

Lecture 1: Introduction to Multicast

7COM1030 – Multicast and Multimedia Networking

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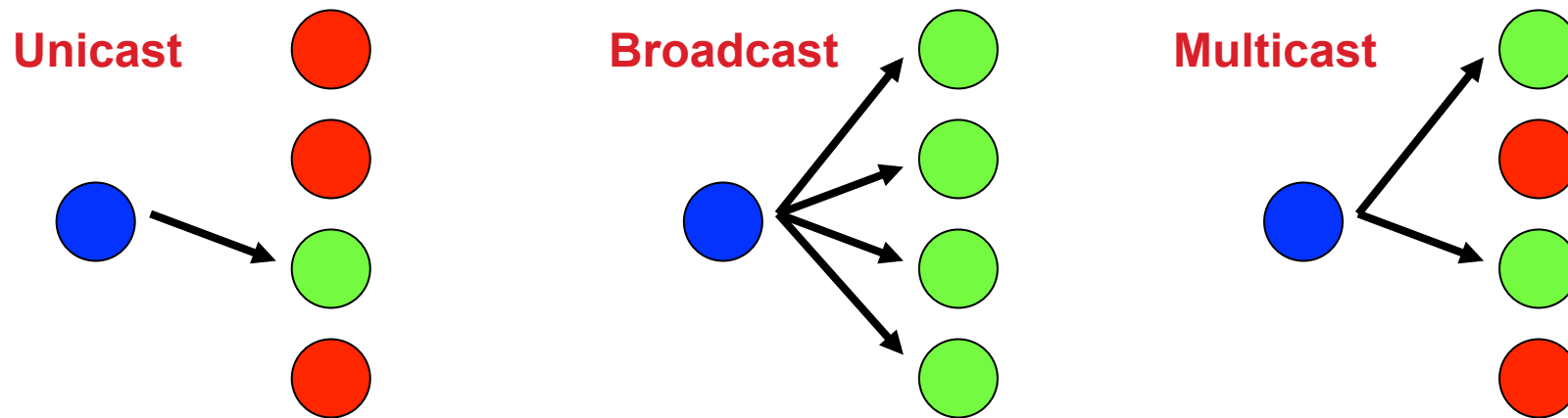


Topics

- ▶ Why Multicast?
- ▶ Multicast Groups
- ▶ Multicast Services

Multicasting

- ▶ Multicast refers to one-to-many or many-to-many communications



Multicast is driven by receivers: Receivers indicate interest in receiving data.

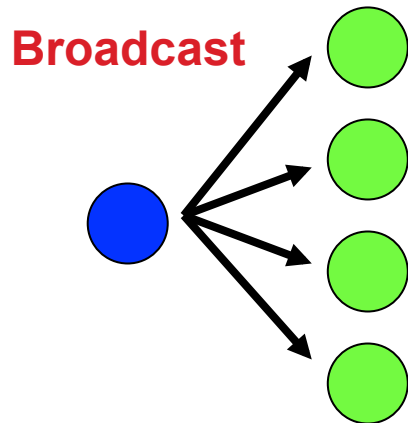
Multicast is sending a packet that is received at many destinations, NOT sending packets to many destinations.

Multicast Applications

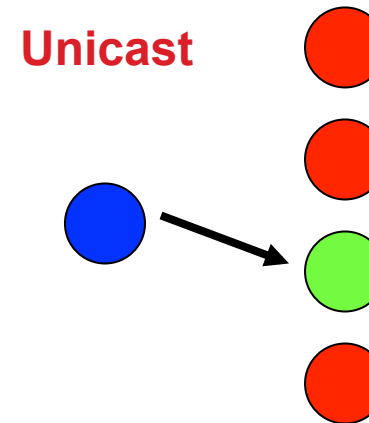
- ▶ Many applications transmit the same data at one time to multiple receivers
 - Broadcasts of radio or video
 - Video conferencing
 - Shared applications
- ▶ A network must have mechanisms to support such applications in an efficient manner

Why Multicast?

- ▶ It is feasible to implement multicast using either unicast or broadcast, but both solutions have shortcomings.

