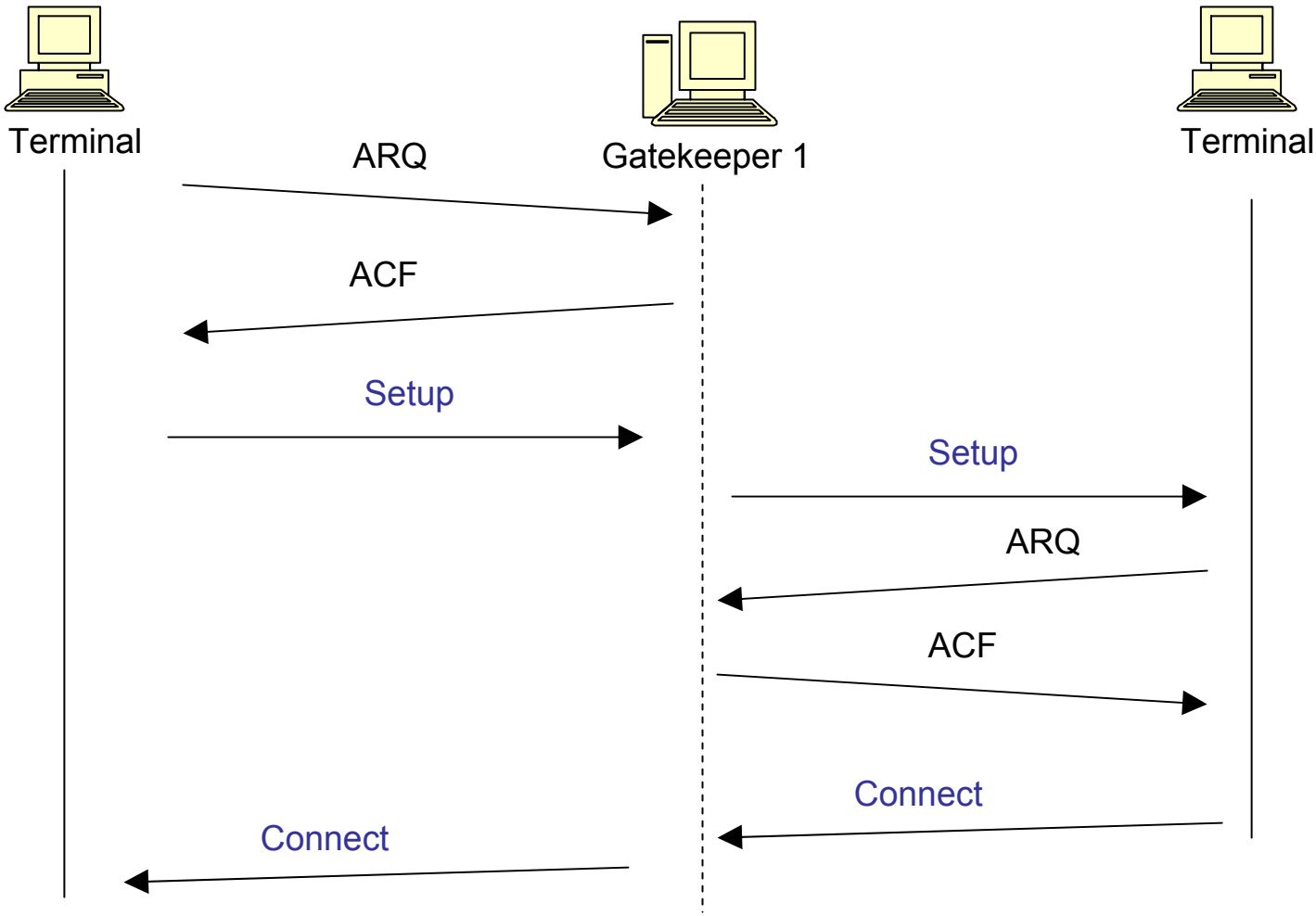
H.323

- Endpoints
  - Terminals –typically the end-user device
  - Gateways –translates between different types of networks
  - Multipoint Controller Units –manages multipoint (>2) conferences.
- Gatekeepers
  - serves to control (authorization, bandwidth control, address translation) this exchange
- Zone
  - Set of endpoints under the control of a gatekeeper
  - Can be a sub-network or span multiple networks

