

Computer Networks

Network Layer Overview



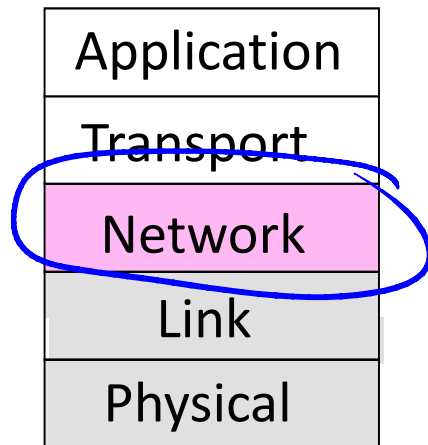
David Wetherall (djw@uw.edu)

Professor of Computer Science & Engineering

UNIVERSITY *of* WASHINGTON

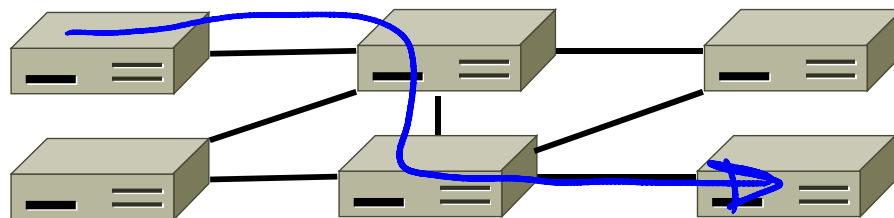
Where we are in the Course

- Starting the Network Layer!
 - Builds on the link layer. Routers send packets over multiple networks



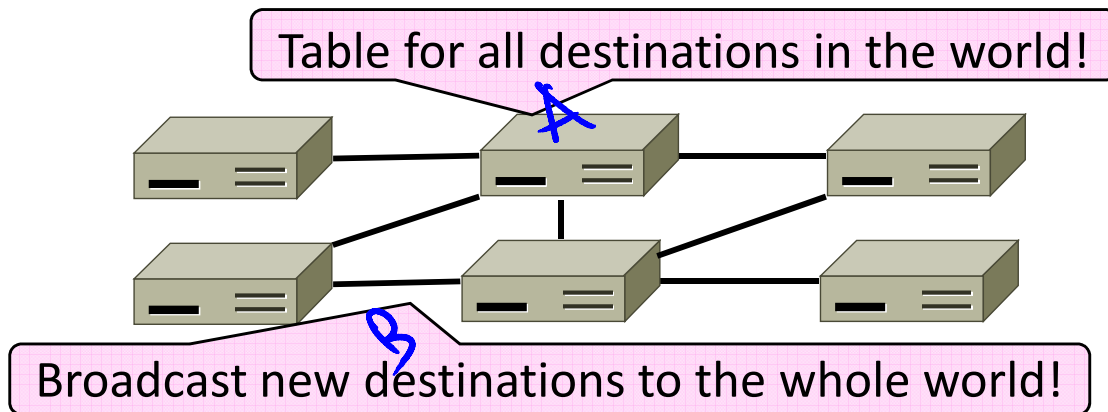
Why do we need a Network layer?

- We can already build networks with links and switches and send frames between hosts ...



Shortcomings of Switches

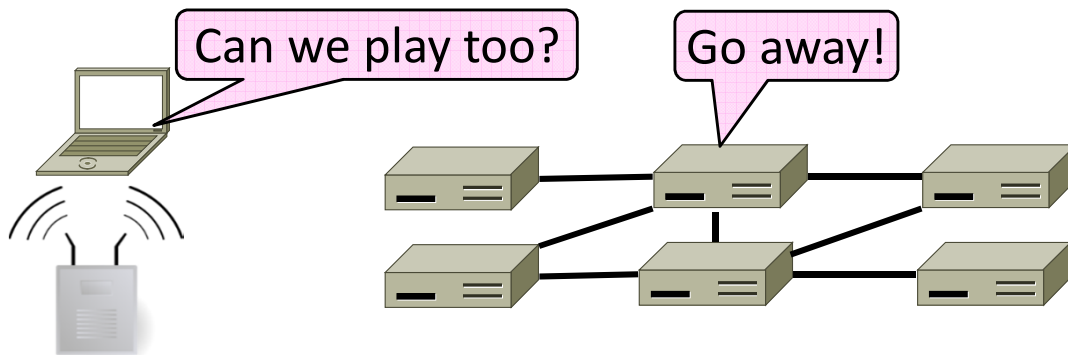
1. ~~A~~ Don't scale to large networks
 - Blow up of routing table, broadcast



Shortcomings of Switches (2)

