

QoS: Call Admission Control and RSVP

**Presented by:
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Slide 1

About the Speaker

- **Dr. Pete Welcher**
 - Cisco CCIE #1773, CCSI #94014, CCIP
 - Network design & management consulting
 - Stock quotation firm, 3000 routers, TCP/IP
 - Second stock quotation firm, 2000 routers, UDP broadcasts
 - Hotel chain, 1000 routers, SNA
 - Government agency, 1500 routers
 - Teach many of the Cisco courses
- **Enterprise Networking Magazine articles**
 - <http://www.netcraftsmen.net/welcher/papers>



Objectives

Upon completion of this seminar, you will be able to:

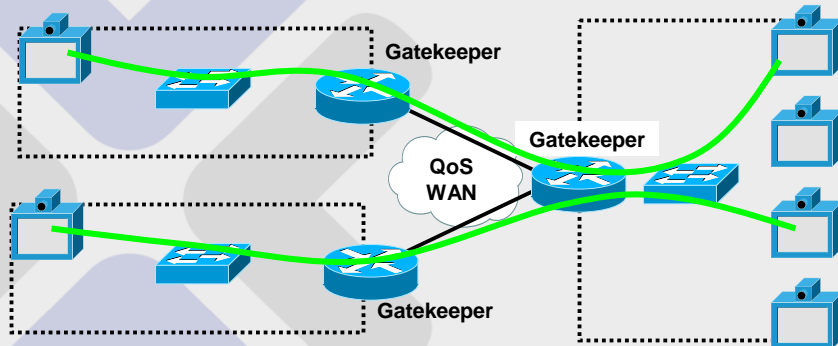
- Describe and configure H.323-based CAC
- Describe and configure RSVP-based CAC
- Briefly list and describe other CAC techniques

Topics

- **H.323 Call Admission Control (CAC)**
- **RSVP**
- **Other Forms of Call Admission Control**

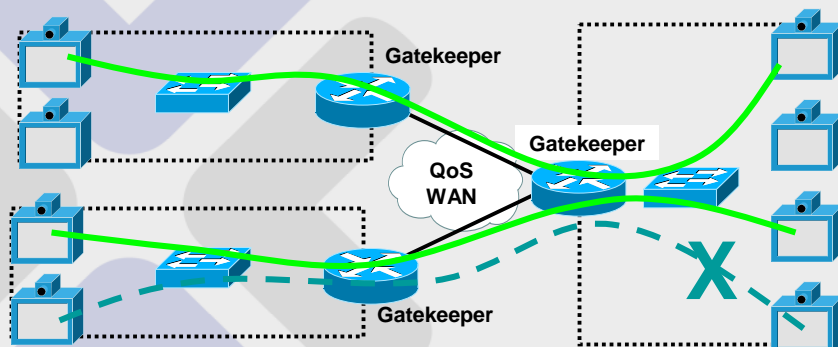
H.323 Call Admission Control

- **Simple CAC: limit the number of terminals, that limits the number of calls (and bandwidth) to each site**
- **Works for small, simple topologies**



