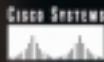




Packet Telephony Protocols and Architectures

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Agenda

- **The Protocols**
- **Network and Protocols in Fixed Network**
- **Moving Into Wireless Mobile**

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H.323

- H.323 is a suite of multimedia conferencing protocol, which includes voice, video, and data conferencing, for use over packet-switched networks
- ITU-T SG16. v1 approved in 1996, v2 in January 1998, v3 in September 1999, v4 in November 2000, v5 targeted 2002.
- ASN.1 coded. Highly scalable, Versatile and Robust Protocol Suite Since v2.

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H.323 is an “Umbrella” Specification

Media

H.261 and H.263 – Video codecs.

G.711, G.723, G.729 – Audio codecs.

RTP/RTCP – Media.

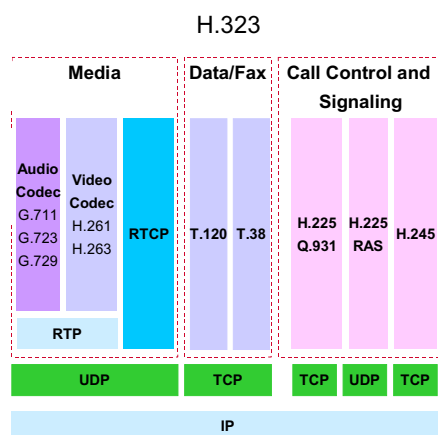
Data/Fax

T.120 – Data conferencing.

T.38 – Fax.

Call Control and Signaling

- H.245 - Capabilities advertisement, media channel establishment, and conference control.
- H.225
- Q.931 - call signaling and call setup.
- RAS - registration and other admission control with a gatekeeper.



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Elements of an H.323 System

- **Terminals**
- **Multipoint Control Units (MCUs)**
- **Gateways**
- **Gatekeeper**
- **Border Elements**

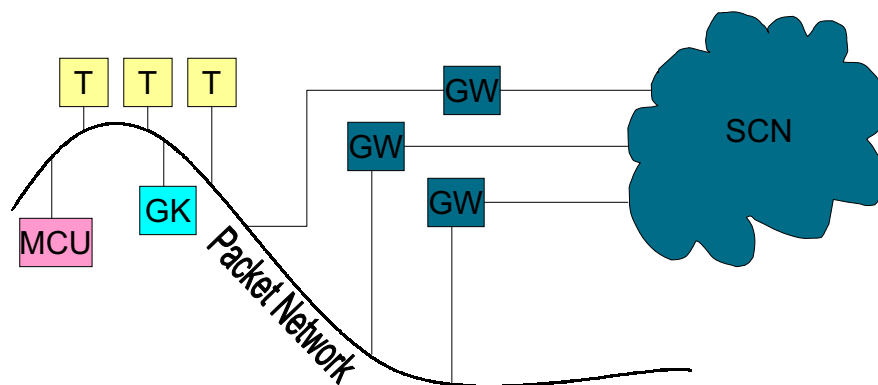
Referred to
as
“endpoints”



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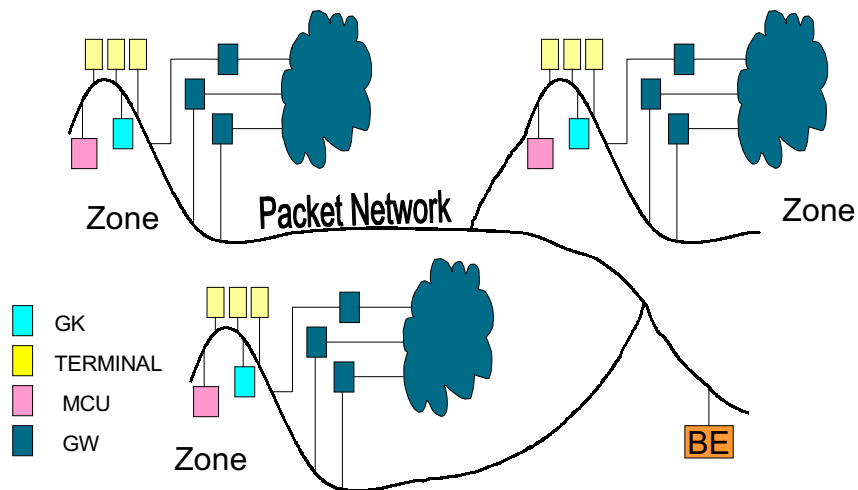
The Zone



