Real-Time Multicast Communication and Applications

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IP Multicast: What is it?

Allows efficient delivery to several hosts simultaneously

- Only one copy of the packet ends up on each subnet
- No expensive connection setup is required
- Group membership can be highly dynamic

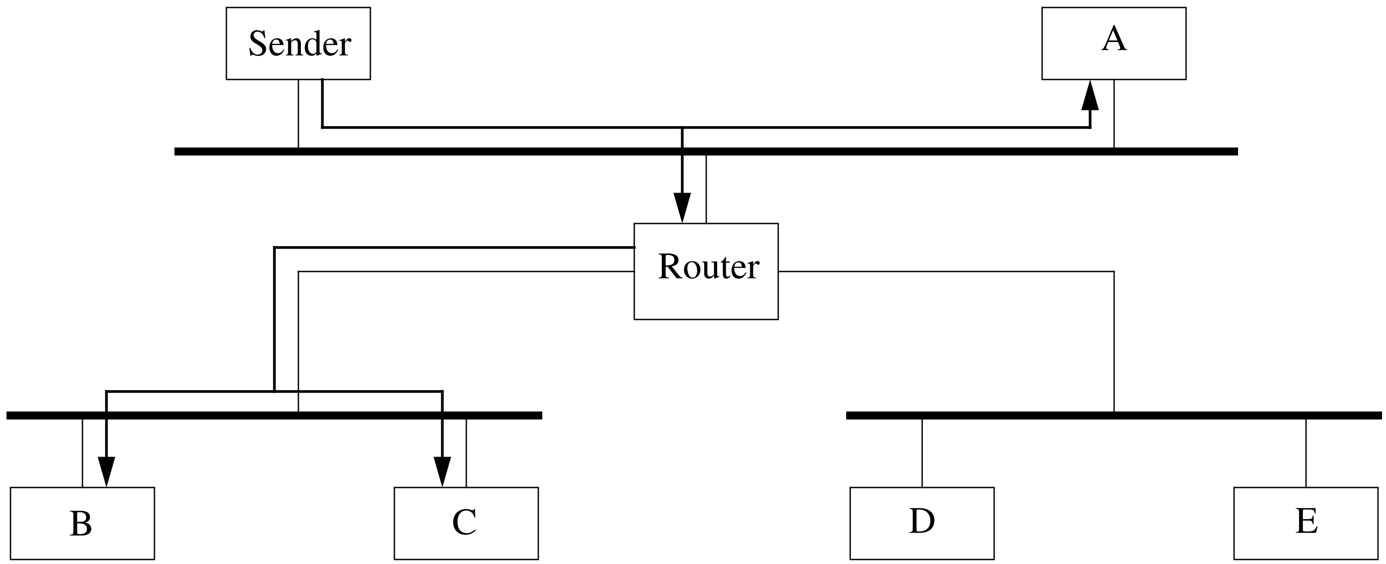
Group addresses are just regular IP addresses

- IP Class D addresses (224.0.0.0 to 239.255.255.255)
- Receivers decide which groups to join, senders just send

Applications typically get at multicast with UDP

- Standard BSD socket interface on UNIX machines

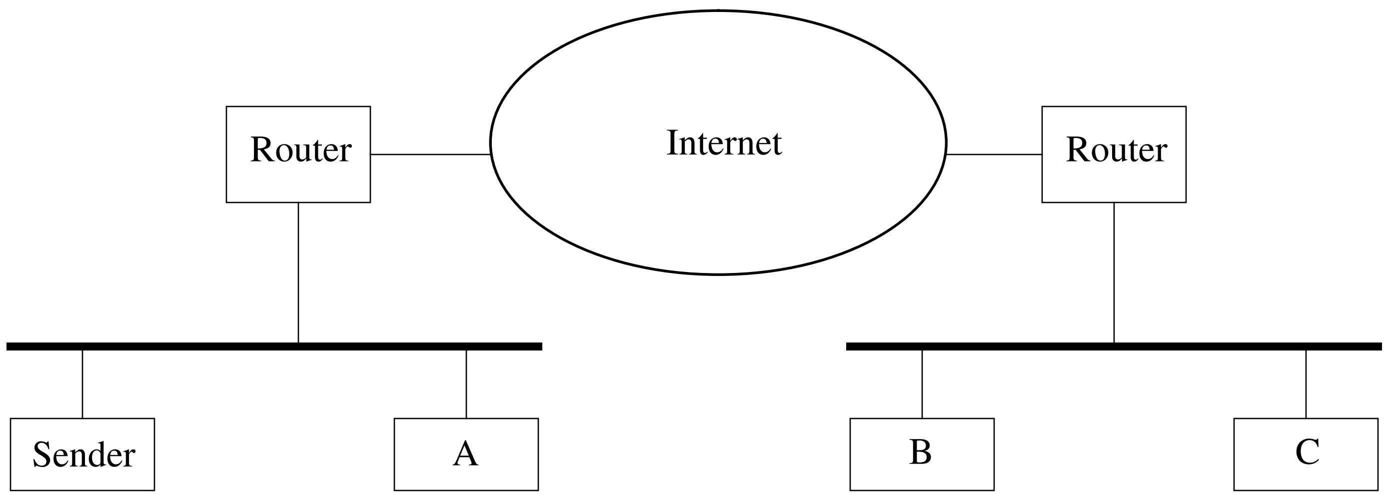
Multicast Delivery Example



Multicast Routing Details

- Hosts announce interest in multicast groups
  - IGMP: Internet Group Membership Protocol
  - Only one membership message per group is typically sent
- Multicast routers build loop-free “broadcast” trees
  - Logically, one tree exists per potential source network
  - Multiple multicast routing protocols exist, and can interoperate
- Actual delivery is to a subset of the broadcast tree
  - Membership information is used to “prune” the tree
  - If a host joins on a pruned subnet, “graft” messages are sent up the tree

Multicast Tunnels



Multicast tunnels (cont.)

Advantage: Allows a multicast network to be built today

- Not all the routers along the path need to be multicast-aware
- Tunnels are only needed to connect together multicast-aware “clouds”

Disadvantage: Tunnels cause duplicate copies of packets

- Both multicast & unicast (tunneled) packets appear on the same net
- Poorly architected tunnel configurations can congest backbone links
- Maintaining a large overlay network like this is a nightmare

Availability of IP Multicast

Workstations

- Standard part of Irix (SGI), Solaris 2.x (Sun), and OSF/1 2.x (DEC Alpha)
- Available as patches for SunOS 4.x, Ultrix, HP/UX, and AIX

PCs (DOS)

- Available in PC/TCP (FTP Software)
- Available as patches to Waterloo's public domain WATTCP

Macs

- Being added to MacTCP (unknown availability)

Routers/Bridges

- Being worked on by most major router vendors
- Available now in Alantec Smart Hub bridge

Why is multicast interesting?

Groupware applications for large groups are now practical

- Sending to a dozen users is now as cheap as sending to one
- If you can afford to send to each recipient, you can send to all of them

Lightweight joins mean you can “publish” information

- No need to know in advance who your receivers are
- Just send to the group and the network will get it to all who want it

Add audio/video and you get desktop conferencing

- Audio is now common in workstations, video is coming
- Workstations are fast enough to do basic compression
- Networks are fast enough to carry several compressed streams