H.323 multipoint

- Multipoint Controller Units
  - Manages multipoint (>2) conferences
  - Shares capability sets with participants
- Multipoint Processor
  - Processes the actual media stream
  - Switches and/or mixes the media
  - Controller by the MC

H.323 RAS and H.225
GK-routed call signaling



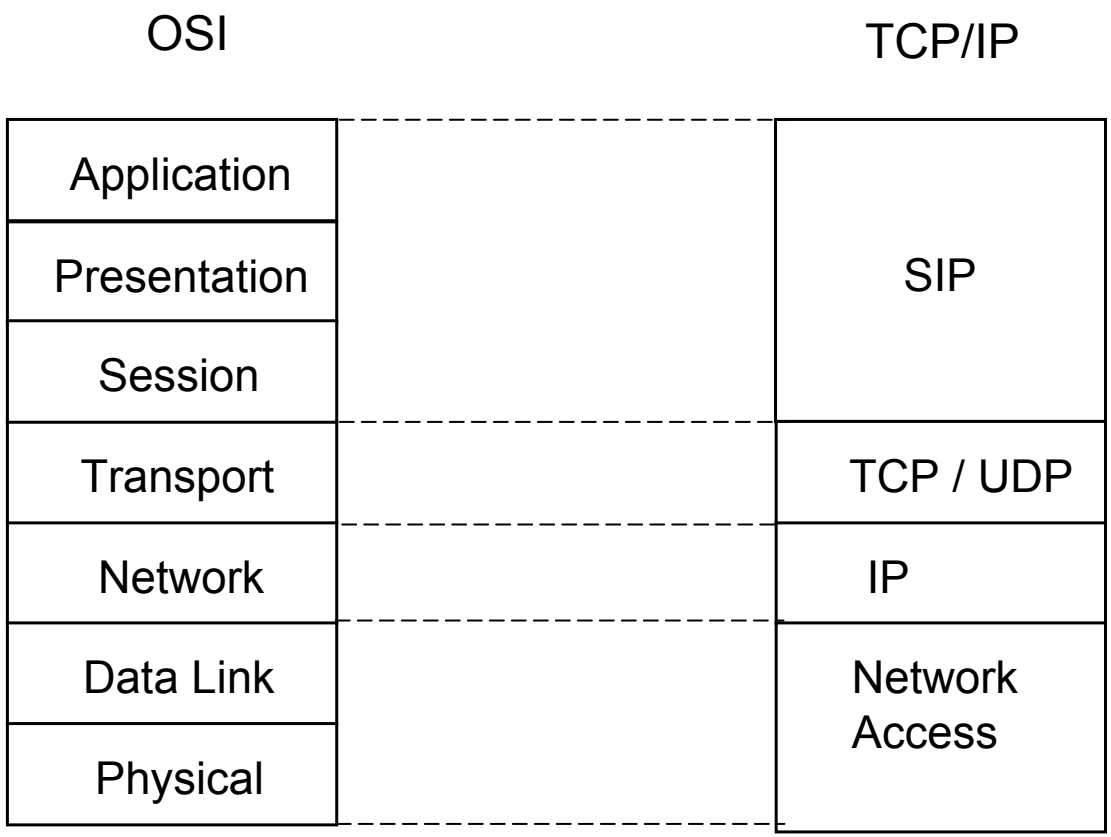
Session Initiation Protocol

- SIP allows two end-points to establish media sessions with each other.
- Functions include:
  - Locating end point
  - Contacting end point
  - Exchanging media info necessary for completing media connection
  - Modification of existing sessions
  - Terminating the session
- The media can be voice, video, messaging, telemetry, gaming…