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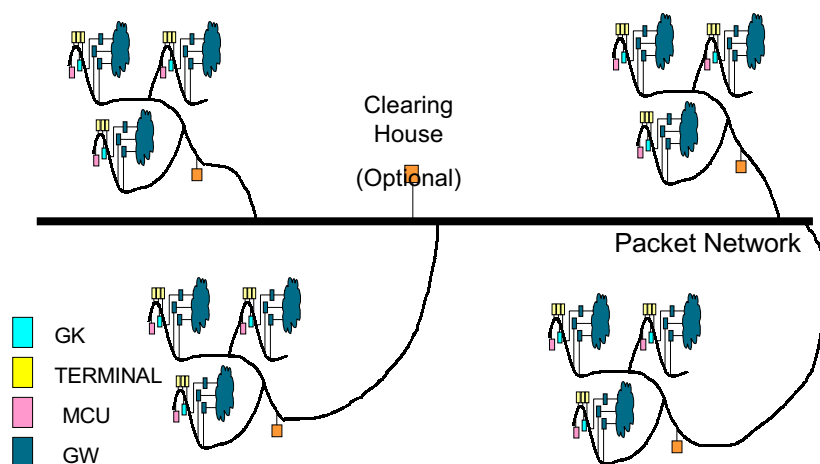
A Single Administrative Domain



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Multiple Administrative Domains



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Past To Present

- Recognizing the fact that H.323 was much more than a LAN protocol, the name was changed in H.323 Version 2 (1998)
- Enhancements were made, including:
 - Security
 - Performance
 - Supplementary Services
 - Scalability



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Past to Present

- H.323 version 3 introduced a few modest improvements, mostly geared for better PSTN integration and scalability
- New annexes were introduced:
 - Annex E/H.323 – UDP signaling
 - Annex F/H.323 – Simple endpoint type
 - Annex G/H.225.0 – Communication between administrative domains

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H.323 Version 4

- **H.323 version 4 was approved November 17, 2000 and brings a number of enhancements to H.323. Areas of focus include:**

Robustness and Flexibility

Services

“Must Have” Features

Generic Extensibility Framework



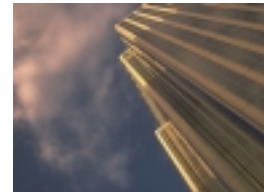
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Robustness and Flexibility

- **Gateway Decomposition with H.248**
- **Additive Registrations**
- **Alternate Gatekeepers***
- **Endpoint Capacity Reporting**

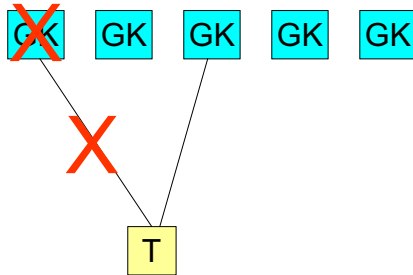
*Alternate gatekeepers were first introduced in H.323v2, but not documented. H.323 version 4 fully defines the procedure.



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Alternate Gatekeepers

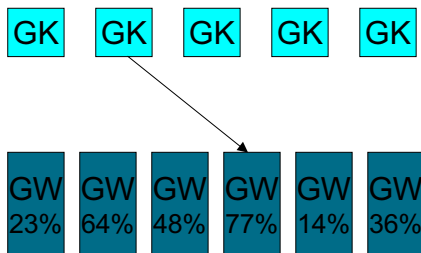


- By using Alternate Gatekeepers, endpoints are able to continue functioning in the face of one or more failures
- *Never Lose a Call!*

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Endpoint Capacity Reporting



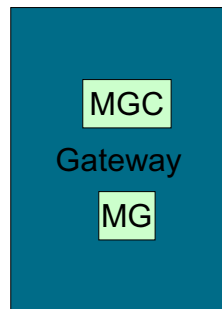
The GK selects the GW with the most capacity. Note that H.323 endpoints report capacity in absolute terms, not in percentages.

- By utilize endpoint capacity reporting, Gatekeepers may select an endpoint that is best capable of handling the call
- This is extremely useful for large scale deployments of Gateways and is also useful in call center applications
- *Never Lose a Call!*

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The Composite Gateway

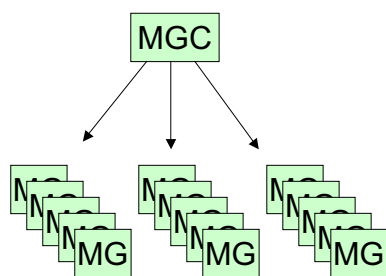


- Traditional Gateways were designed in such a way that both media and call control were handled by the same box
- The two components are referred to as the Media Gateway Controller (MGC) and Media Gateway (MG)

