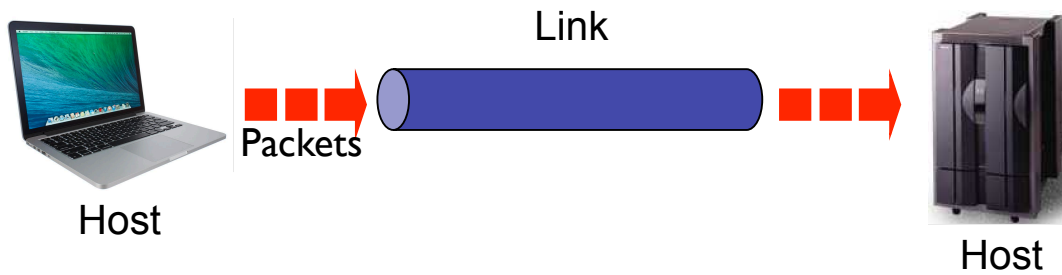
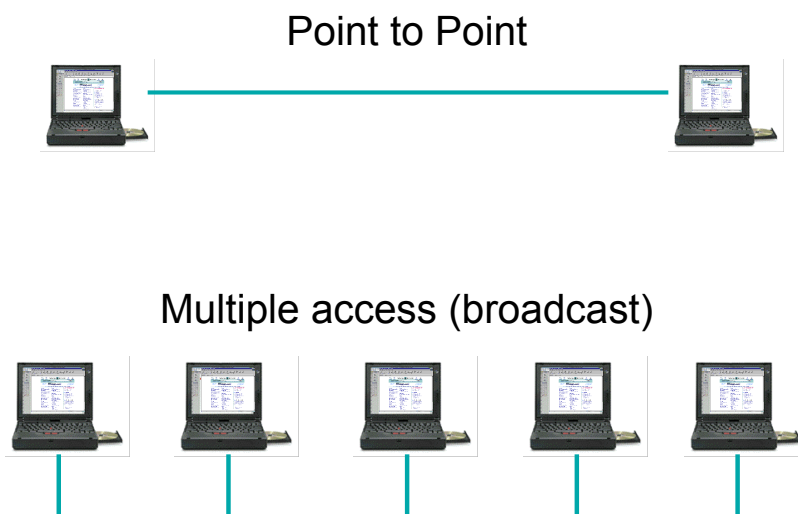


