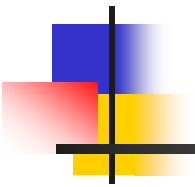
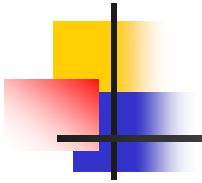


Media Gateway Control and the Softswitch Architecture

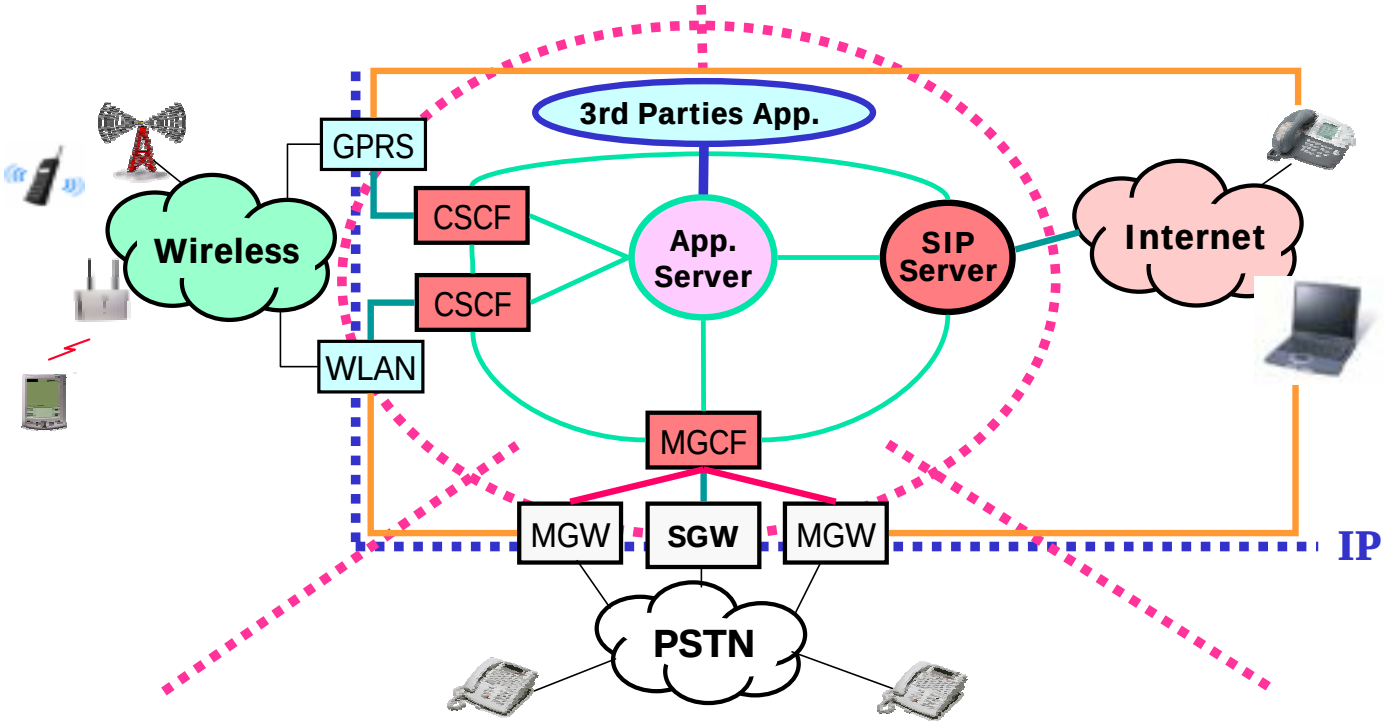


Outline

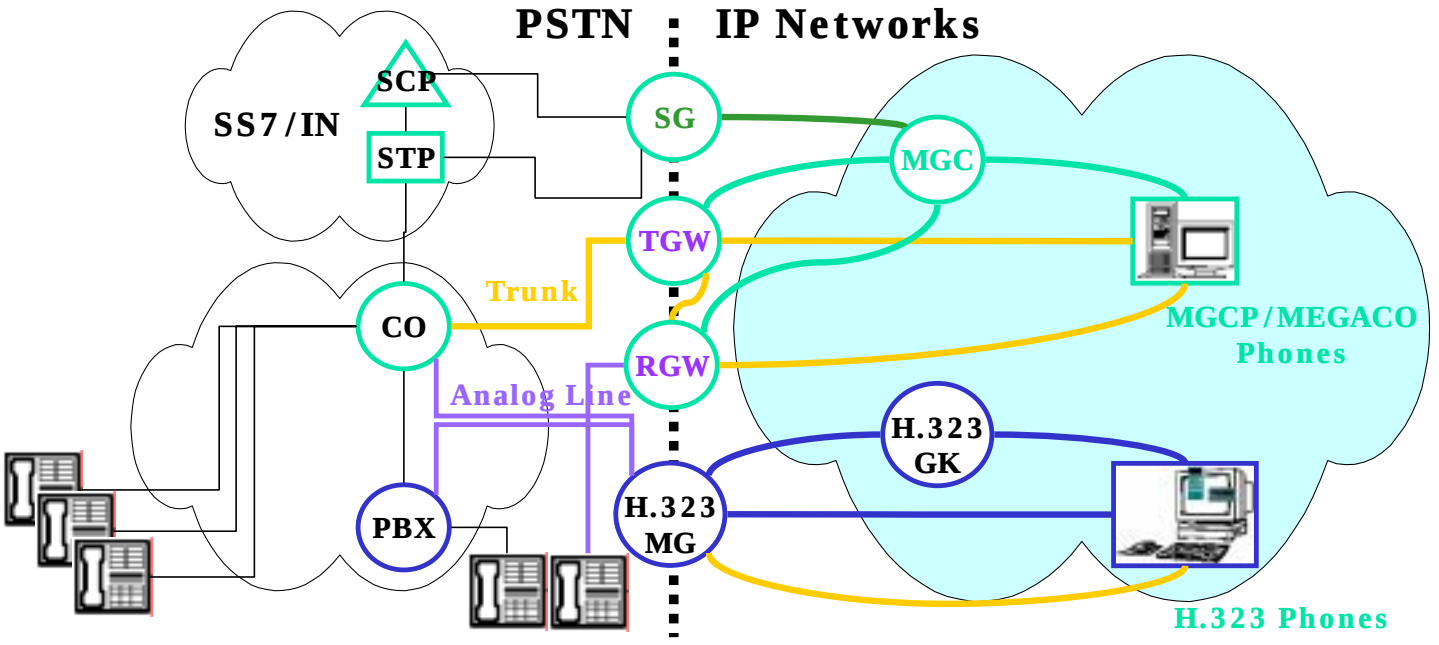
- Introduction
- Softswitch
  - Softswitch Architecture
  - Softswitch Operations
- Media Gateway Control Protocols
  - MGCP
  - MEGACO