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The Decomposed Gateway

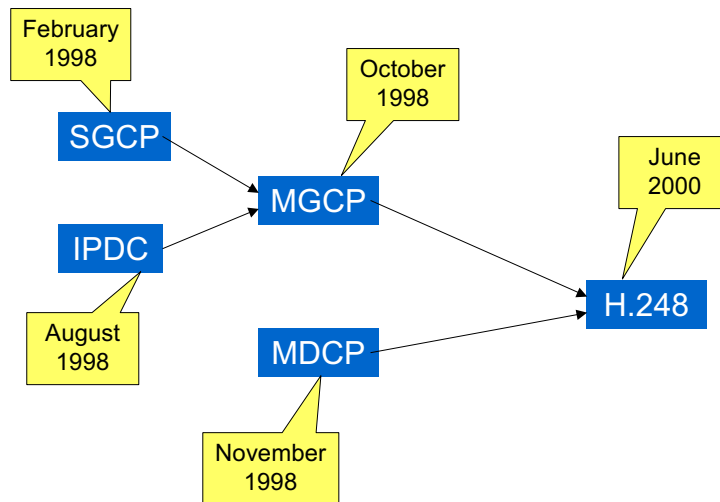


- The decomposed Gateway separates the MGC function and the MG function
- Multiple MGs may exist to allow the Gateway to scale to support much more capacity than a composite Gateway
- Communication between the MGC and MGs is done through H.248

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H.248 and MGCP



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H.248 and MGCP (cont.)

- **SGCP** was the first protocol to address Media Gateway Control, but **IPDC** followed very soon
- In **October 1998**, **SGCP** and **IPDC** were merged to create **MGCP**
- **Lucent** (among others) did not like the design philosophy behind **MGCP** and proposed **MDCP**
 - MGCP had an “endpoint” model
 - MDCP had an “edgepoint” model
- The **ITU** and **IETF** worked jointly to create **H.248**,

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H.248 and MGCP (cont.)

- One context (multiple terminations)
- Context associating terminations
- Service in change
- Add/subtract/move
- TermID has local part only
- Possible to specify parameters for diff codecs
- Protocol encoding in text or binary (ASN.1)
- One end-point model (multiple connections)
- Endpoint associating connections
- RSIP
- CRCX/DLCX/MDCX
- Endpoint—Domain/ local part
- Impossible to specify different parameters for diff codecs
- Protocol encoding in text

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SIP

- SIP (Session Initiation Protocol) is a text based, flexible, yet simple tool for establishing interactive connections across the Internet.
- RFC 2543, March 1999 and other docs by SIP WG
- It can be extended in numerous ways. New methods, headers and body types and new parameters for existing headers can be defined.

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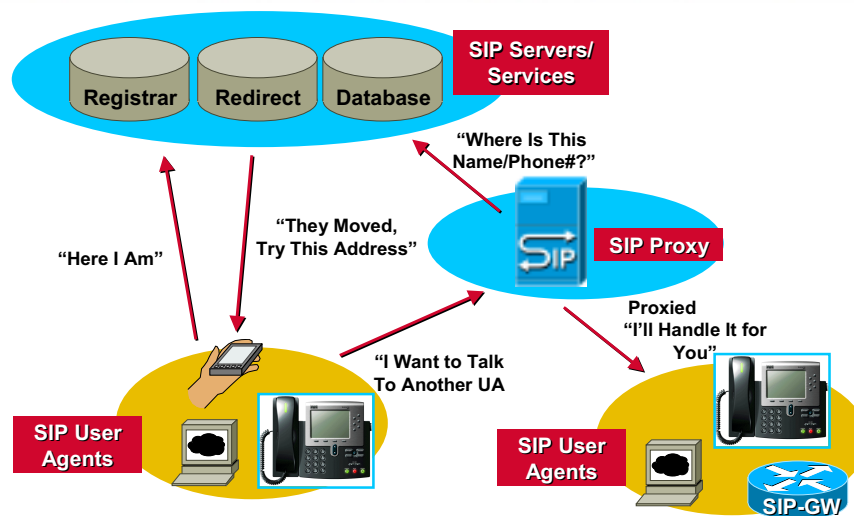
SIP Basics

- SIP is a peer-to-peer protocol where end-devices (User Agents—UAs) initiate sessions
- SIP defines the signaling mechanism for multimedia calls and conferences
- SIP uses several existing IETF protocols to provide message formatting (HTTP 1.1), media negotiation (Session Description Protocol—SDP), media (RTP), name resolution and mobility (DHCP and DNS), and application encoding (MIME)
- SIP is ASCII text-based for easy implementation and debugging

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SIP Servers/Services (Cont.)



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SIP Methods

- Consists of requests and responses
- Requests (unless mentioned, each has a response)
 - REGISTER** (UA registers with registration server)
 - INVITE** (request from a UA to initiate a call)
 - ACK** (confirms receipt of a final response to INVITE)
 - BYE** (sent by either side to end a call)
 - CANCEL** (sent to end a call not yet connected)
 - OPTIONS** (sent to query capabilities)
- Proposed new methods—SUBSCRIBE, NOTIFY, INFO, REFER, MESSAGE
- Gateways support INVITE, ACK, BYE and CANCEL; GWs and phones will respond to OPTIONS but will not send them; Gateways do not support REGISTER; Phones do support REGISTER
- Messages contain SIP headers and body; body might be SDP or an attachment or some other application

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SIP Applications

- Easily enables applications (Internet model)
 - Text-based
 - Web-enabled
 - Application-independent
- Uses a distributed architecture that overlays on existing data networks and allows new services to be added anywhere in the network
- Availability of commercial products is growing rapidly, and interoperability has been very strong
- Carriers and ASPs are beginning to announce availability of SIP services