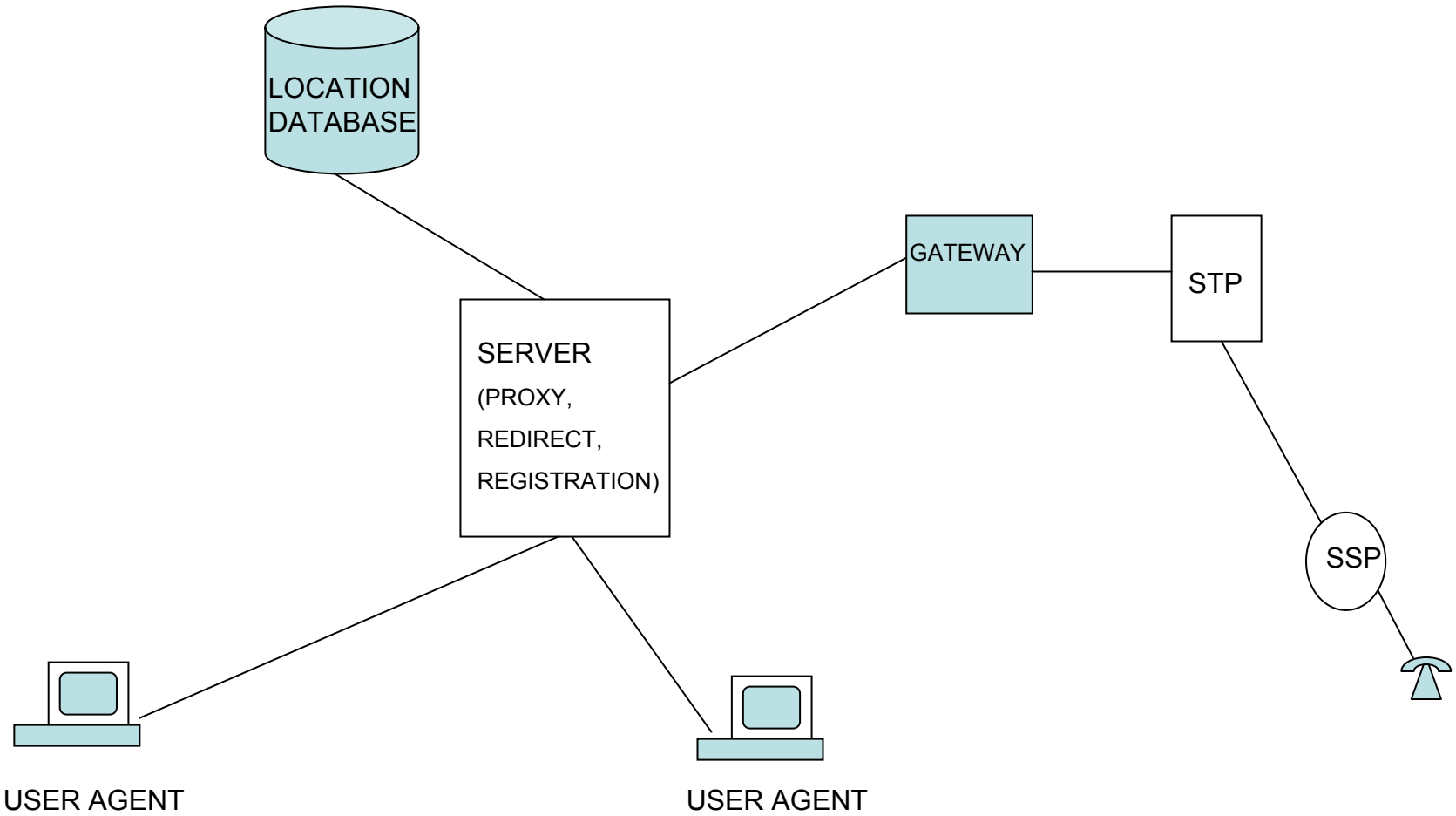
Session Initiation Protocol

- SIP is a “pure” signaling protocol
  - Keeping with IETF design: one problem, one protocol
  - It relies on other protocols to provide media description, transport, network routing, physical network…
- Based largely on
  - Hyper Text Transport Protocol (HTTP)
    - Use of URLs
    - Client/server design
  - Simple Mail Transport Protocol (SMTP)
    - Header style
    - Text encoding scheme