Next Generation Network

- Internet Telecom & Wireless Communication



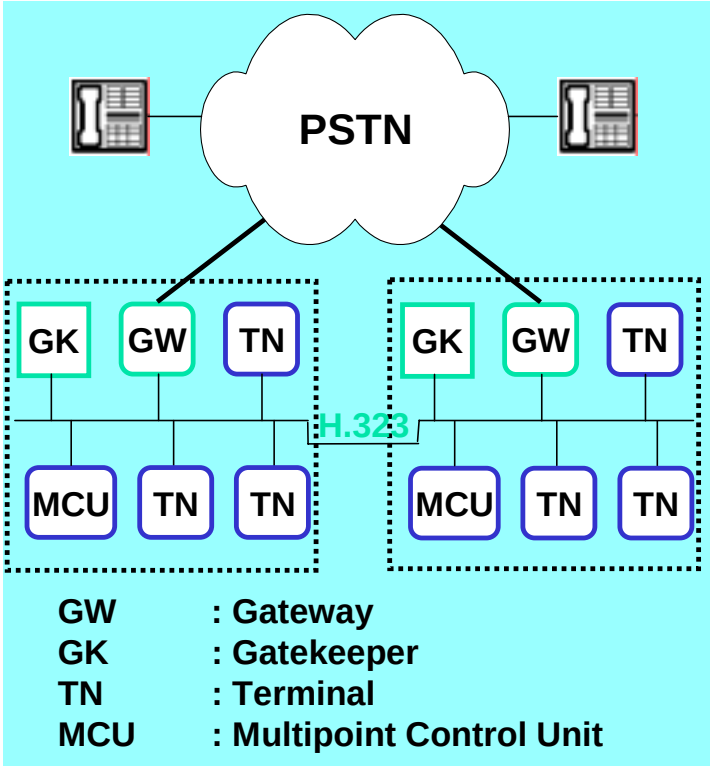
Gateways in Next Generation Networks



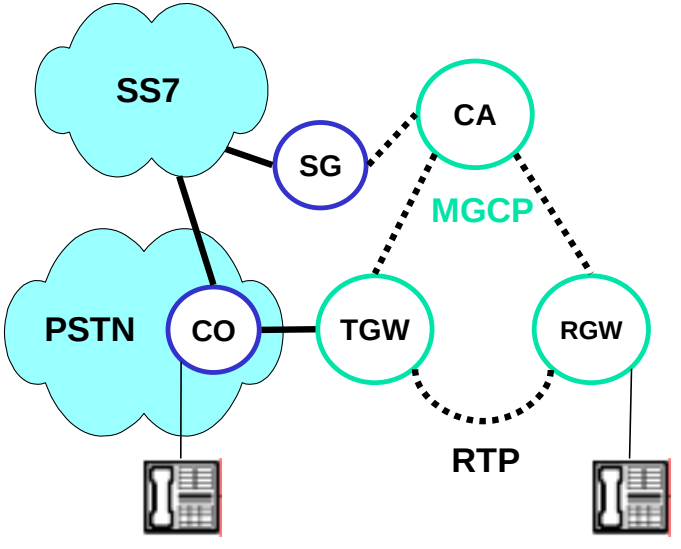
MGC : Media Gateway Controller
SG : Signaling Gateway
TGW : Trunking Gateway
RGW : Residential Gateway

MGCP/MEGACO
H.323/SIP
SIGTRAN
RTP/RTCP

H323/SIP VS. MGCP/MEGACO [1/2]



GW : Gateway
GK : Gatekeeper
TN : Terminal
MCU : Multipoint Control Unit



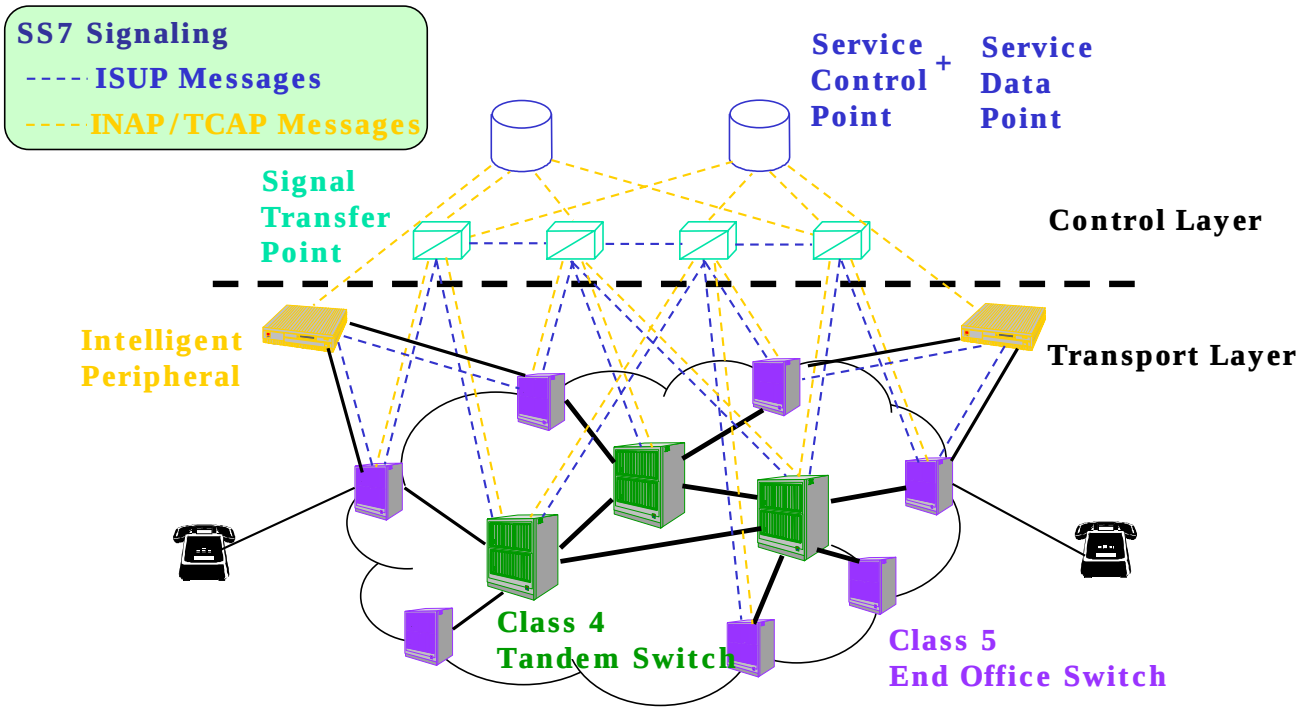
CA : Call Agent
TGW : Trunking Gateway
RGW : Residential Gateway
SG : Singling Gateway

H323/SIP VS. MGCP/MEGACO [2/2]

- H.323 , SIP
  - peer-to-peer
  - internet oriented
  - intelligent endpoint
    - optional GK
  - decentralized
- Problems
  - maintenance
    - cost & scalability of large systems
  - signaling & media control are coupled
  - interoperability with SS7

- MGCP/MEGACO
  - client-server
  - traditional telephony
  - intelligent server
    - “dumb” terminal
  - centralized
- Concept
  - gateway decomposed
    - separate call control from media ports
    - CA (MGC), MG, SG
  - interoperability with PSTN

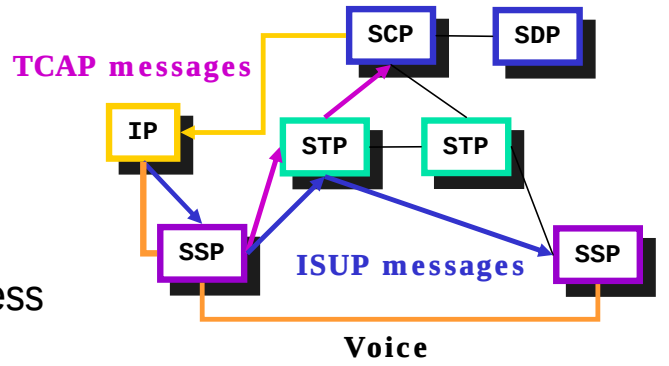
The Telephone Network [1/2]

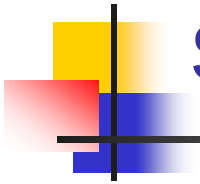


Circuit Switched Network

The Telephone Network [2/2]

- 5 Basic Components in Intelligent Networks
  - SSP/Service Switching Point
    - switching, signaling, routing, service invocation
  - STP/Service Transfer Point
    - signaling, routing
  - SCP/Service Control Point
    - service logic execution
  - SDP/Service Data Point
    - subscriber data storage, access
  - IP/Intelligent Peripheral
    - resources such as customized voice announcement, voice recognition, DTMF digit collection