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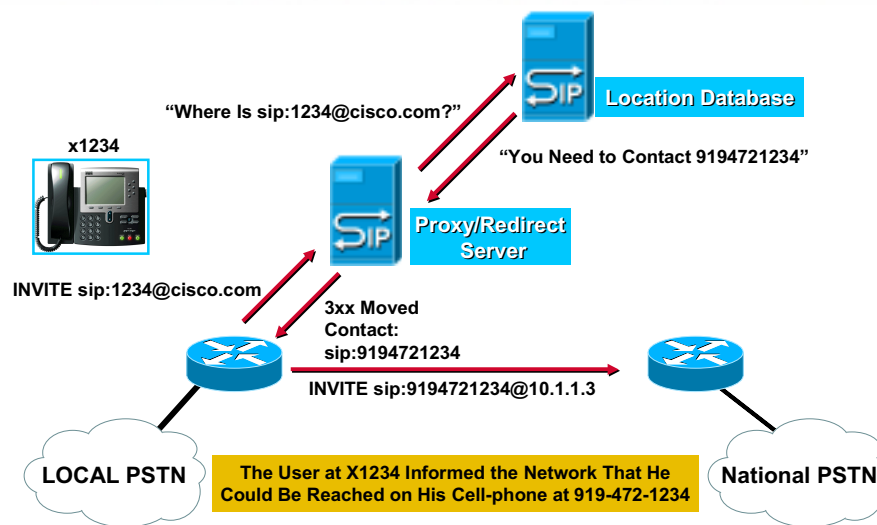
SIP Topologies/Applications

- IP centrex and IP-PBX
- PC to phone and/or PC to PC (ASP)
- Integration with existing applications like Instant Messaging
- 3rd-party call-control applications
- Find-me/follow-me, roaming, single-number-reach
- Internet call-waiting
- Presence
- Voice VPNs, managed voice/data networks
- Many other possibilities...

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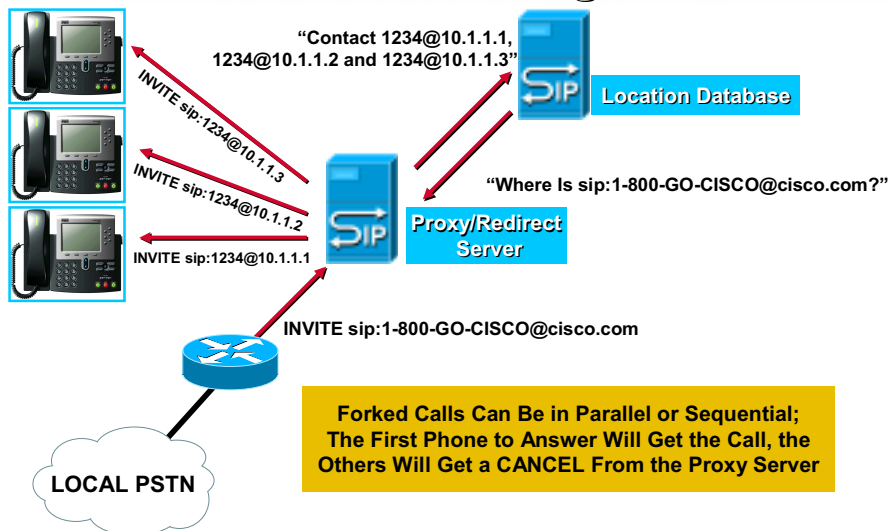
SIP Topologies/Applications— Call Redirection



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SIP Topologies/Applications— Call Forking



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SIP (Cont.)

- SIP model is quite analogous to H.323
- Intelligence is spread over the network
- Model similar to GK routed model (proxy servers, app servers and UAs)
- Semi-intelligent model (proxy servers, ASPs, UAs)

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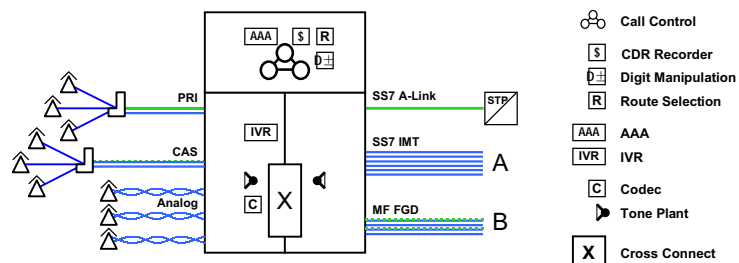
Agenda