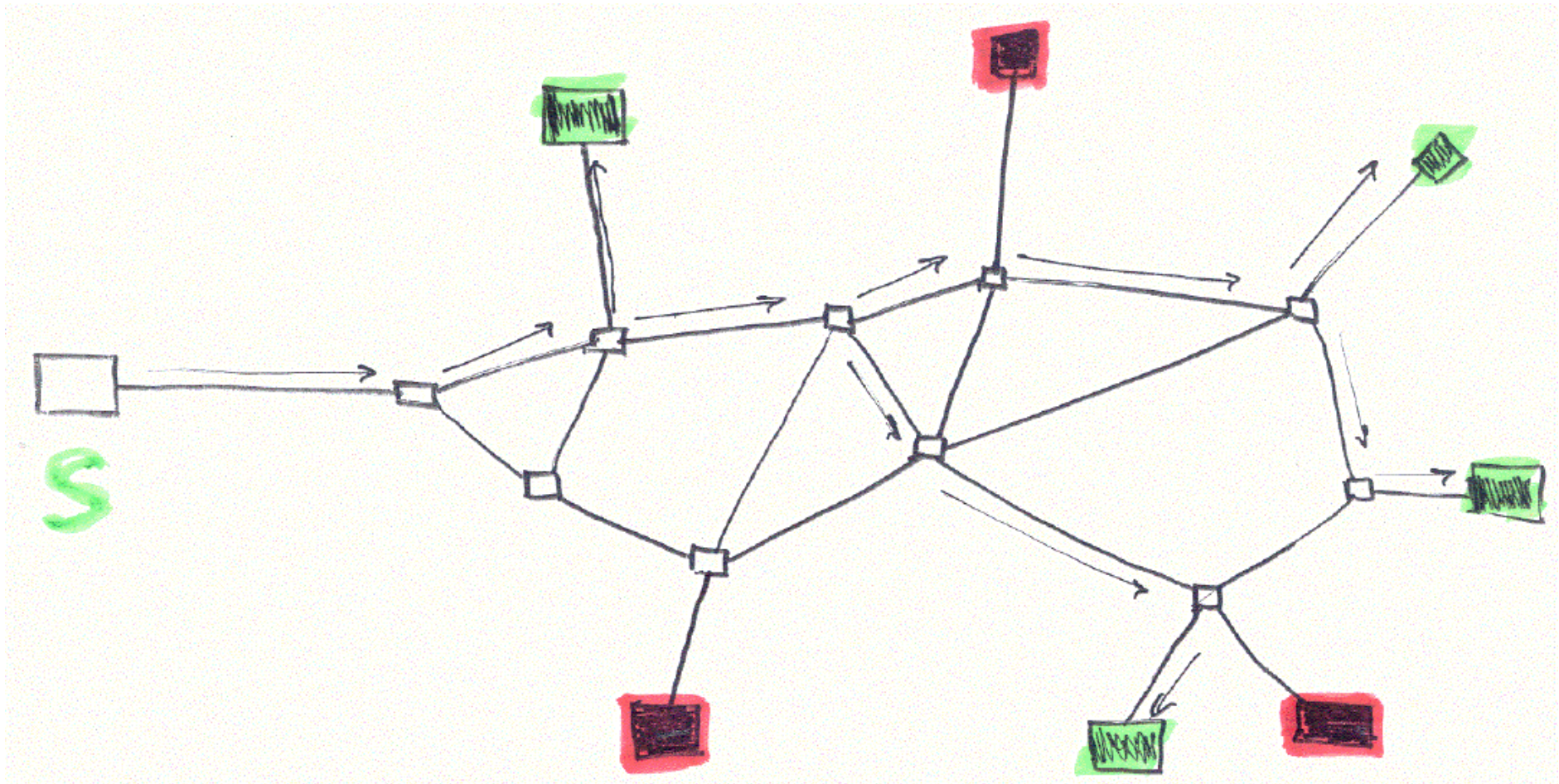


- Only works if all members are in the same LAN.
- Waste of network capacity.
- Security Issues



