

IP Multicast Basics

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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

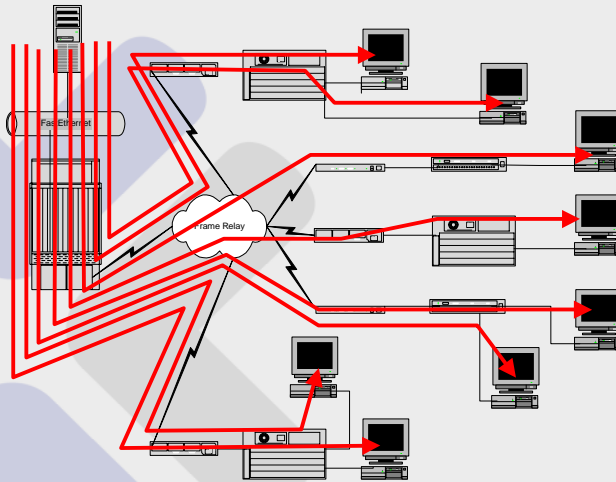
- Understand where IP multicast is appropriate
- Overview of IP multicast-related protocols
- Light overview of configuring multicast

Multimedia Versus Multicast

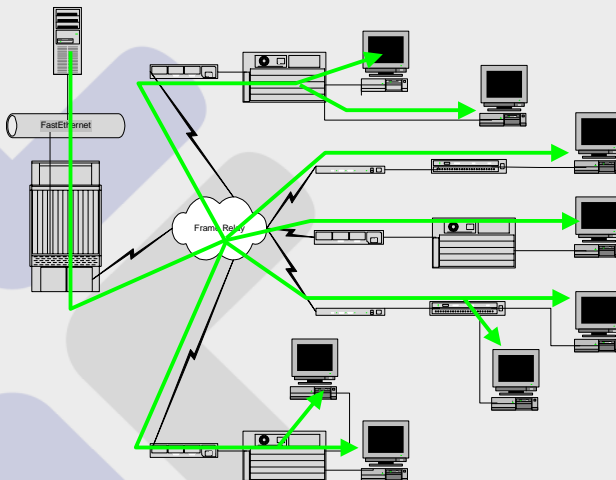
- Can have one without the other!

Service	Preferred Delivery Mechanism	Scaling
On-demand video or audio	Unicast	$O(\# \text{ users})$
Scheduled video + audio	Multicast	$2 \times O(\# \text{ channels} \times \# \text{ servers})$
Conferencing	Multicast x N	$2 \times O(\text{total } \# \text{ participants})$

Using Unicast...



Using Multicast...



Some IP Multicast-Related Protocols

- IGMP
- PIM
- CGMP, IGMP Snooping, GMRP
- Other pieces of IP multicast

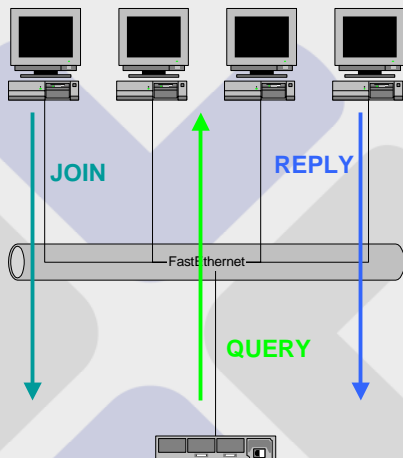
Details follow...



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IGMP

IGMP



- **I**nternet **G**roup **M**embership **P**rotocol
- **A**llows routers to track “subscribers”
 - Join
 - Member query
 - IGMPv2 leave message/router query



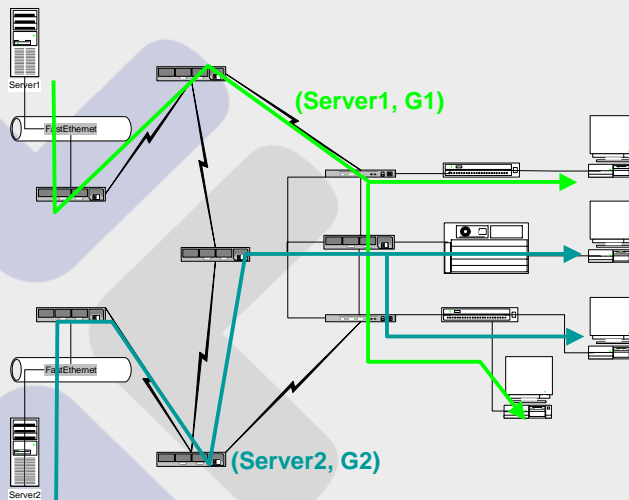
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PIM