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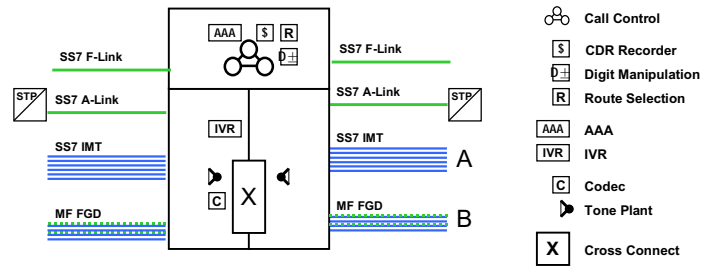
Basic Class 5 Switch



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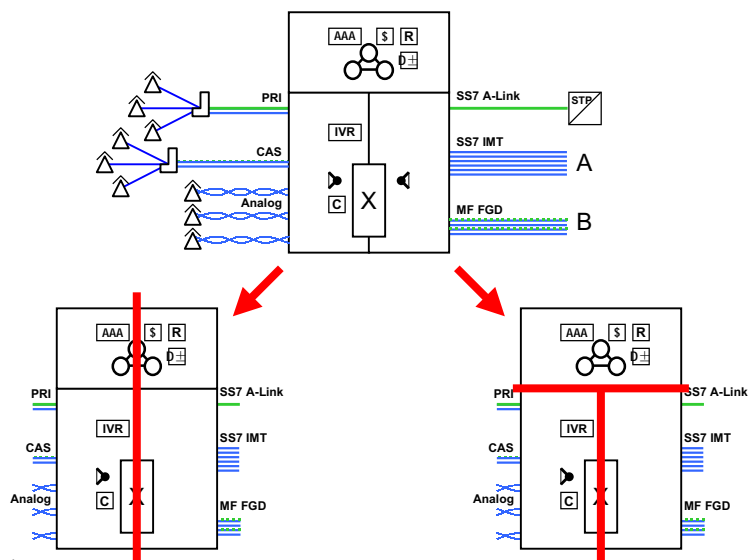
Basic Class 4/3 Switch



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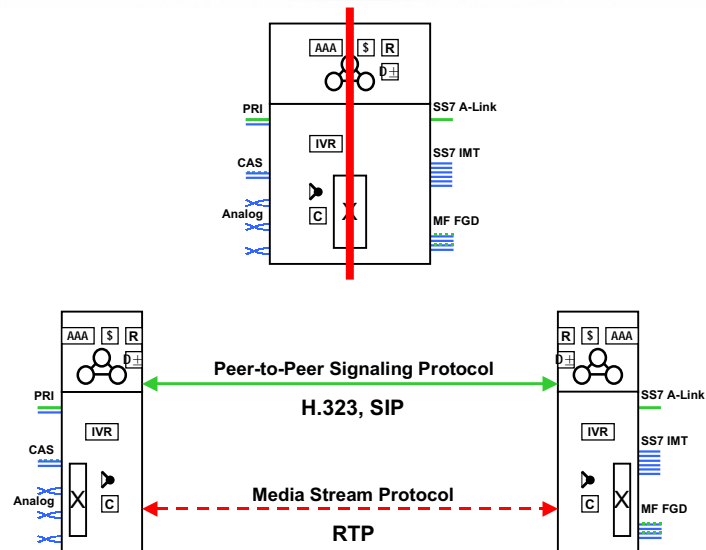
“Distribution Models” of a Basic Switch



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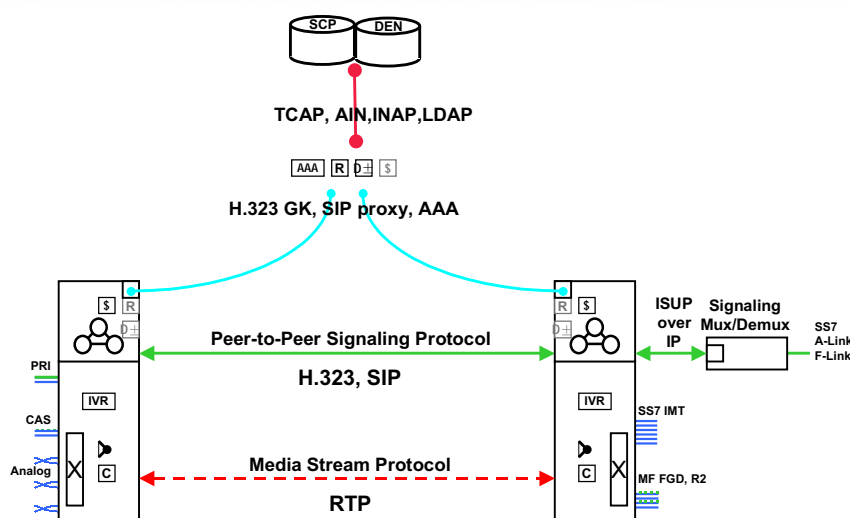
Peer-to-Peer Distribution