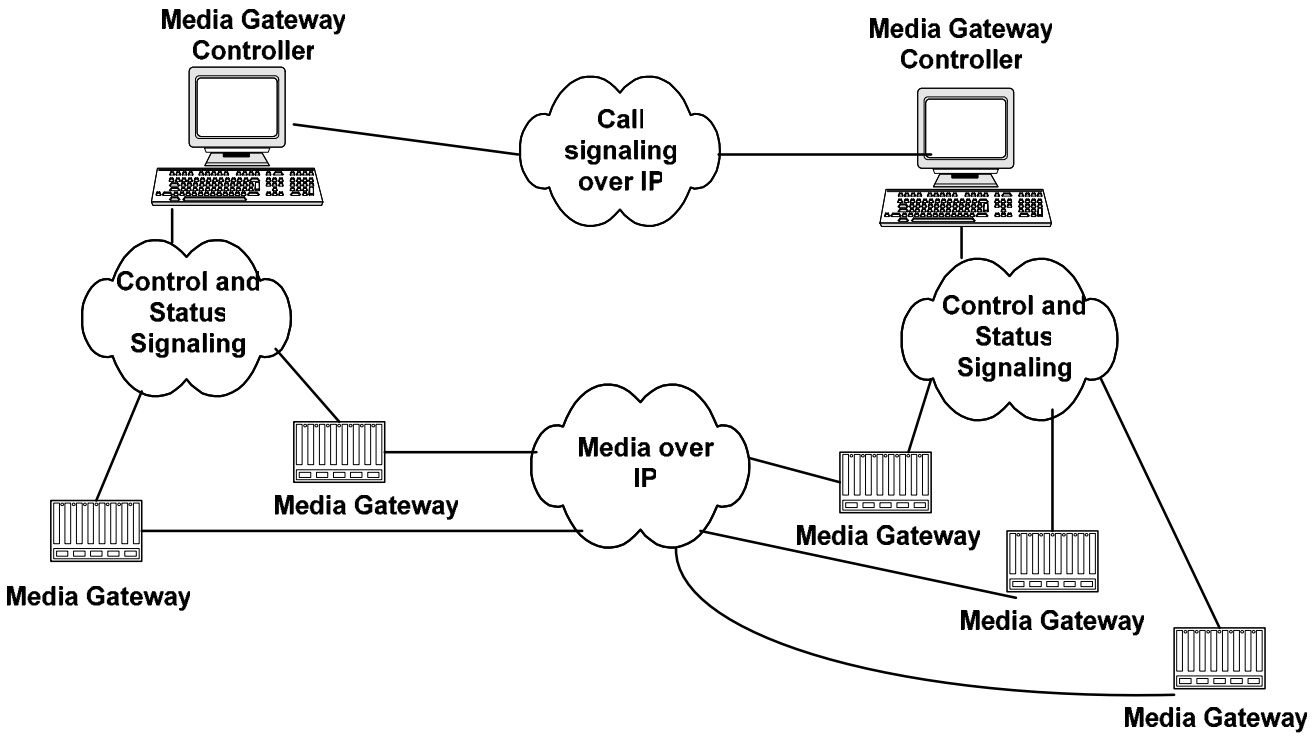


Softswitch

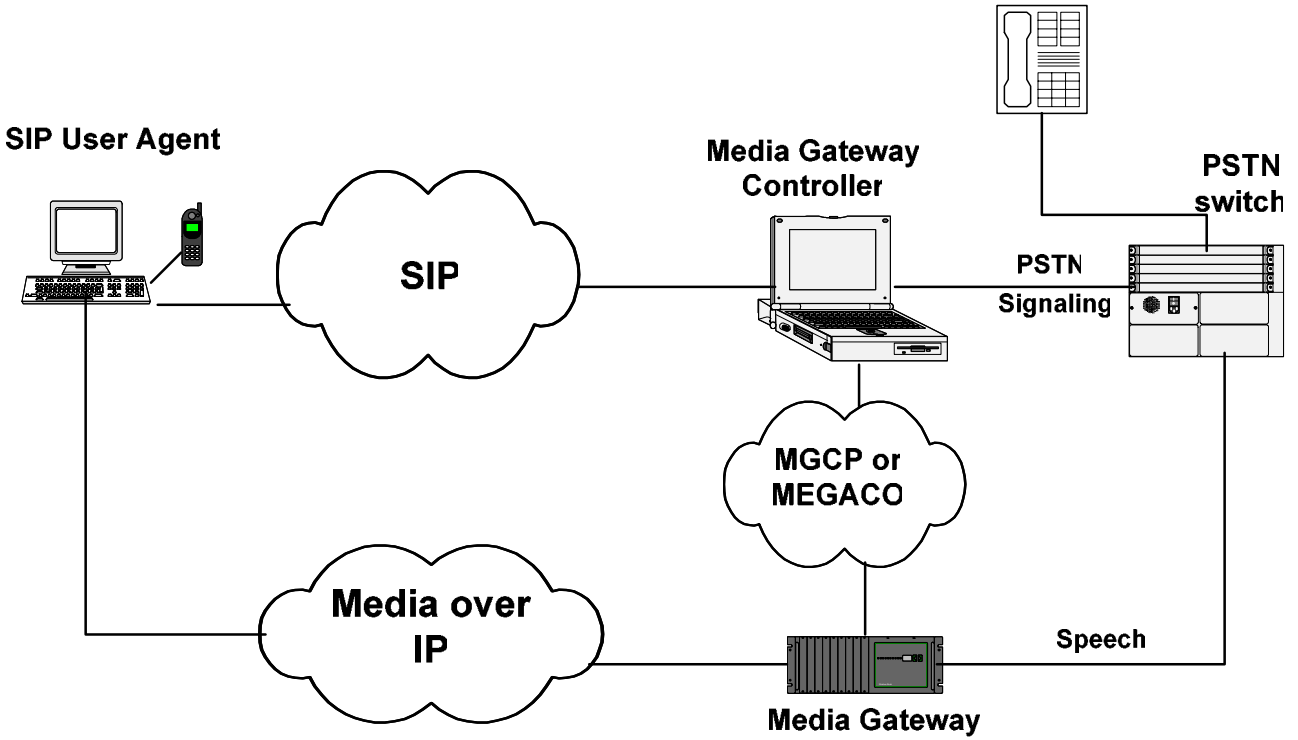
- The switching functions are handled by software.
- International Softswitch Consortium (ISC)
  - www.softswitch.org
  - To promote the softswitch concept and related technologies
- Why the softswitch approach is popular?
  - A distributed architecture
  - For network operators
    - It is possible to use different network components from different vendors.
  - For equipment vendors
    - It is possible to focus on one area.

Abstract Softswitch Architecture

- SIP is often used as the signaling protocol between the MGCs.