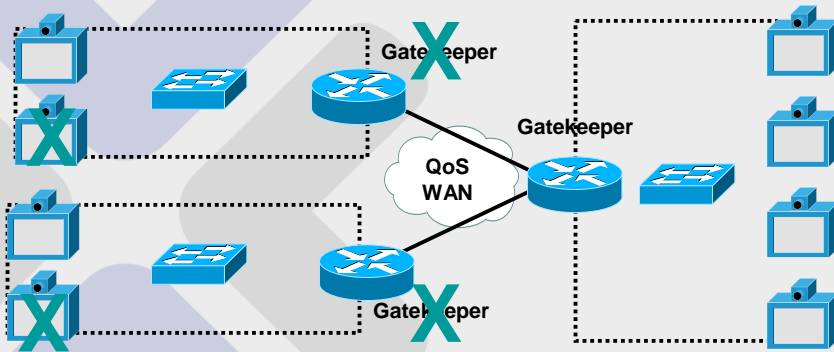
H.323 Call Admission Control

- **H.323 gatekeepers can enforce Call Admission Control (CAC)**



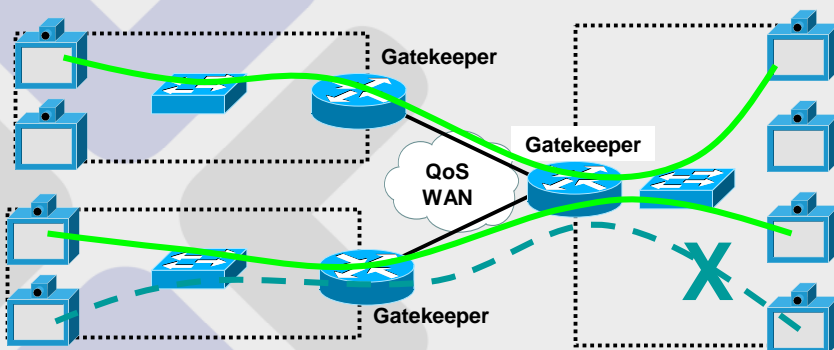
CAC with a Single Gatekeeper

- If remote sites do not have gatekeepers, limit the number of video terminals at each site
- Central gatekeeper controls calls from central site



CAC with Multi-Zone WAN

- Each gatekeeper manages bandwidth in the local zone and across the WAN
- Hub and spoke topology required



Provisioning Bandwidth

- **Don't forget to add 20% to the video and audio stream bandwidth for Layer 2 + IP header overhead**
- **Don't prioritize more than 33% of link bandwidth**
 - Voice and video conferencing traffic

Where Do I Get an H.323 Gatekeeper?

- **Cisco Multimedia Conference Manager (MCM) router code**
 - Includes H.323 gatekeeper functions
 - Includes an H.323 proxy, making classification of IPVC easier
 - Cisco directory gatekeeper function
 - Maintains zone prefixes for network or part of network
 - Centralizes zone dial prefix administration
 - HSRP for redundancy

MCM Performance

Model	# registered endpoints	# simultaneous video calls	# video proxy sessions (768/384/128 K)	routing capacity (Kpps)
7200	3000	500	50 / 75 / 100	50-100
3660	1800	250	25 / 35 / 50	25-100
3640	1800	150	10 / 15 / 30	10-40
3620	1800	75	10 / 15 / 30	10-15
2620	900	60	2 / 4 / 8	5-10

This data is mildly old. The 7200 has new NPM's with more CPU capabilities for example. And 3700's can be used instead of 3600's.



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Configuring CAC

gatekeeper

bandwidth {interzone | total | session}

{default | zone *zone-name*}

bandwidth-size

bandwidth remote *bandwidth-size*

- Call bandwidth gets doubled: a 368K call is accounted for in each direction (half-duplex), hence counts as 768K



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H.323 CAC Improvements

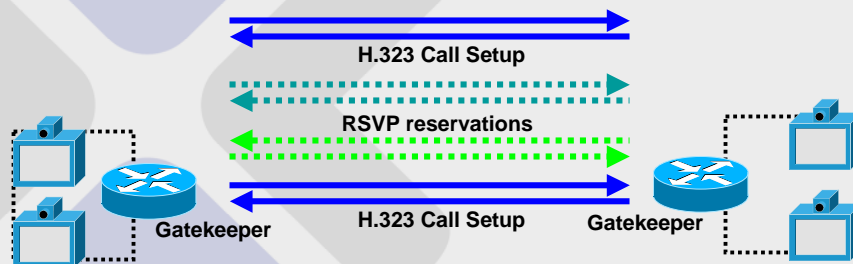
- **Recent Cisco IOS (12.2 X*, T) added support to busy-out calls (per session or per T1):**
 - Spike in traffic
 - Lack of resources
 - **cpu-5sec**—the CPU utilization in the last 5 seconds
 - **cpu-avg**—the average CPU utilization
 - **io-mem**—the IO memory utilization
 - **proc-mem**—the Processor memory utilization
 - **total-calls**—the total number of calls
 - **total-mem**—the total memory utilization
 - How to handle the call (disconnect with cause, hairpin, message, busy tone)

H.323 CAC Limitations

- **Requires hub & spoke topology**
 - No provision to “pass through” reservations
 - No per-peer bandwidth control: all remote sites!
- **If either of these is a problem, consider RSVP ... (next)**