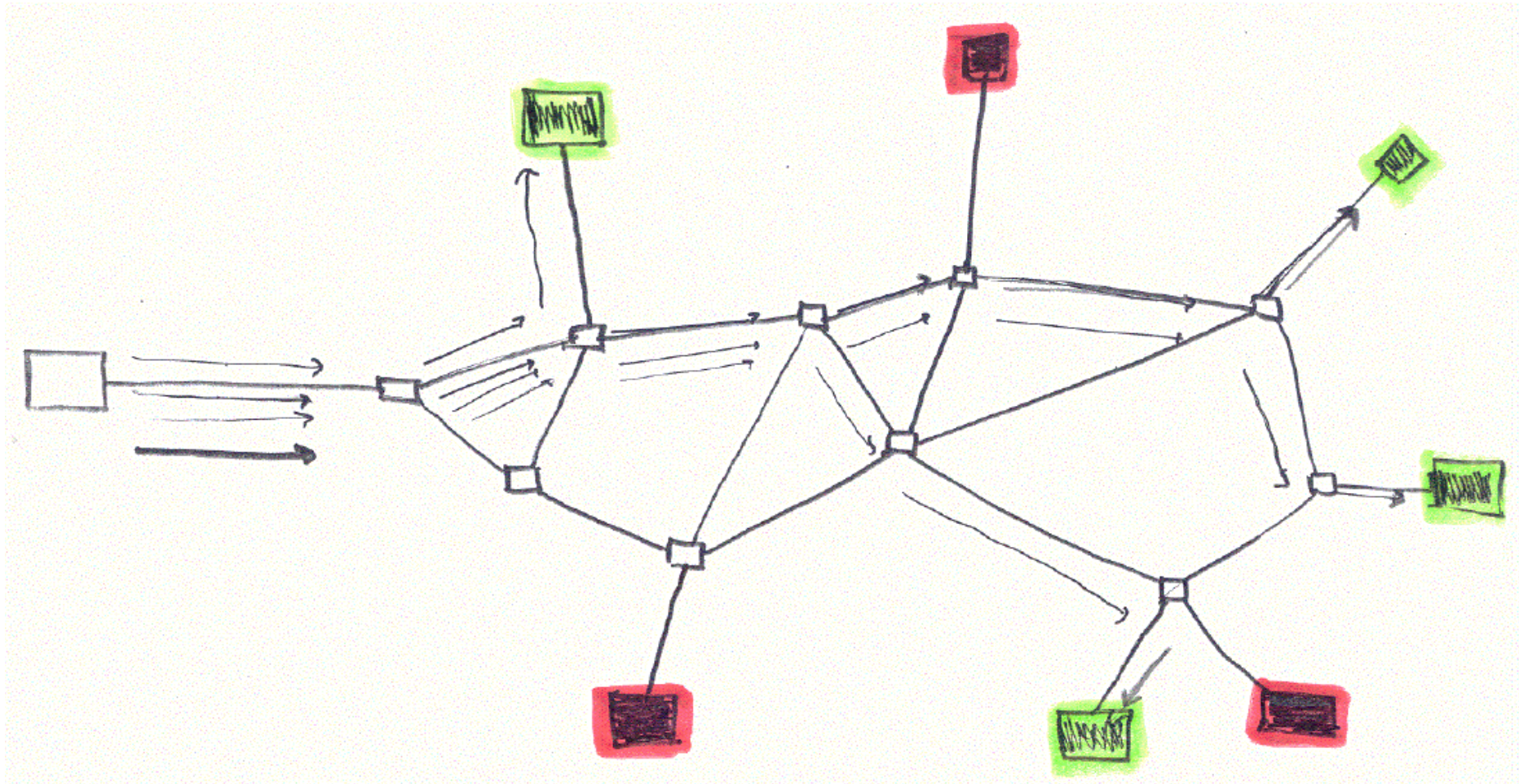
- One copy sent to every destination
- Not realistic for large multicast networks

Network with Multicast



- ▶ A packet is sent over a link 12 times.

Attempting with Unicast



- ▶ A packet is sent over a link 22 times:

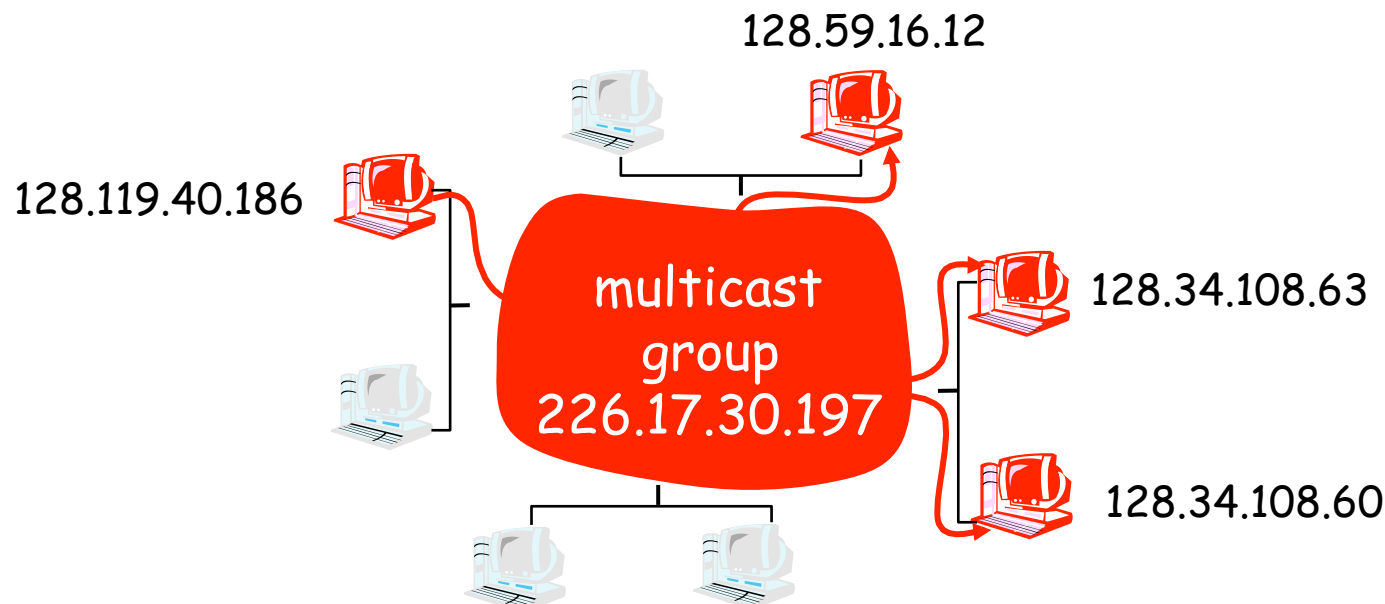
$$3 + 6 + 7 + 6 = 22$$

Topics

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Multicast Groups

- ▶ The set of receivers for a multicast transmission is called a **multicast group**
 - A multicast group is identified by a **multicast address**
 - A user that wants to receive multicast transmissions **joins** the corresponding multicast group, and becomes a **member** of that group



Semantics of IP Multicast

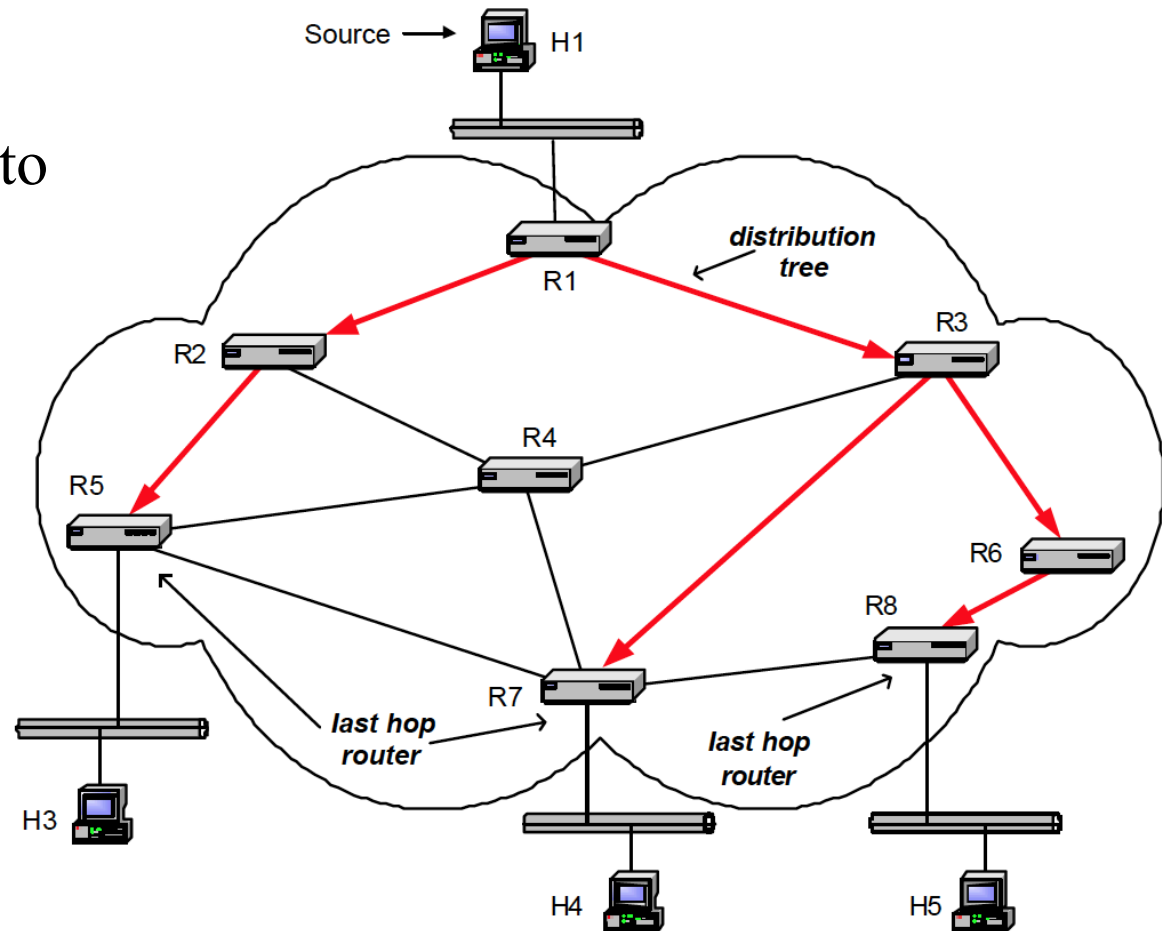
- ▶ Multicast groups are identified by IP addresses in the range 224.0.0.0 - 239.255.255.255 (class D address)
- ▶ Every host (*more precisely*: interface) can join and leave a multicast group dynamically
 - no access control (*think of tuning to a radio frequency*)
- ▶ Every IP datagram sent to a multicast group is transmitted to all members of the group
 - no security, no “floor control”
 - Sender does not need to be a member of the group