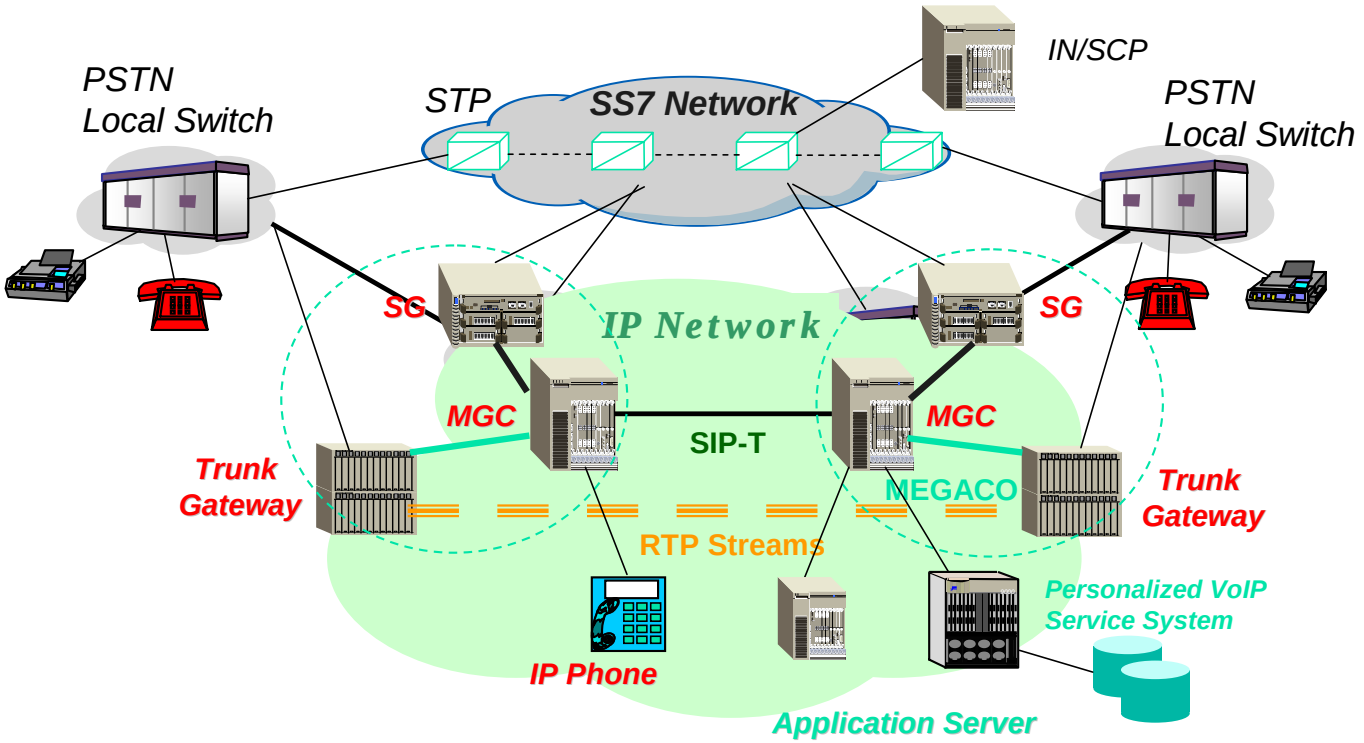


Softswitch/PSTN Interworking



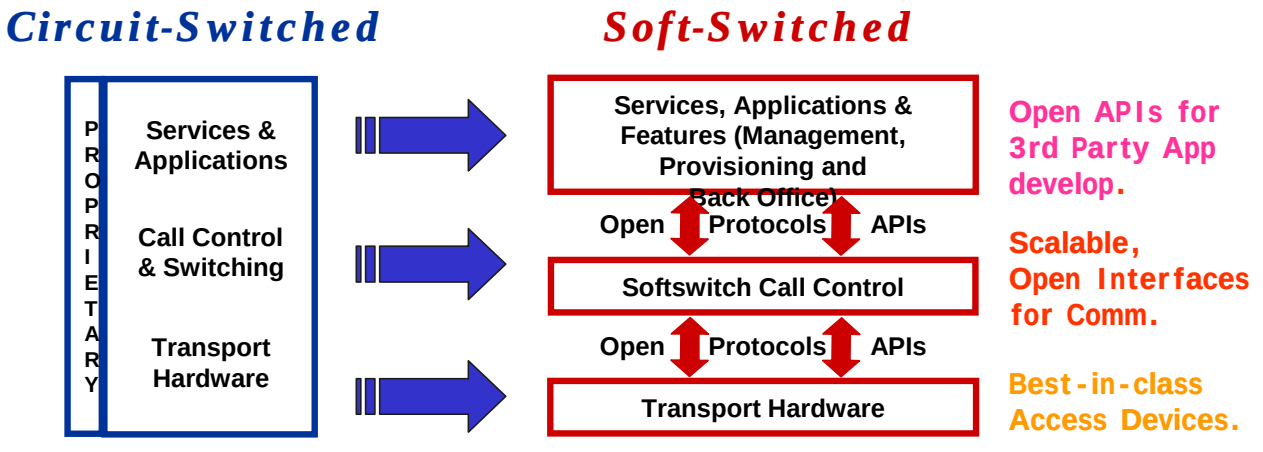
Softswitch Overview [1/3]

- Softswitch: Emulating Circuit Switching in Software



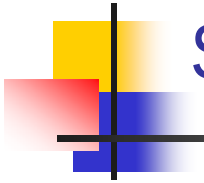
Softswitch Overview [2/3]

- Softswitch Provides Open Layered Architecture



- **Solutions in a proprietary box**
- **Expensive**
- **Little room for innovation**

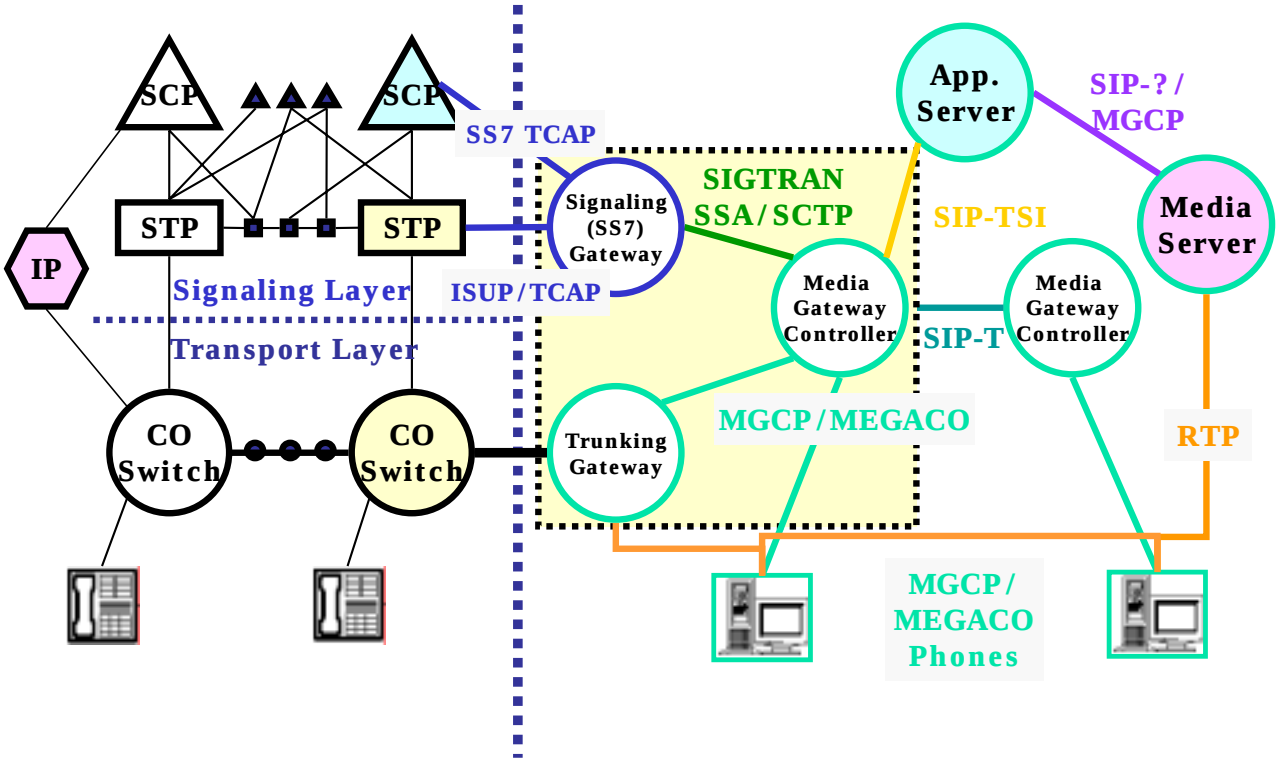
- **Solutions are open standards-based**
- **Customers choose best-in-class products**
- **Open standards enable lower cost for innovation**



Softswitch Overview [3/3]