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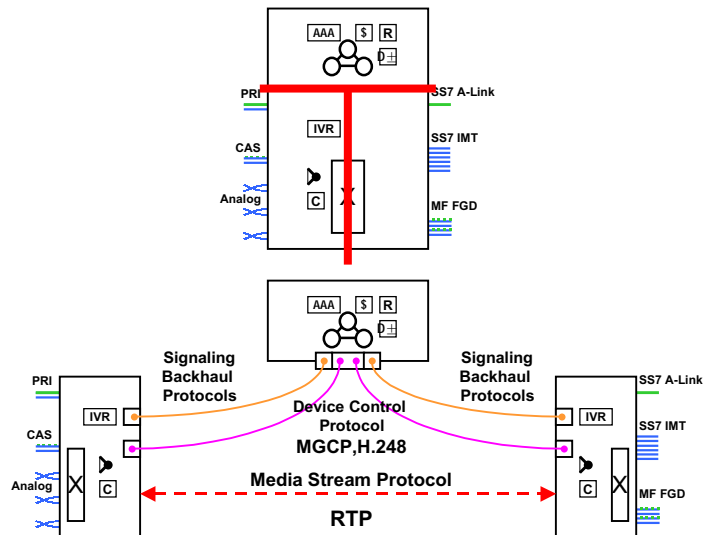
"Scalable" Peer-to-Peer



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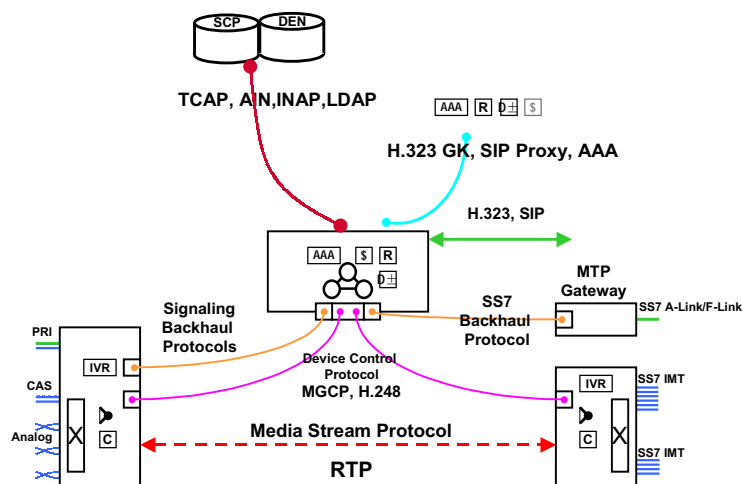
Master-Slave Distribution



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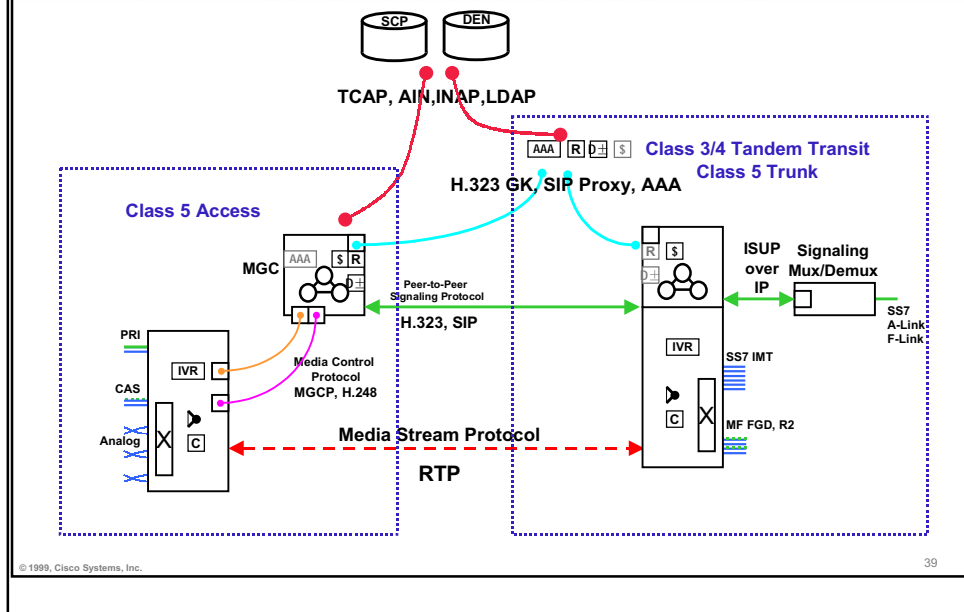
Basic Device Control (Realigned SS7)