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- ▶ Multicast Services

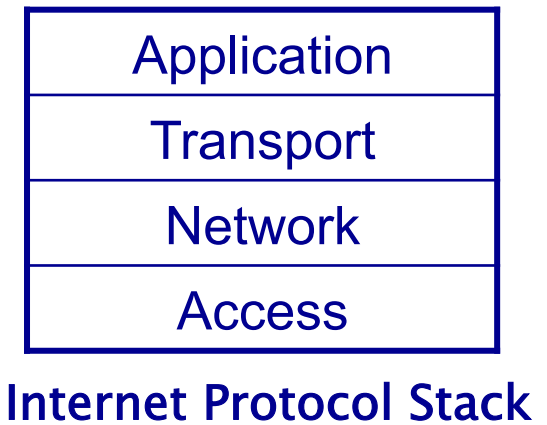
Multicast Delivery in an IP Network

- ▶ After a user joins, the network builds the necessary routing paths to delivery data to the multicast group, called **distribution tree**
- ▶ Data is delivered downstream in the tree

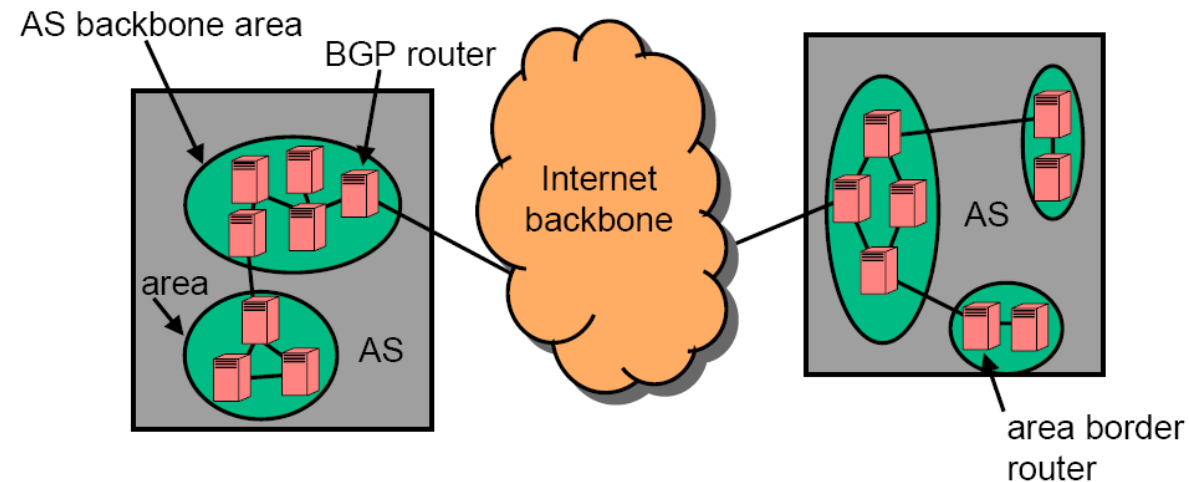


Multicast Services

- ▶ The IP Multicast service is unreliable
- ▶ Transport layer protocols:
 - User Datagram Protocol (UDP)
 - Real-time Transport Protocol (RTP): for multimedia content
 - Reservation Protocol (RSVP): for bandwidth reservation in a multicast distribution
 - There is no multicast version of TCP
- ▶ For applications (*e.g. file delivery*) that require a reliable data transfer (*e.g. sequence numbers, timers, re-transmission*), the service guarantee must be provided by the application layer



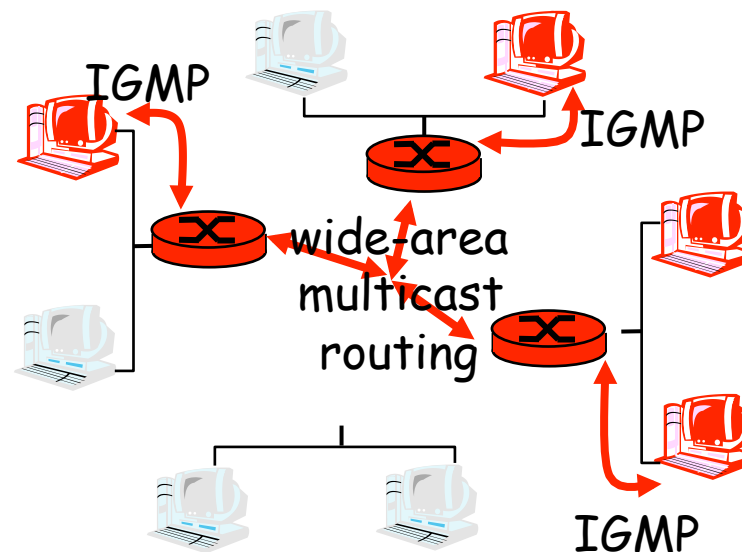
Network Layer Protocols in the Internet Hierarchy



Local Area Network (join/leave)	<ul style="list-style-type: none"> • Internet Group Management Protocol (IGMP) • Multicast Listener Discovery (MLD): for IPv6
