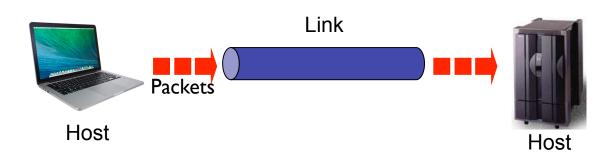
Networking Fundamentals



Bowdoin Sean Barker 1

Network Connections



Connection Types

Point to Point

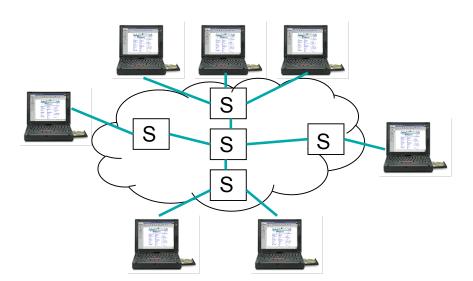


Multiple access (broadcast)

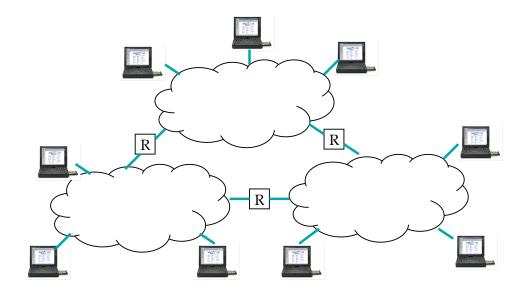


Bowdoin Sean Barker 3

Switched Networks

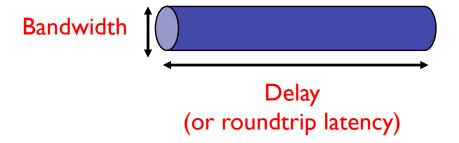


Interconnection of Networks (Routers)



Bowdoin Sean Barker 5

Network Performance



propagation delay = distance / speed of light
transmit time = message size / bandwidth
queue delay = time spent in router queues

latency = propagation + transmit + queue

Bandwidth vs. Latency

I Byte Object

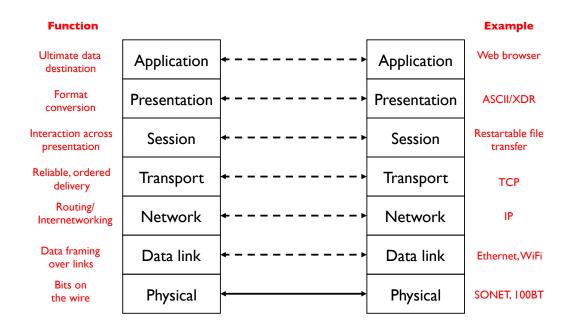
	Prop delay: 1 ms	Prop delay: 100 ms	
Bandwidth: 1 Mbps	1,008 μs	100,008 μs	
Bandwidth: 100 Mbps	1,000 μs	100,000 μs	

10 MB Object

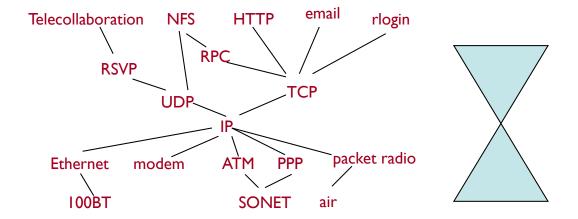
	Prop delay: 1 ms	Prop delay: 100 ms	
Bandwidth: 1 Mbps	80.001 s	80.1 s	
Bandwidth: 100 Mbps	.801 s	.9 s	

Bowdoin Sean Barker 7

OSI Model

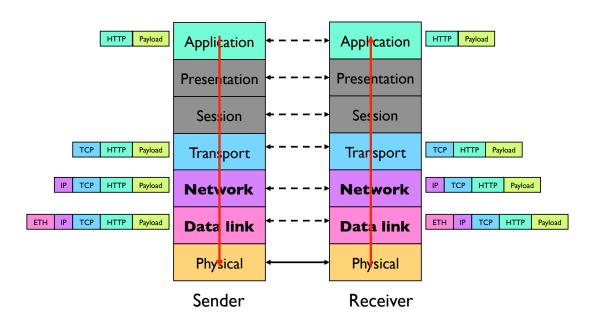


IP Hourglass

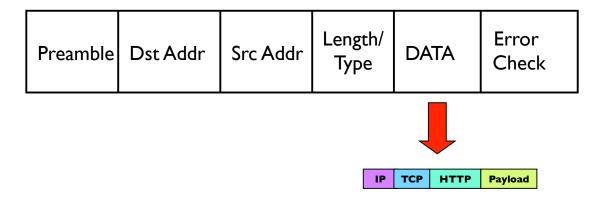


Bowdoin Sean Barker 9

Protocol Encapsulation



Ethernet/Wifi (Data Link, Layer 2)



Bowdoin Sean Barker 11

Internet Protocol (Network, Layer 3)

Version	HLen	TOS	Length		
Identification		Flags	Offset		
Т	TL	Protocol	Header Checksum		
Source IP Addr					
Destination IP Addr					
Options (variable)			Pad (variable)		
Data TCP HTTP Payload					

Bowdoin Sean Barker 12

Dynamic Host Configuration Protocol (DHCP)

Your computer





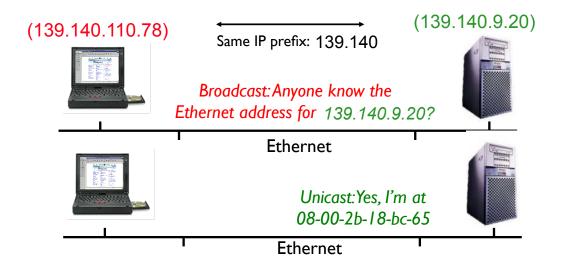
Broadcast: Hi, I'm new to the network!



Hi, I assigned you IP 139.140.235.145, DNS is at 139.140.9.20, gateway router is at 139.140.235.129

Bowdoin Sean Barker 13

Address Resolution Protocol (ARP)



Bowdoin Sean Barker 14

Domain Name System (DNS)

Your computer (139.140.235.145)

Local DNS server (139.140.9.20)





Oh, you can find it at 74.125.225.83



Bowdoin Sean Barker 15

Routing