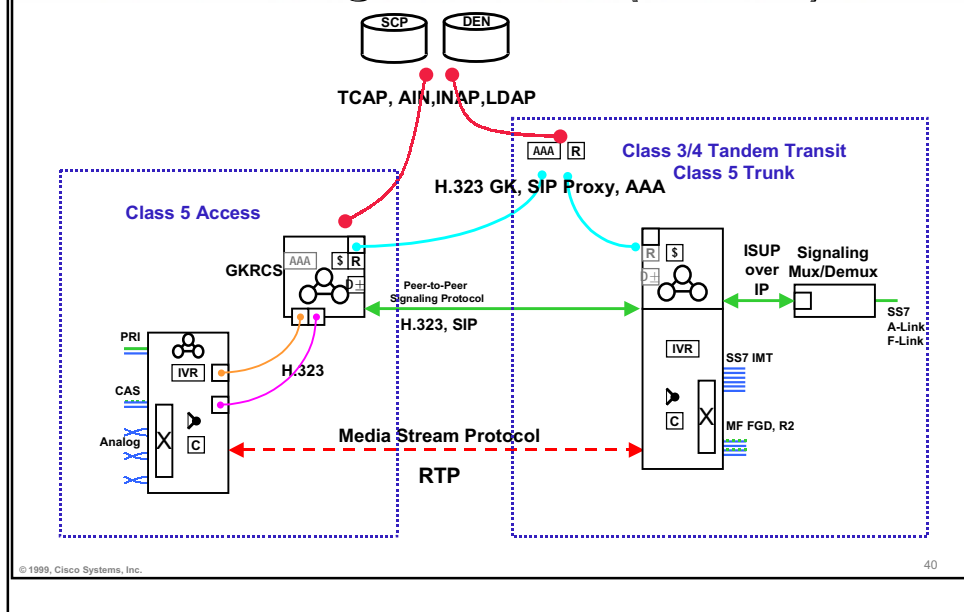
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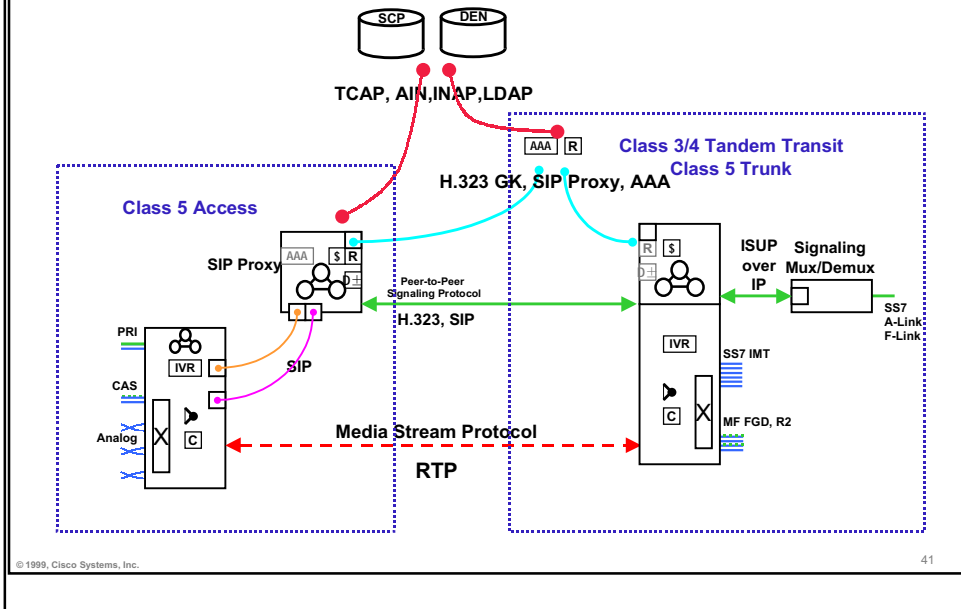
“Convergence” of Both Models (Cont’d)



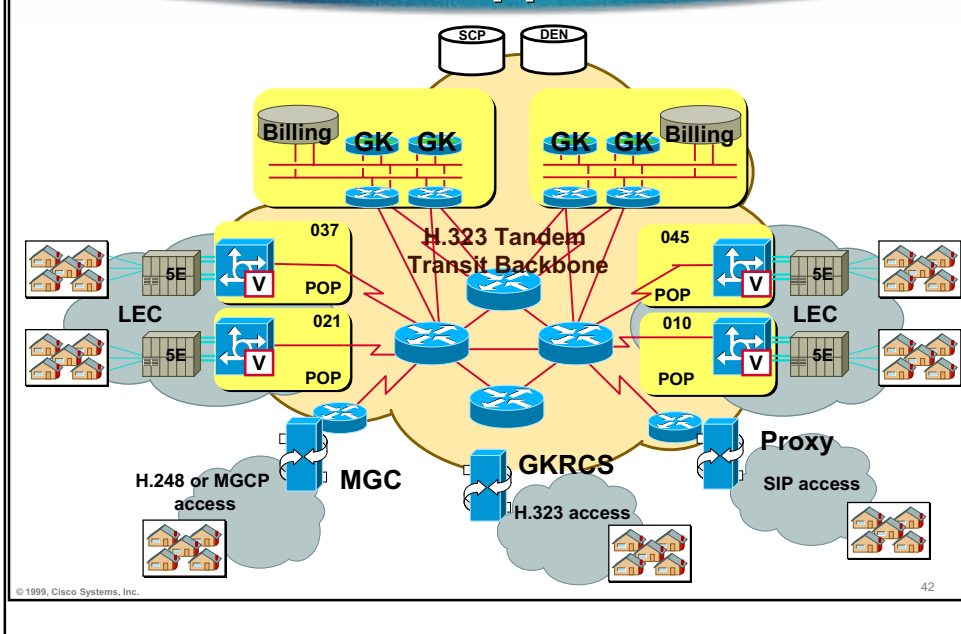
Alternative Access in Converged Model (Cont’d)