H.323 Synch with RSVP

- H.323 call setup now makes an RSVP reservation in each direction
- Call setup succeeds only if both RSVP reservations succeed
- If either RSVP reservation fails, the H.323 call fails



VOIP H.323 CAC with RSVP

- **Benefits of CAC with RSVP:**
 - VoIP gateways default to H.323 Version 2 (Fast Connect)
 - Called-party phone rings only after bandwidth reservation confirmed
 - QoS for voice calls is guaranteed across IP network
- **Limitations of CAC using RSVP:**
 - For RSVP with H.323 Version 2 (Fast Connect), originating and terminating gateways must be at Cisco IOS Release 12.1(3)XI or 12.1(5)T, or later.
 - For RSVP with H.323 Version 1 (Slow Connect), Cisco H.323 Version 2 gateways must be at Cisco IOS Release 12.1(1)T or later.
 - RSVP with multicast is not supported

Configuring H.323 RSVP Sync

- Specify requested and acceptable QoS
- Also enable RSVP

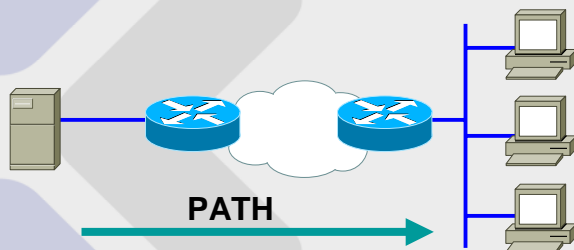
```
call rsvp-sync
dial peer voice 100 voip
destination pattern 7...
session target ipv4: 192.16.1.1
req-qos guaranteed-delay
acc-qos guaranteed-delay
```

Topics

- H.323 Call Admission Control (CAC)
- RSVP
- Other Forms of Call Admission Control

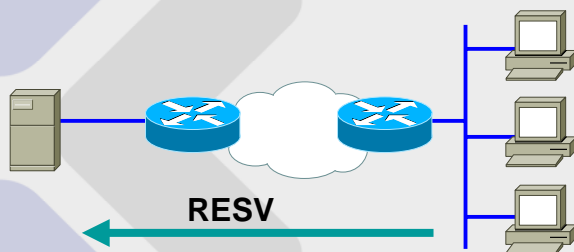
How RSVP Works – 1

- **“Server” sends PATH message**
 - Routed normally (unicast or multicast) downstream towards receiver(s)
 - Carries flow information (“TSpec”): bit rate, token bucket size
 - Allows intermediate nodes to know the previous hop back towards the server



How RSVP Works – 2

- **“Receiver” sends RESV message**
 - Uses previous hop information from PATH state creation to travel along reverse path, avoiding issues with asymmetric routing
 - “RSpec” indicates desired QoS (bandwidth)
- **RESV is sent periodically (approx. every 30 seconds) to refresh the “soft state” reservation**



About Cisco RSVP

- “Integrated Services” RFC’s
- Two kinds of service:
 - Guaranteed bandwidth: RSVP
 - Controlled load: RSVP + WRED

Configuring RSVP – 1

- On both ends of each participating link, configure the RSVP bandwidth
 - Bandwidth pool size, and max amount per single reservation, in Kbps
 - Total pool size can be at most 75% of link bandwidth

```
interface serial 0/1
bandwidth 1536
ip address ...
fair-queue
ip rsvp bandwidth 1000 200
```

Size of bandwidth pool
for all reservations

Max for any single
reservation

Configuring RSVP – 2

- **RSVP can now set IP Precedence or ToS based on conforming / exceeding flow rate**
- **Can combine with WRED to drop excess flow traffic when congestion is occurring**

```
interface serial 0/1
 ip rsvp precedence conform 3 exceed 0
 ip rsvp tos conform 3 exceed 0
```

Configuring RSVP – 3

- **Can attach to NetFlow for token bucket for precedence setting**
- **Automatically set up with ATM SVC's**

```
interface serial 0/1
 ip rsvp flow-assist
```

RSVP Support for LLQ

- **Voice is sent via LLQ (prioritized)**
- **Data gets normal RSVP weight**

```
! global config mode:  
ip rsvp pq-profile
```