Intra-domain (routing)	<ul style="list-style-type: none"> • Multicast Open Shortest Path First (MOSPF) • Distance Vector Multicast Routing Protocol (DVMRP) • Protocol Independent Multicast (PIM)
Inter-domain (routing)	<ul style="list-style-type: none"> • Multicast Border Gateway Protocol (MBGP) • PIM-SM: PIM in the sparse mode • Multicast Source Discovery Protocol (MSDP)

Joining a multicast group: 2-step process

- ▶ **Local area:** host informs local multicast router of desire to join group: IGMP
- ▶ **Wide area:** local router interacts with other routers to receive multicast datagram flow
 - many protocols (e.g., DVMRP, MOSPF, PIM)



Home Reading

► **Mastering Networks: An Internet Lab Manual**

Jorg Liebeherr, Magda El Zarki

Pearson, 1st edition, 20 Aug. 2003

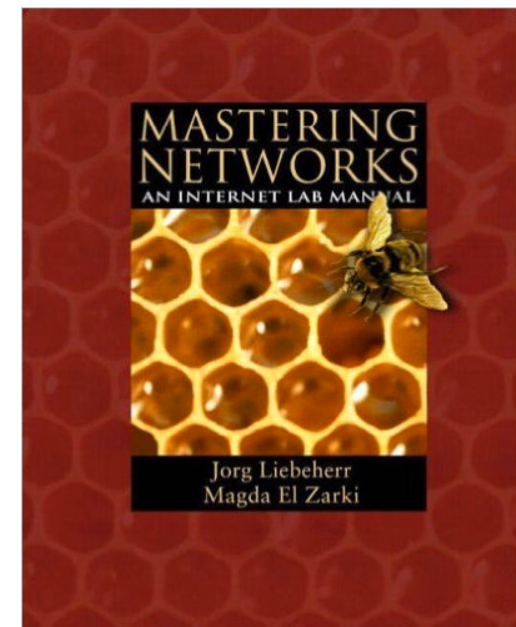
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■ **Chapter 10: IP Multicast**

Available on StudyNet:

Pay attention to the highlights!



Questions?

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