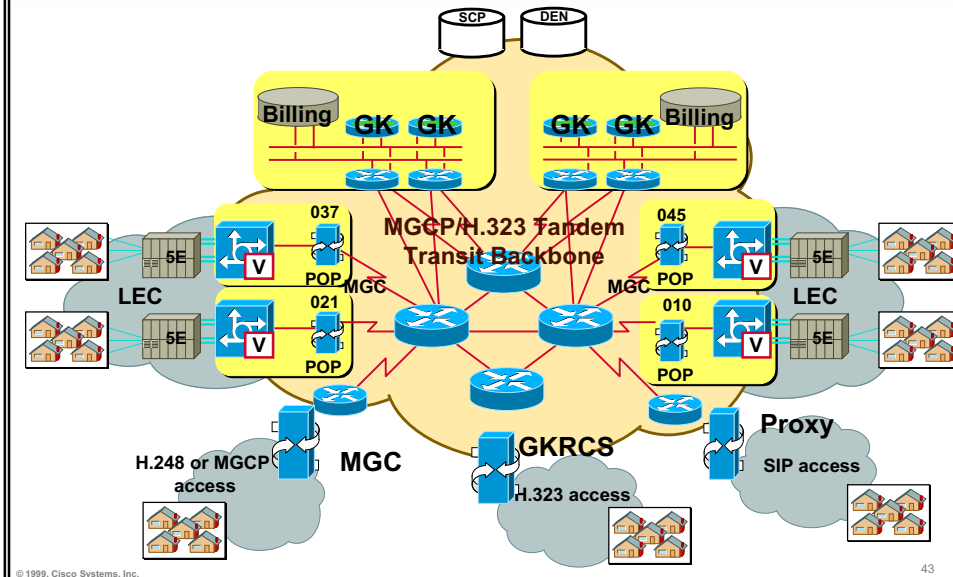
Alternative Access in Converged Model (Cont'd)



Emerging H.323, MGCP, H.248, and SIP Applications



Emerging H.323, MGCP, H.248, and SIP Applications (Cont'd)



Agenda

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- **Moving Into Wireless Mobile**

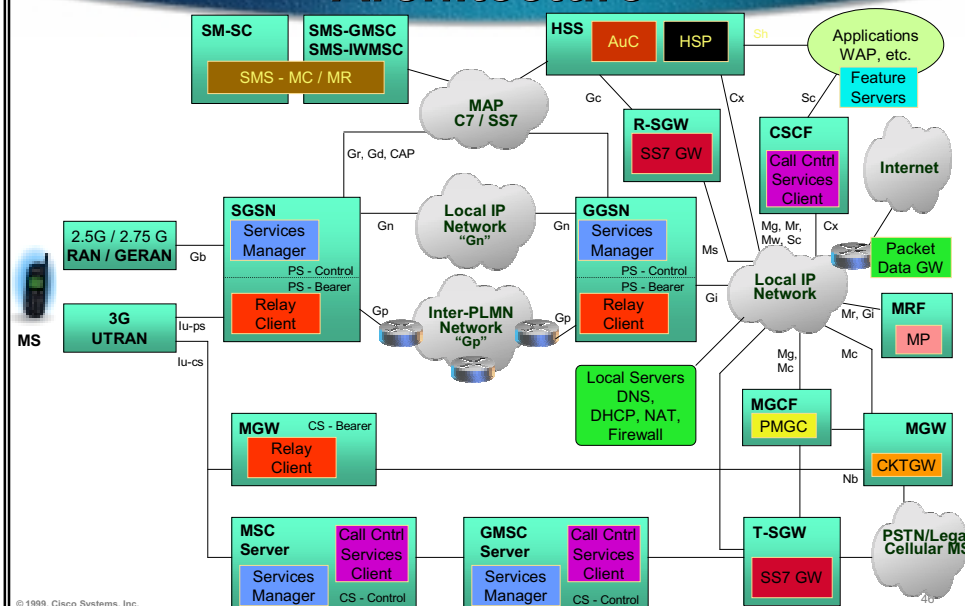
Protocol Evolutions

- The VoIP architecture and protocols for Fixed Network is already well understood.
- Telephony will be a key application in 3G Mobile Wireless Network, yet the protocols and architecture issues are not resolved yet.
- A set of new and different requirements on the protocols in 3G Mobile Wireless.
- Different parts of the network and different implementation of the Network Elements will shape the evolution of the protocols.

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3G Mobile Reference Architecture



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