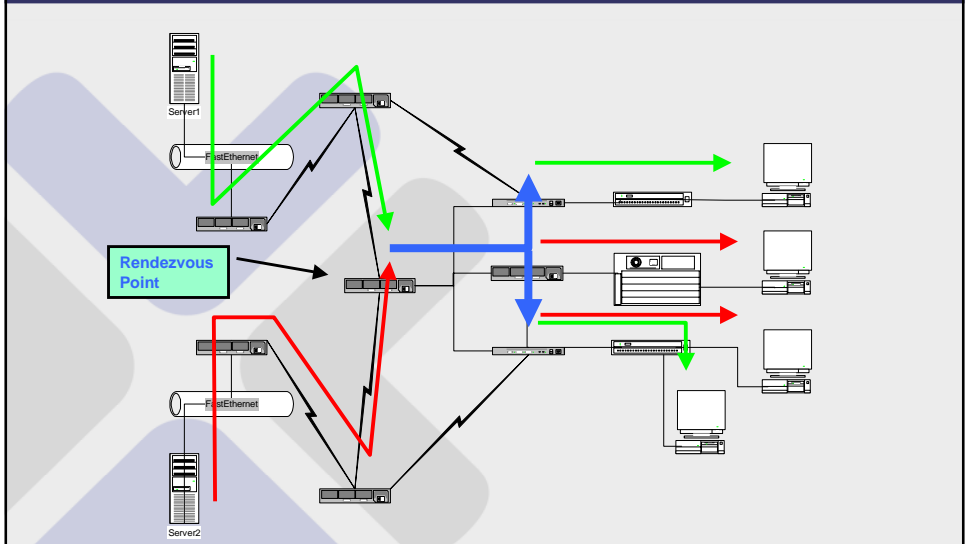


- **Protocol-Independent Multicast**
 - Dense Mode
 - Analogy: CEO speech to company
 - Sparse Mode
 - Analogy: HR training/values for new hires
 - Rendezvous Point(s) -- key router initially used to connect receiver to sender's packet stream
- **Routers communicate to build multicast trees**
 - Multicast RPF Rule for forwarding IPmc

PIM: Source Tree (S, G)



PIM: Shared Tree (*, G)

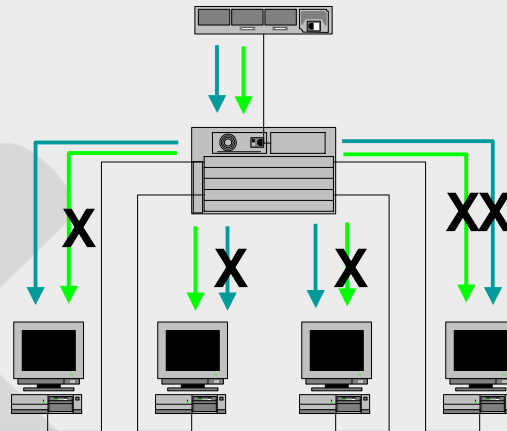


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CGMP



- Router tracks group members via IGMP
- Router uses CGMP to inform switch
- Switch associates multicast with ports
- Switch automatically learns ports connecting to multicast routers



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Standard Alternatives to CGMP

- **IGMP Snooping**
 - Switch listens for IGMP and enables multicast forwarding
 - Requires hardware (chipset) support
 - Switch needs to know ports connecting to routers
 - De facto standard
- **GMRP (GARP Multicast Registration Protocol)**
 - 802.1q/p
 - Client / NIC stack support required on PC
 - Switch needs to know ports connecting to routers

Cisco RGMP



- Works with IGMP Snooping
- Way for multicast-enabled router to contact switch and arrange for the switch to forward locally sourced multicasts to the router

Other Aspects of Multicast

- **Finding out what's available**
 - Listing of showings
 - sdr
 - IP/TV Content Manager
- **Mechanism that triggers IGMP Join**
 - Application-specific
 - Start up program?
 - Select “channel”?
- **Multicast address assignment**
 - GLOP, longer term schemes
- **Internet Service Provider multicast**



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Configuring IGMP



- **No configuration needed, just turn on PIM on router interface**
- **Can make the router a static member of a group to aid in troubleshooting**

```
interface fast 1/0
ip igmp join-group ipmc-group-address
```
- **Related show command**

```
show ip igmp group
```



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Configuring PIM



- **Configure router globally for multicast forwarding**

```
ip multicast-routing
```

- **Configure participating interfaces**

```
interface fast 1/0
```

```
ip pim sparse-dense-mode
```

- **Related show commands**

```
show ip pim interface
```

```
show ip pim neighbor
```



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Configuring CGMP



- **Configure PIM on a router interface.**
- **Additionally configure:**

```
interface fast 1/0
```

```
ip cgmp
```

- **On Catalyst 5000:**

```
set cgmp enable
```

- **Catalyst 5000 show command**

```
show cgmp statistics
```



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Troubleshooting IP Multicast

- **Useful commands**
 - show ip igmp group
 - show ip mroute
 - ping *multicast-ip-address*
 - mtrace
 - mstat
 - MRM — Multicast Routing Monitor
- **Troubleshooting tools URL:**
 - <http://www.cisco.com/warp/public/105/57.html>

Summary

- **Examined some of the protocols used for IP multicast**
 - IGMP
 - CGMP, etc.
 - PIM
- **Understand where IP multicast may be appropriate**
- **Have a rough idea how to configure IP multicast**

Any Questions ?

For more info, see my CiscoWorld articles —
<http://www.netcraftsmen.net/welcher/papers>



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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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