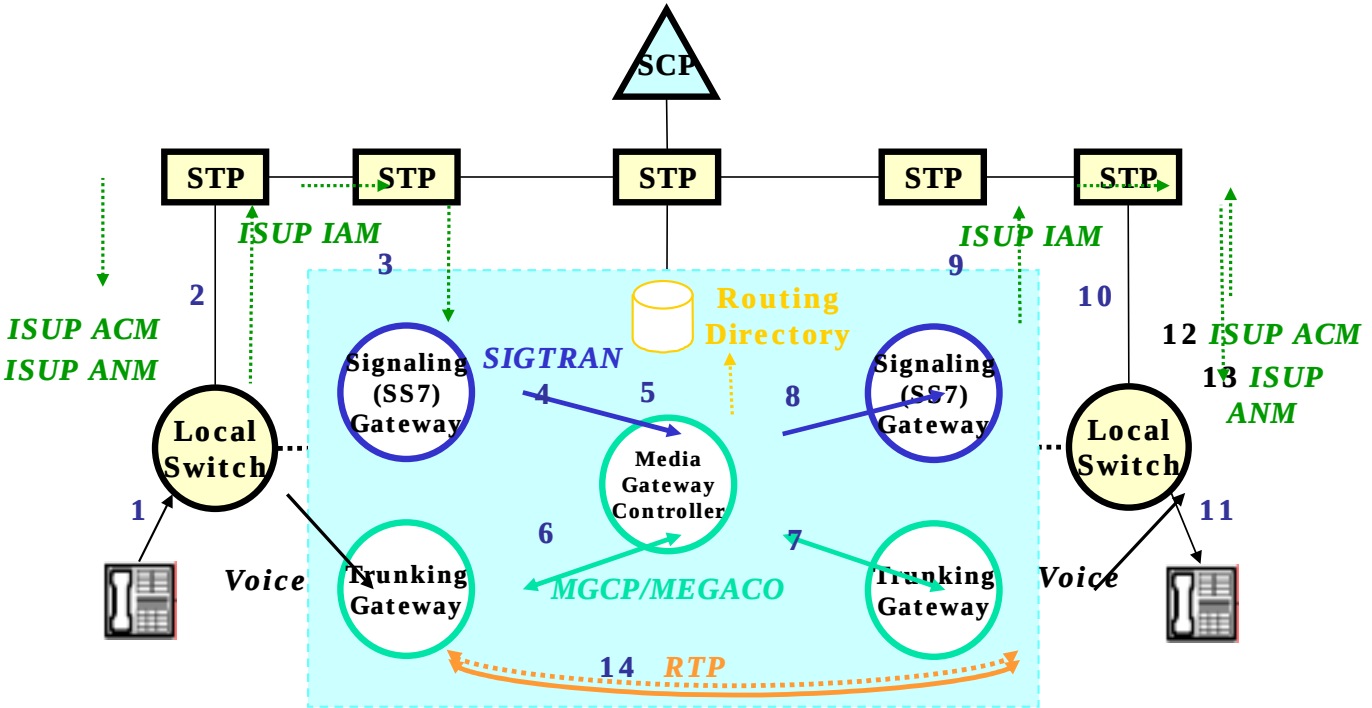
- Softswitch Changes the Telecom Landscape
  - Integration/Incorporation
    - Convergence of voice and data
    - Combination of telecom & internet technologies
    - Reuse PSTN database & IN services in packet networks
    - Multiple sources for app development & deployment
    - Decreased operating costs
  - Standardization
    - Standard interfaces (protocols) for communications
    - Open standards (APIs) for service creation
    - Customized services created by users themselves
    - Better scalability

Softswitch Architecture



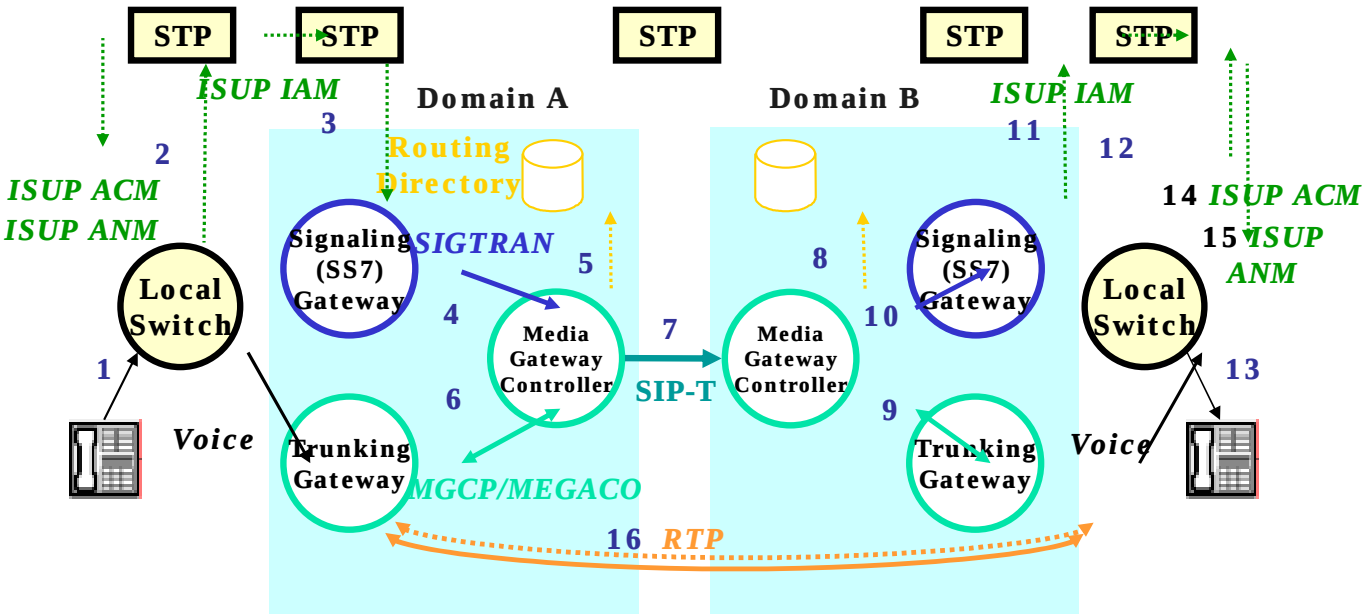
Softswitch Operations [1/3]

- Basic Call Control



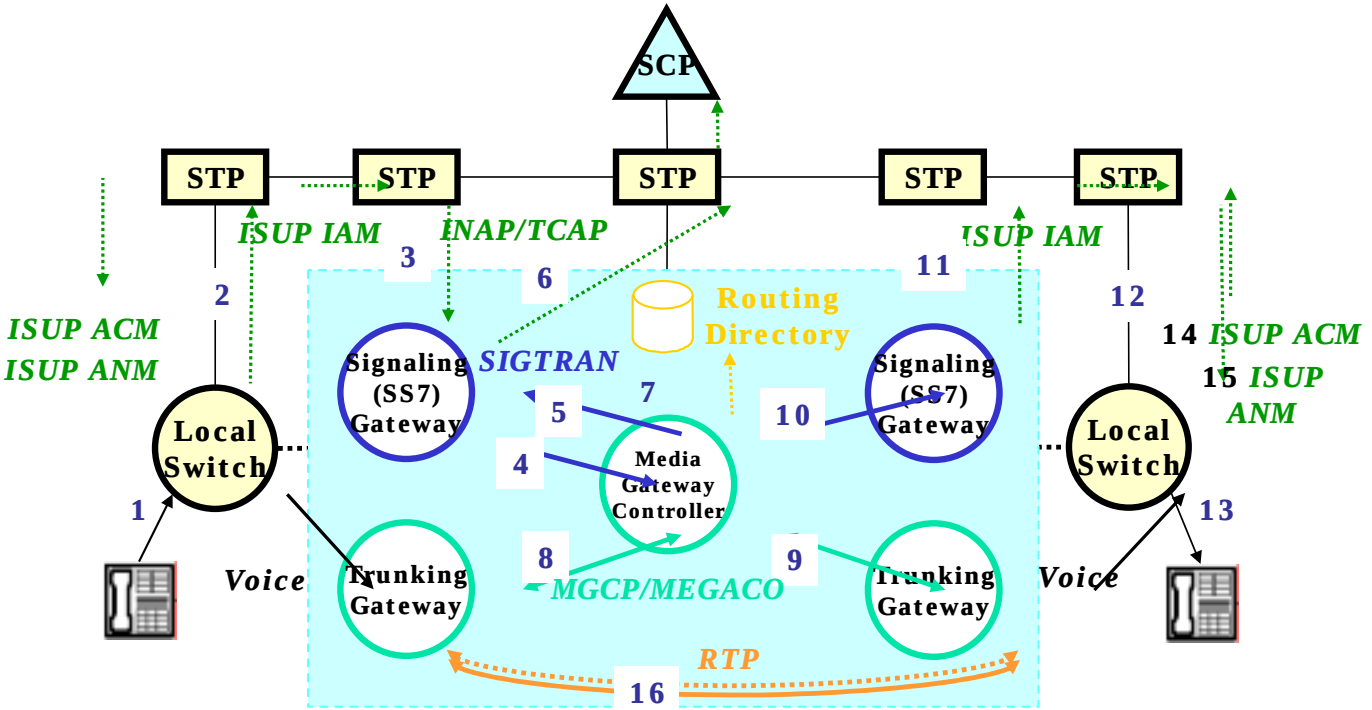
Softswitch Operations [2/3]

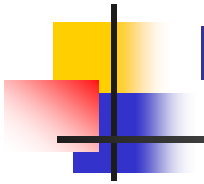
- Inter-Softswitch Communications



Softswitch Operations [3/3]

