CS 725/825 & IT 725

Lecture 26

Course Wrap Up

December 11, 2023

Multicasting

- Media delivery
  - IPTV
- Data distribution
  - streamed data (e.g., stock market)
  - multicasted files (file distribution in CDNs)
- Management and discovery
  - Bonjour, mDNS
  - “All routers” multicast address

Multicasting

- Delivery to multiple destinations…
  - potentially from multiple sources
- Objective
  - reduce the number of link transitions
- Alternative approaches
  - repeated unicast
  - flood and filter
- L2 and L3 multicast

Multicast Considerations

- Reliable vs unreliable
- Static vs dynamic group membership
  - membership churn
- Permanent vs transient multicast groups
  - group churn
- Sparse vs dense groups
- Concentrated vs distributed members
- Amount of data

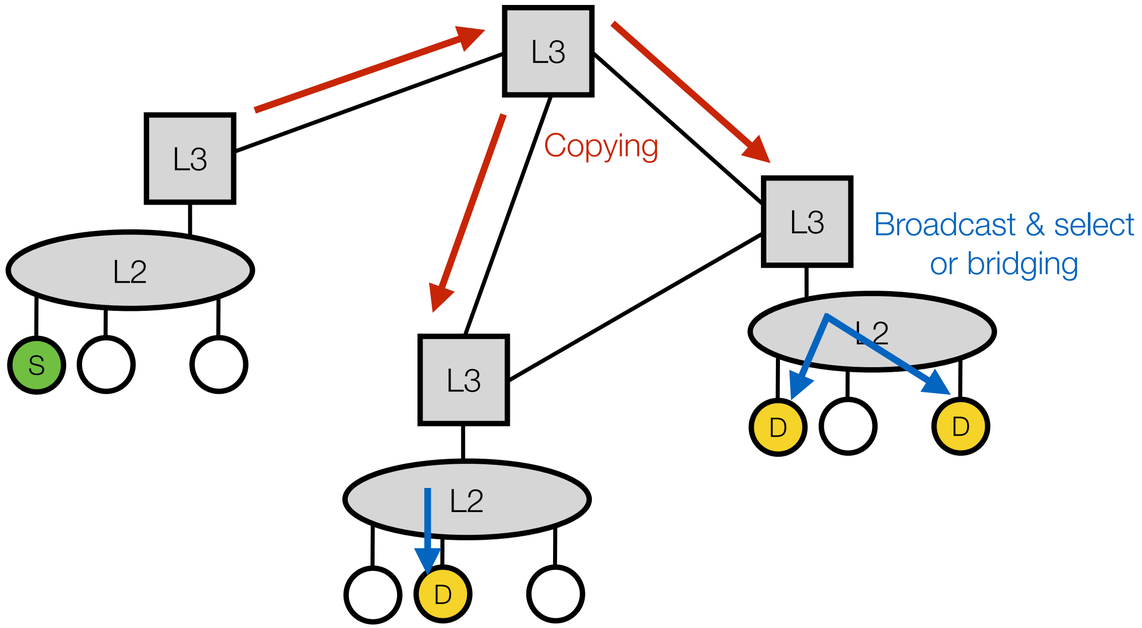
Multicast Addressing

- In general
  - list of destinations, multicast group id, “implicit”, …
- In practice
  - IPv4: 224.0.0.0 to 239.255.255.255, i.e., IP addresses starting with (1110)2; remaining 28 bits* form the multicast group id
  - IPv6: FF::, anything starting with 8 ones; remaining120 bits* form the multicast group id
  - MAC
    - IPv4 01:00:5E:00:00:00 to 01:00:5E:7F:FF:FF, multicast group id is 23 bits
    - IPv6 33:33:00:00:00:00 to 33:33:FF:FF:FF:FF, multicast group id is 32 bits

* It is a bit more complicated but for now it is close enough

Two Problems

- L3 and L2 multicast



Multicast Membership

- IGMP - Internet Group Management Protocol
  - Version 1
  - Version 2 - group leave message
  - Version 3 - source specific multicast (SSM)
- Messages
  - Host Membership Query (MAC broadcast to 224.0.0.1)
  - Host Membership Report
- IGMP Snooping

Wrap up

Wrapping up…

- Basic principles of networking
  - addressing, layers, performance evaluation
- Application protocol design
  - sockets, client/server communication, HTTP
- Securing data transmission
  - encryption, authentication/certificates, integrity, attacks
- Support services in the application layer
  - DNS, network management

Wrapping up…

- Principles of reliable transport, TCP and UDP
  - ARQ, sliding window
  - receiver and network congestion control
- Network layer and routing in the Internet, IP
  - routing algorithms and protocols, scalability
  - QoS, virtual circuit switching, MPLS, SDN
- Link layer, Ethernet, bridging
  - MAC protocols and wireless networks
  - scaling of L2 networks, bridging, virtualization

Thank you!