

Computer Networks

Routing Overview



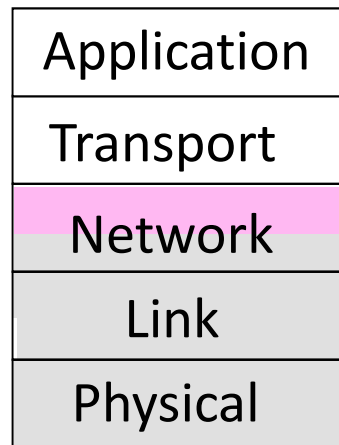
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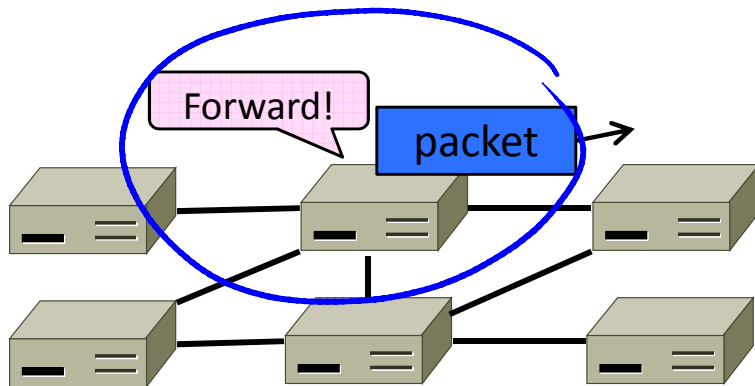
Where we are in the Course

- More fun in the Network Layer!
 - We've covered packet forwarding
 - Now we'll learn about routing

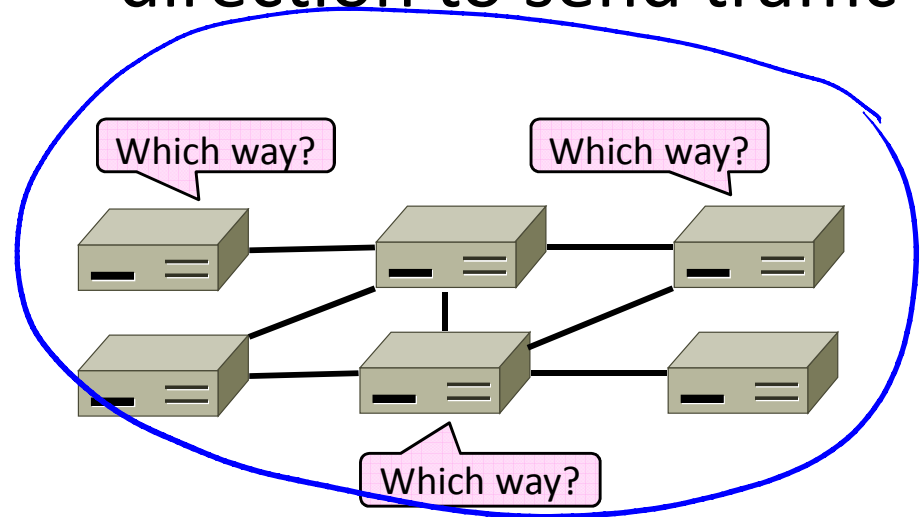


Routing versus Forwarding

- Forwarding is the process of sending a packet on its way

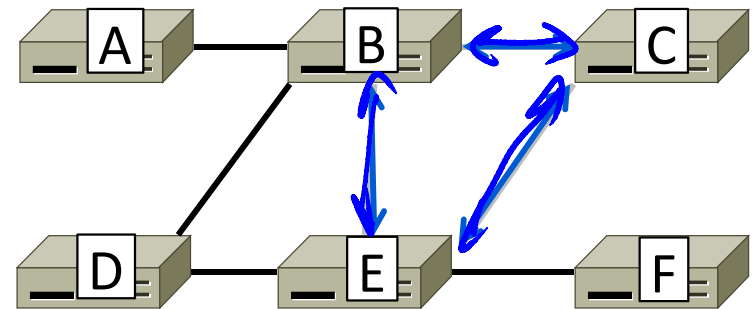
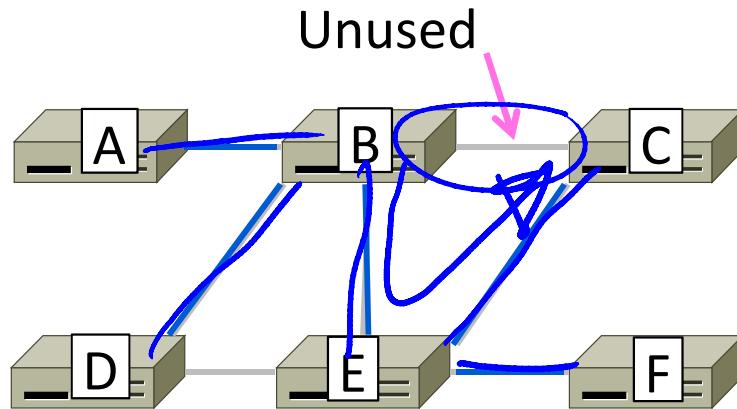