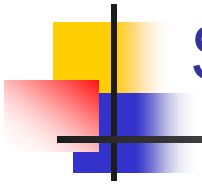
- IP-PSTN Interworking for IN Services





Introduction

- Voice over IP
  - Lower cost of network implementation
  - Integration of voice and data applications
  - New service features
  - Reduced bandwidth
- Replacing all traditional circuit-switched networks is not feasible.
- VoIP and circuit-switching networks coexist
  - Interoperation
  - Seamless interworking

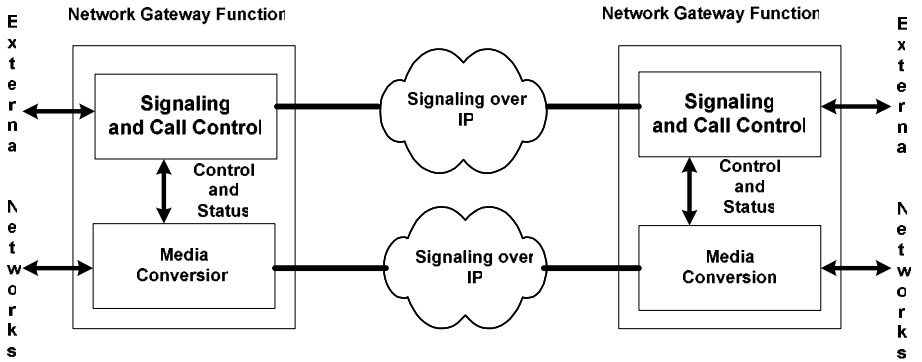


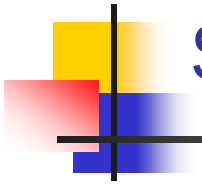
Separation of Media and Call Control

- Gateways
  - Interworking
  - To make the VoIP network appear to the circuit switched network as a native circuit-switched system and vice versa
- Signaling path and media path are different in VoIP systems.
  - Media – directly (end-to-end)
  - Signaling – through H.323 gatekeepers (or SIP proxies)
- SS7, Signaling System 7
  - The logical separation of signaling and media

Separation of Media and Call Control

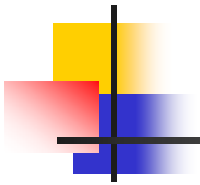
- A network gateway has two related but separate functions.
  - Signaling conversion
    - The call-control entities use signaling to communicate.
  - Media conversion
    - A slave function (mastered by call-control entities)
- Figure 6-1 illustrates the separation of call control and signaling from the media path.





Separation of Media and Call Control

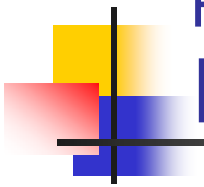
- Advantages of Separation
  - Media conversion close to the traffic source and sink
  - The call-handling functions is centralized.
  - A call agent (media gateway controller - MGC) can control multiple gateways.
  - New features can be added more quickly.
- MGCP, Media Gateway Control Protocol
  - IETF
- MEGACO/H.248
  - IETF and ITU-T Study Group 16



Requirements for Media Gateway Control [1/2]

- RFC 2895
  - Media Gateway Control Protocol Architecture and Requirements
- Requirement
  - The creation, modification and deletion of media streams
    - Including the capability to negotiate the media formats
  - The specification of the transformations applied to media streams
  - Request the MG to report the occurrence of specified events within the media streams, and the corresponding actions

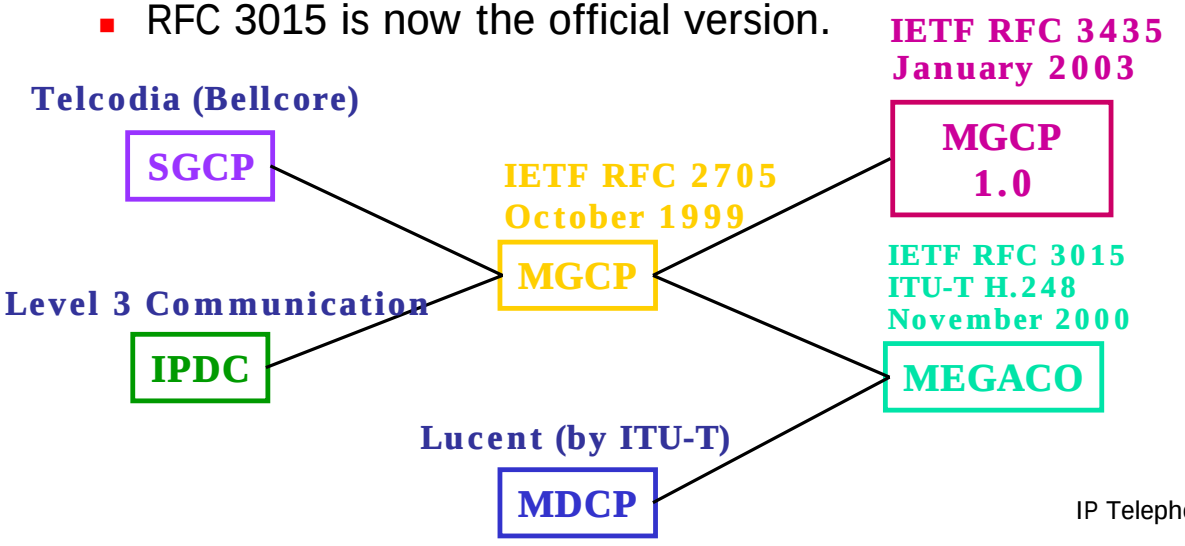
Requirements for Media Gateway Control [2/2]



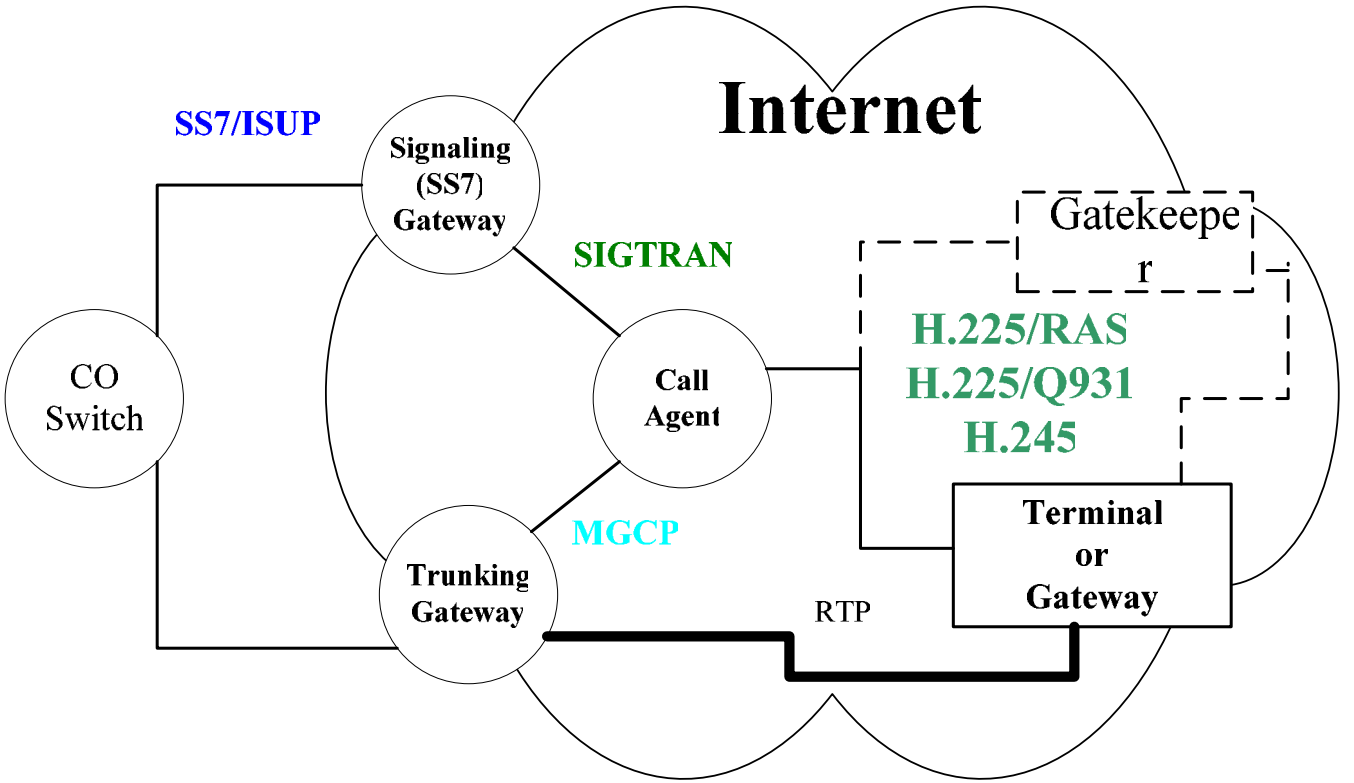
- Request the MG to apply tones or announcements
- The establishment of media streams according to certain QoS requirements
- Reporting QoS and billing/accounting statistics from an MG to an MGC
- The management of associations between an MG and an MGC
  - In the case of failure of a primary MGC
- A flexible and scalable architecture in which an MGC can control different MGs
- Facilitate the independent upgrade of MGs and MGCs