RSVP Support for Frame Relay

- **This relatively recent feature adds RSVP support on a per-VC basis, constrained by the minCIR of the VC instead of the bandwidth of the physical interface**
- **Configured by configuring RSVP on FR subinterface**
 - MinCIR etc. specified via FRTS

RSVP Support for ATM

- **RSVP can trigger SVC creation**
- **You can specify the PCR for all new SVC's (default is infinite)**

```
interface atm 0/1
...
ip rsvp svc-required
ip rsvp atm-peak-rate-limit limit
```

Monitoring RSVP – 1

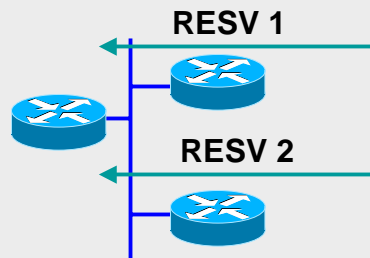
```
Router# show ip rsvp interface
interface allocate i/f max flow max per/255 UDP IP UDP_IP UDP M/C
AT1/0/0 OM 110000K 100000K 0 /255 0 0 0 0 SVC
AT1/0/1 OM 110000K 100000K 0 /255 0 0 0 0 FLOW
Et2/0 OM 7500K 7500K 0 /255 0 1 0 0
```

Monitoring RSVP – 2

```
Router# show ip rsvp installed
RSVP:
RSVP: Ethernet1: has no installed reservations
RSVP: Serial0:
kbps To From Protocol DPort Sport Weight Conversation
0 224.250.250.1 132.240.2.28 UDP 20 30 128 270
150 224.250.250.1 132.240.2.1 UDP 20 30 128 268
```

Subnet Bandwidth Manager

- Used when there are multiple routers doing RSVP on a shared LAN segment
- One router is automatically elected DSBM to allocate bandwidth on the multi-access media
- Avoids reserving more bandwidth than is really there, double reservations
- Can configure priority to influence DSBM election



RSVP Considerations

- **Marking for RSVP PATH and RESV messages? Default is Best Effort**
- **Need WFQ or CBWFQ on interfaces to guarantee bandwidth**
- **End-end only if configured on all interfaces**
- **Overhead: signaling, per-flow state, post-dial delays**

Topics

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- **RSVP**
- **Other Forms of Call Admission Control**

Local CAC

- **Physical DS0 limit between PBX and gateway**
- **Max-connections for dial peer**
- **Trunk conditioning for a connection trunk with channel associated signaling (CAS)**
- **Local Voice Busyout (LVBO) for analog or CAS trunk**
- **Voice-bandwidth for VoFR**

SAA Measurement-Based CAC

- **Advanced Busyout (AVBO)**
 - For CAS or analog trunks
 - Busies out entire trunk
- **PSTN Fallback**
 - Per-call decision to allow call setup

Resource-Based CAC

- **Resource Availability Indicator (RAI)**
 - Terminating gateway informs gatekeeper when short on resources
 - Uses gateway “resource threshold” command
- **Gatekeeper zone bandwidth**
 - See earlier slides
- **RSVP**
 - See earlier slides

Summary

Having completed this chapter, you should be able to:

- Describe and configure H.323-based CAC
- Describe and configure RSVP-based CAC
- Briefly list and describe other CAC techniques

Questions

Any Questions?



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A Word From Us ...



- **We can provide**
 - Network design review: how to make what you have work better
 - Periodic strategic advice: what's the next step for your network or staff
 - Network management tools & procedures advice: what's right for you
 - Implementation guidance (your staff does the details) or full implementation
- **We do**
 - Small- and Large-Scale Routing and Switching (design, health check, etc.)
 - IPsec VPN and V3PN (design and implementation)
 - QoS (strategy, design and implementation)
 - IP Telephony (preparedness survey, design, and implementation)
 - Call Manager deployment
 - Security
 - Network Management (design, installation, tuning, tech transfer, etc.)



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Cisco Certifications

Chesapeake Netcraftsmen
is certified by Cisco in:



- IP Telephony
- Network Management
- Wireless
- Security
- (Routing and Switching)



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