- Routing is the process of deciding in which direction to send traffic



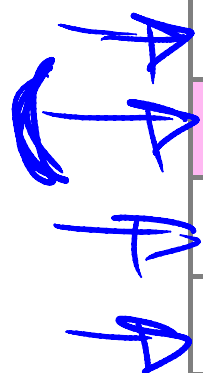
Improving on the Spanning Tree

- Spanning tree provides basic connectivity
 - e.g., some path $B \rightarrow C$
- Routing uses all links to find “best” paths
 - e.g., use BC, BE, and CE



Perspective on Bandwidth Allocation

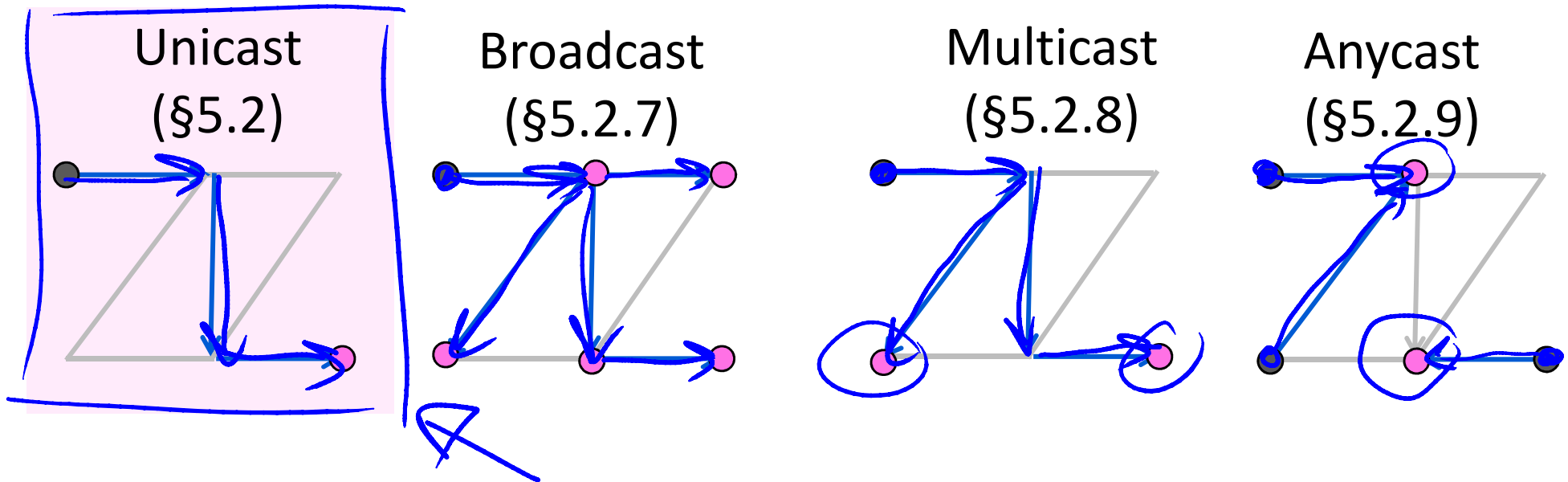
- Routing **allocates network bandwidth** adapting to failures; other mechanisms used at other timescales



Mechanism	Timescale / Adaptation
Load-sensitive routing	Seconds / Traffic hotspots
Routing	Minutes / Equipment failures
Traffic Engineering	Hours / Network load
Provisioning	Months / Network customers

Delivery Models

- Different routing used for different delivery models



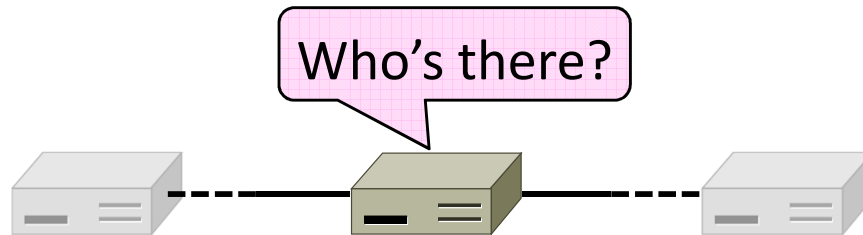
Goals of Routing Algorithms

- We want several properties of any routing scheme:

Property	Meaning
Correctness	Finds paths that work
Efficient paths	Uses network bandwidth well
Fair paths	Doesn't starve any nodes
Fast convergence	Recovers quickly after changes
Scalability	Works well as network grows large

Rules of Routing Algorithms

- Decentralized, distributed setting
 - All nodes are alike; no controller
 - Nodes only know what they learn by exchanging messages with neighbors
 - Nodes operate concurrently
 - May be node/link/message failures



Topics

- ~~IPv4, IPv6, NATs and all that~~ } Last time

- Shortest path routing
 - Distance Vector routing
 - Flooding
 - Link-state routing
 - Equal-cost multi-path
 - Inter-domain routing (BGP)
- } This time

END

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