Protocols for Media Gateway Control

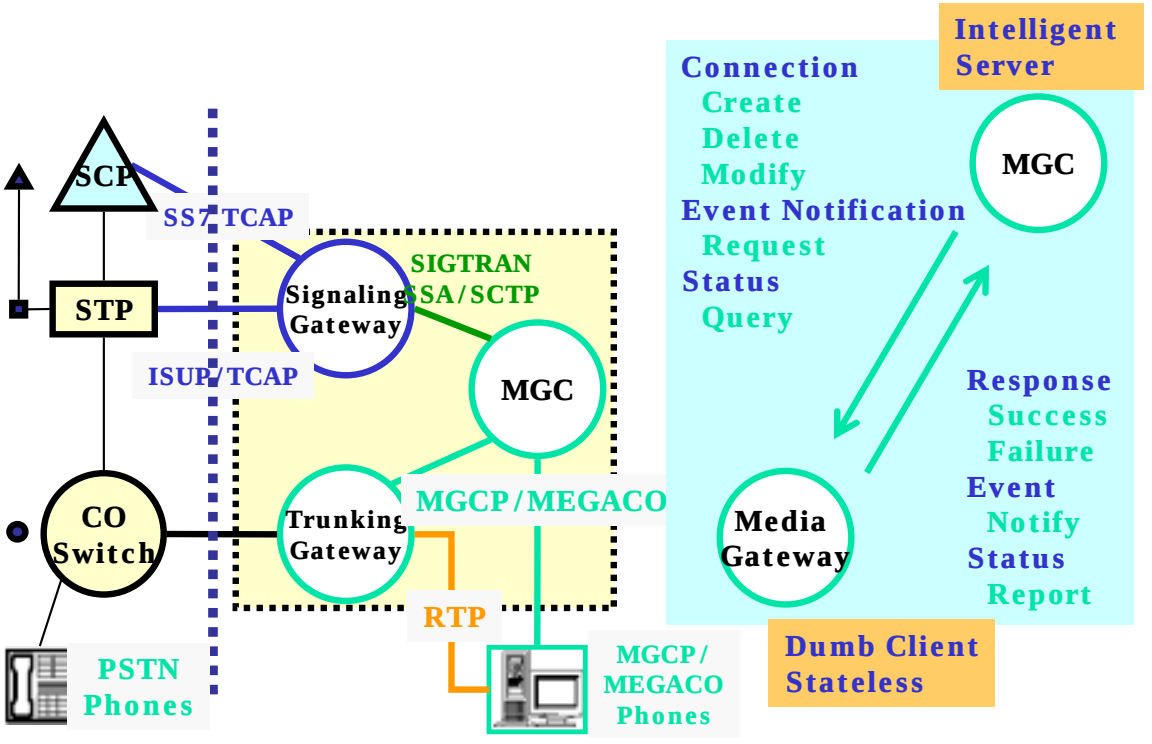
- The first protocol is MGCP
  - RFC 2705, informational
  - To be succeeded by MEGACO/H.248
  - Has be included in several product developments
- MEGACO/H.248
  - A standards-track protocol
  - RFC 3015 is now the official version.

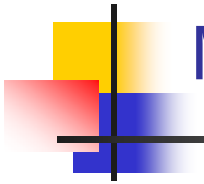


Relation with H.323/SIP Standards



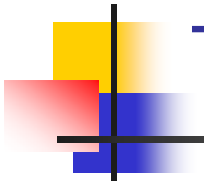
Concept of MGCP/MEGACO





MGCP

- A master-slave protocol (A protocol for controlling media gateways)
  - Call agents (MGCs) control the operation of MGs
    - Call-control intelligence
    - Related call signaling
  - MGs
    - Do what the CA instructs
    - A line or trunk on circuit-switched side to an RTP port on the IP side
- Types of Media Gateway
  - Trunking Gateway to CO/Switches
  - Residential Gateway to PSTN Phones
  - Access Gateway to analog/digital PBX
- Communication between call agents
  - Likely to be the SIP



The MGCP Model

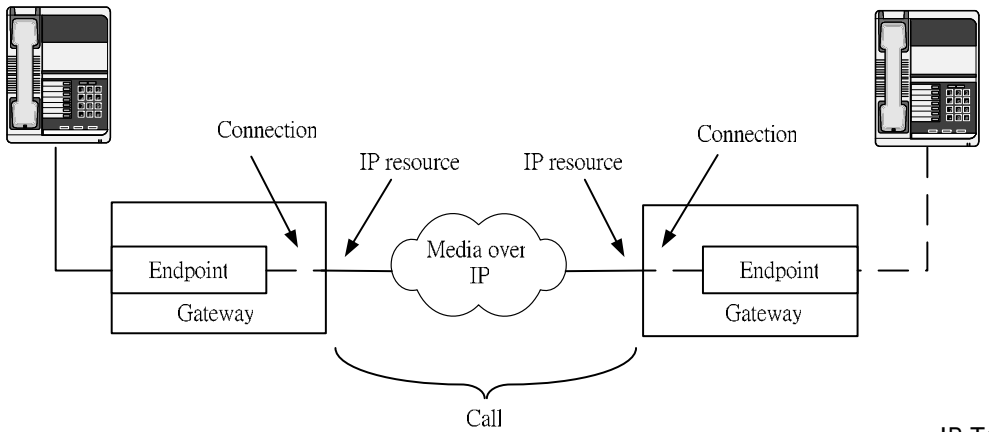
- Endpoints
  - Sources or sinks of media
  - Trunk interfaces
  - POTS line interfaces
  - Announcement endpoint
- Connections
  - Allocation of IP resources to an endpoint
  - An ad hoc relationship is established from a circuited-switched line and an RTP port on the IP side.
  - A single endpoint can have several connections

Endpoint Identifier

- GW's Domain Name + Local Name
- Local Name
  - A hierarchical form: X/Y/Z
- trunk4/12/7@gateway.somenetwork.net
  - To identify DS0 number 7 within DS1 number 12 on DS3 number 4 at gateway.somenetwork.net
- Wild-cards
  - $, any; *, all
  - e.g., trunk1/5/$@gateway.somenetwork.net
    - CA wants to create a connection on an endpoint in a gateway and does not really care which endpoint is used.
  - e.g., trunk1/5/*@gateway.somenetwork.net
    - CA requests statistical information related to all endpoints on a gateway.