Mapping the OSI Reference Model to SIP



SIP Architecture



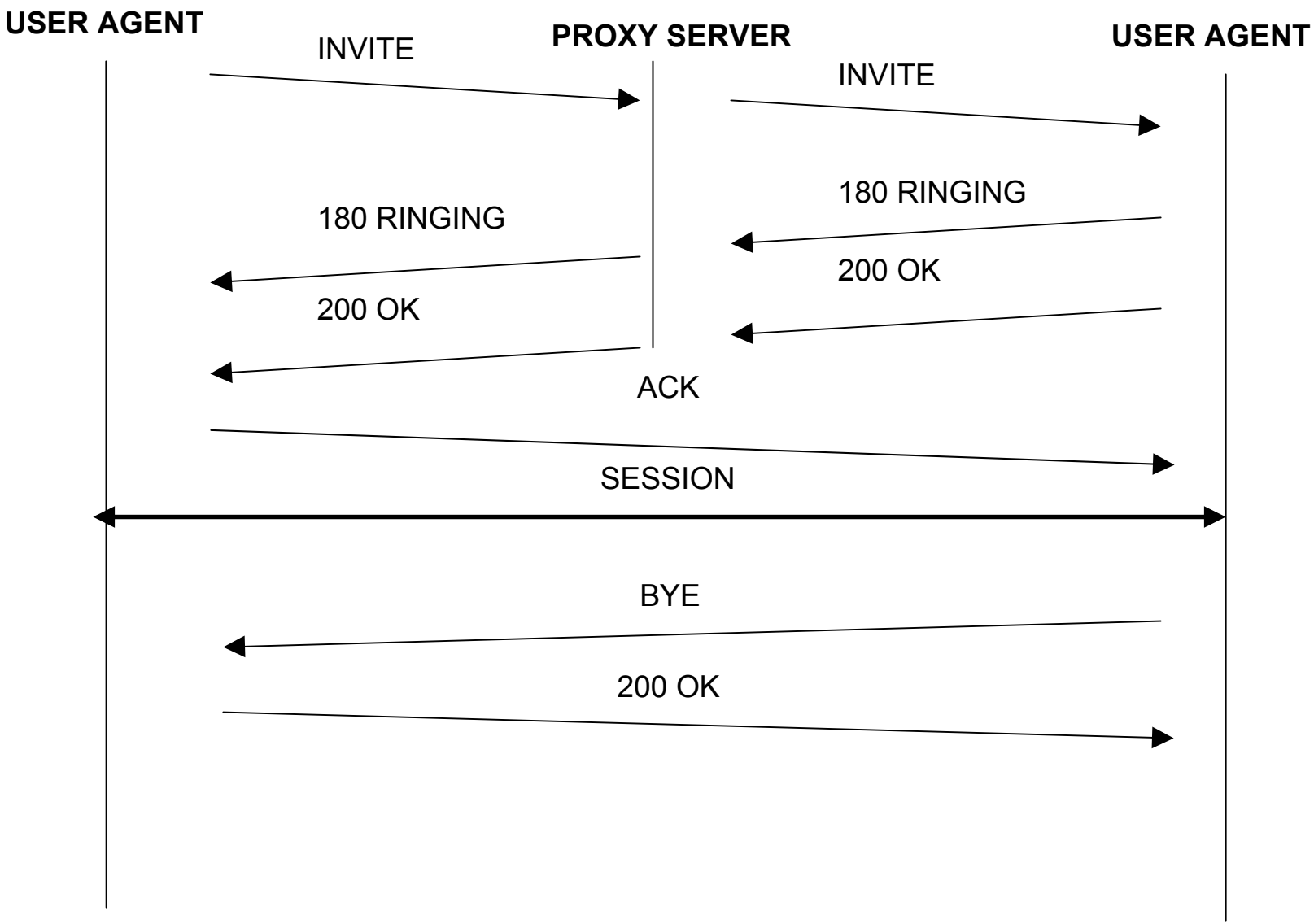
Session Initiation Protocol

- User Agent (UA)
  - Acts on behalf of the user (or an application) to setup/teardown video and voice sessions with other user agents.
  - Combined client and server
    - User Agent Client (UAC) and User Agent Server (UAS)
    - Performs as a client to create requests
    - Performs as a server to generate responses
  - Intended as peer to peer app

Session Initiation Protocol

- SIP servers
  - Accept and respond to SIP requests
  - May be a
    - proxy server
    - redirect server
    - registration server
  - A physical server can contain multiple logical servers (a proxy, a redirect or a registration)

Session Initiation Protocol



Gateways

- Gateways
  - Device that allows signaling and media to traverse between networks of differing types.
    - SIP to H.323
    - SIP to ISUP
    - H.323 to H.320
    - and others
  - Such devices are essential when multiple protocols exist for a given task.