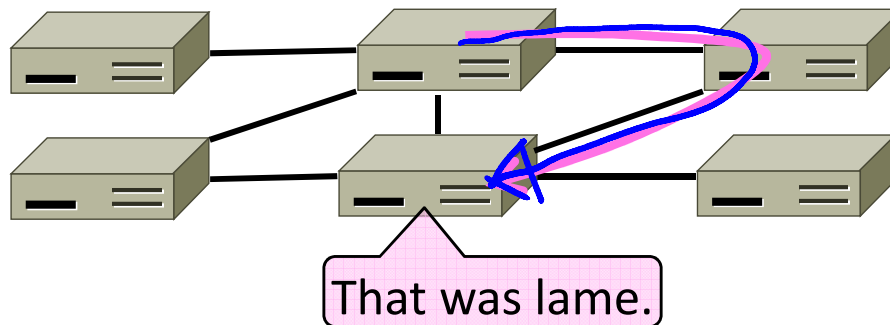
2. ~~Don't~~ Don't work across more than one link layer technology

— Hosts on Ethernet + 3G + 802.11 ...



Shortcomings of Switches (3)







3. ✗ Don't give much traffic control
- Want to plan routes / bandwidth



Network Layer Approach

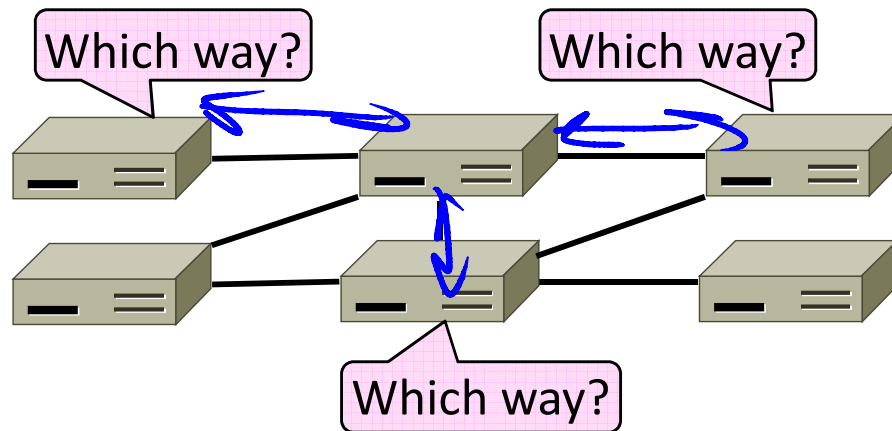
- Scaling:
 - Hierarchy, in the form of prefixes
- Heterogeneity:
 - IP for internetworking
- Bandwidth Control:
 - Lowest-cost routing
 - Later QOS (Quality of Service)

Topics

-  Network service models
 - Datagrams (packets), virtual circuits
 -  IP (Internet Protocol)
 - Internetworking
 - Forwarding (Longest Matching Prefix)
 - Helpers: ARP and DHCP
 - Fragmentation and MTU discovery
 - Errors: ICMP (traceroute!)
 -  IPv6, the future of IP
 -  NAT, a “middlebox”
 -  Routing algorithms
- This time
- Next time

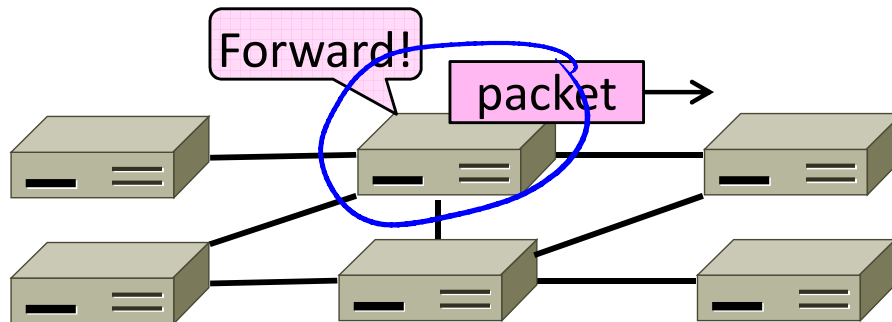
Routing vs. Forwarding

- Routing is the process of deciding in which direction to send traffic
 - Network wide (global) and expensive



Routing vs. Forwarding (2)

- Forwarding is the process of sending a packet on its way
 - Node process (local) and fast



Our Plan

- Forwarding this time
 - What routers do with packets
- Routing next time
 - Logically this comes first
 - But ignore it for now

END

© 2013 D. Wetherall

Slide material from: TANENBAUM, ANDREW S.; WETHERALL, DAVID J., COMPUTER NETWORKS, 5th Edition, © 2011.
Electronically reproduced by permission of Pearson Education, Inc., Upper Saddle River, New Jersey