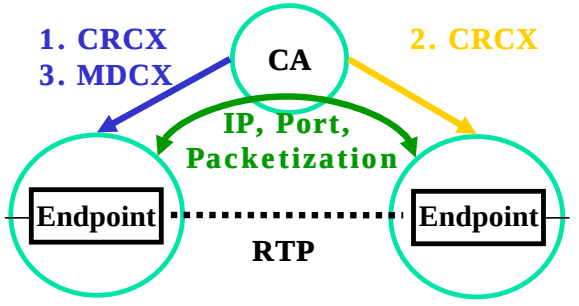
MGCP Calls and Connections

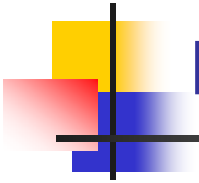
- A connection
  - Relationship established between a given endpoint and an RTP/IP session
- A call
  - A group of connections
- The primary function of MGCP is to enable
  - The connections to be created
  - The session descriptions to be exchanged between the connections



Calls and Connections

- Call Identifier (Call ID)
  - Created by CA
  - Unique within CA Scope
- Connection ID
  - Created by GW
  - Unique under Its GW





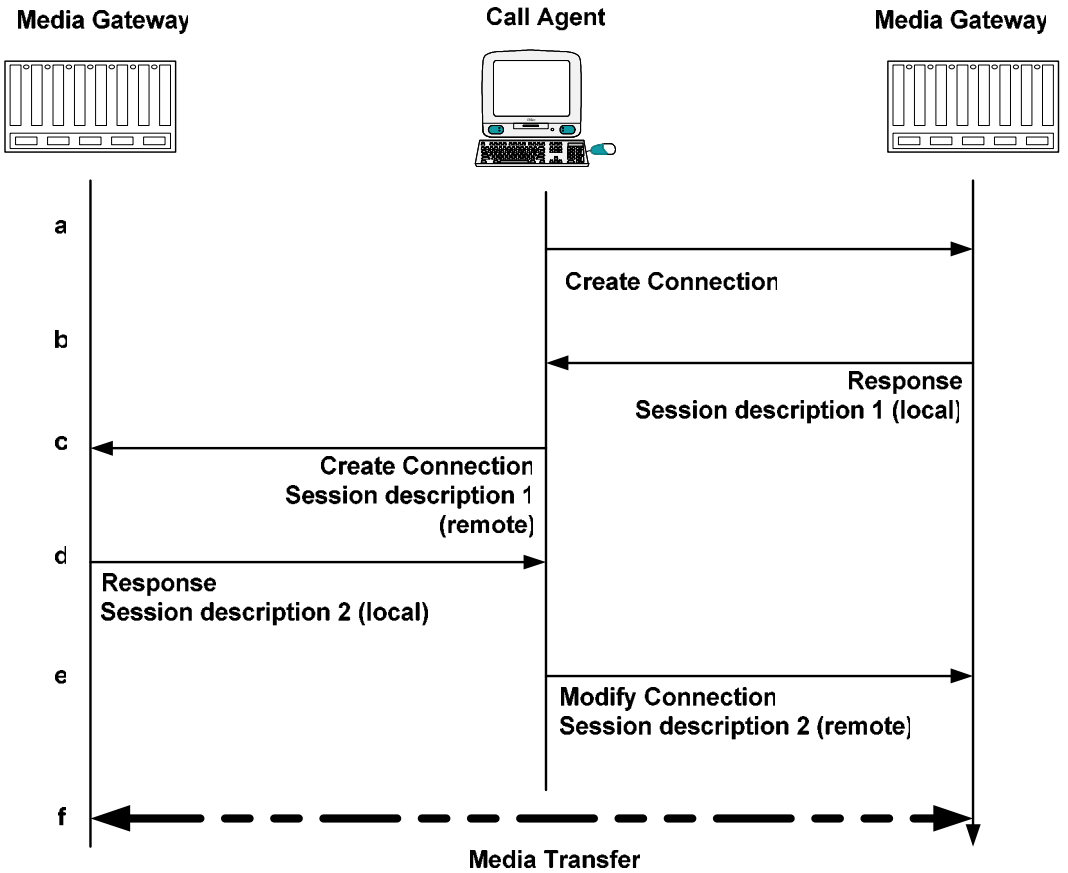
MGCP Commands

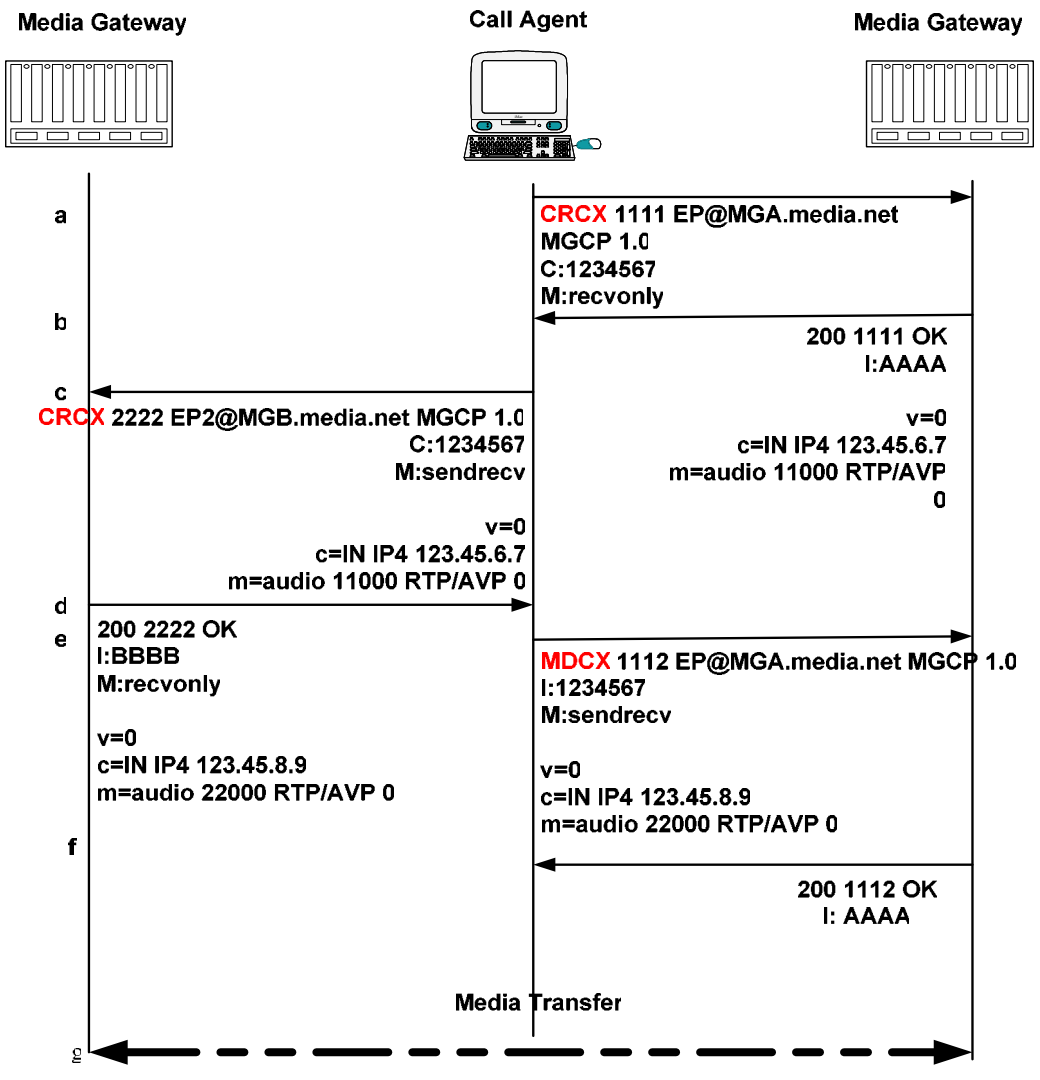
- 9 commands to handle Connection/Endpoints

EPCF	EndpointConfiguration (coding characteristics)
RQNT	NotificationRequest (requested events)
NTFY	Notify (GW: detected events)
CRCX	CreateConnection
MDCX	ModifyConnection
DLCX	DeleteConnection
AUEP	AuditEndpoint
AUCX	AuditConnection
RSIP	RestartInProgress (GW : taken in/out of service)

- All commands are acknowledged.

Call Setup Using MGCP




Media Gateway
Call Agent
Media Gateway
a
CRCX 1111 EP@MGA.media.net
MGCP 1.0
C:1234567
M:recvonly
b
200 1111 OK
I:AAAA
c
CRCX 2222 EP2@MGB.media.net MGCP 1.0
C:1234567
M:sendrecv
v=0
c=IN IP4 123.45.6.7
m=audio 11000 RTP/AVP 0
v=0
c=IN IP4 123.45.6.7
m=audio 11000 RTP/AVP 0
d
e
200 2222 OK
I:BBBB
M:recvonly
v=0
c=IN IP4 123.45.8.9
m=audio 22000 RTP/AVP 0
MDCX 1112 EP@MGA.media.net MGCP 1.0
I:1234567
M:sendrecv
v=0
c=IN IP4 123.45.8.9
m=audio 22000 RTP/AVP 0
f
200 1112 OK
I: AAAA
Media Transfer
g