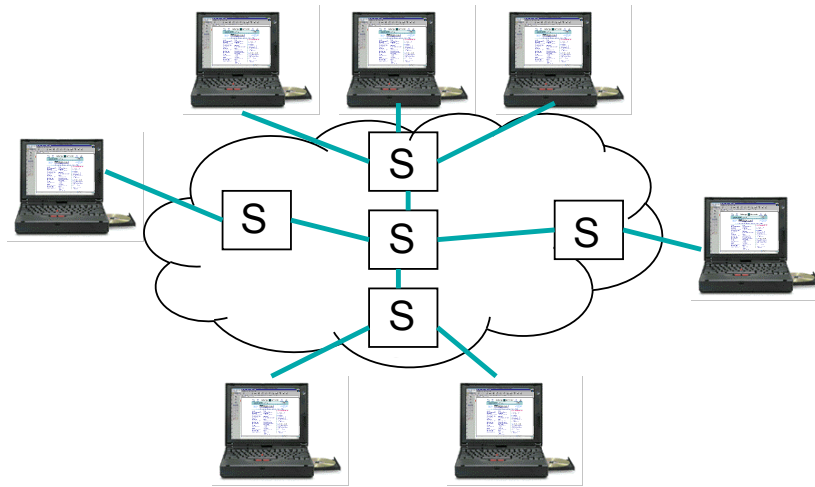
Network Connections



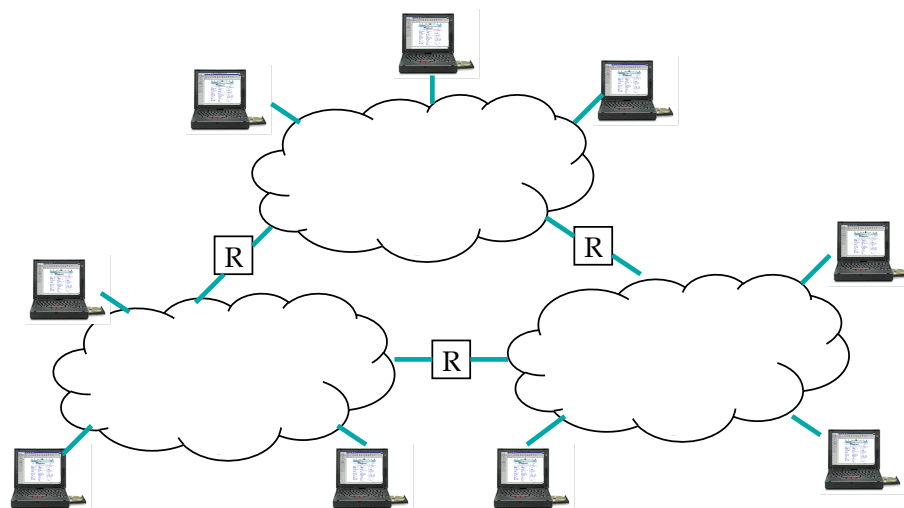
Connection Types



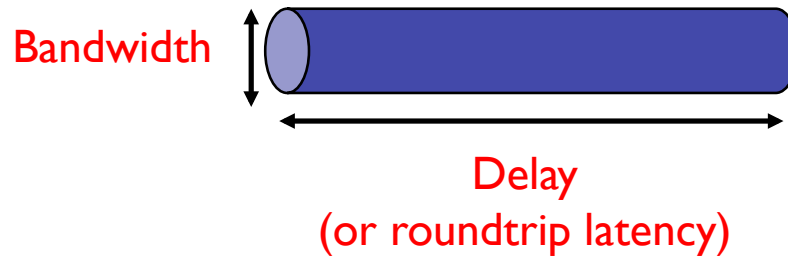
Switched Networks



Interconnection of Networks (Routers)



Network Performance



latency = propagation + transmit + queue

Bandwidth vs. Latency

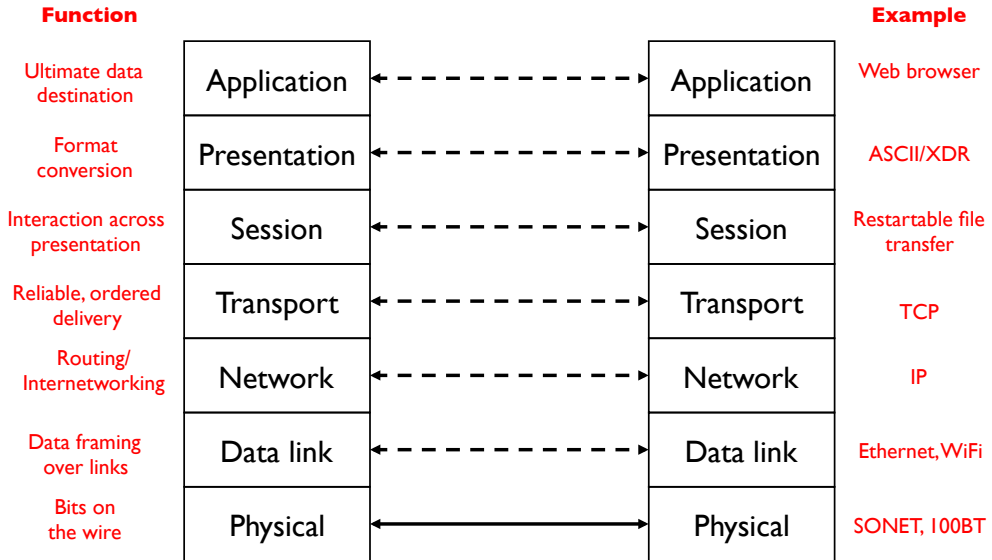
1 Byte Object

	Prop delay: 1 ms	Prop delay: 100 ms
Bandwidth: 1 Mbps	1,008 μ s	100,008 μ s
Bandwidth: 100 Mbps	1,000 μ s	100,000 μ s

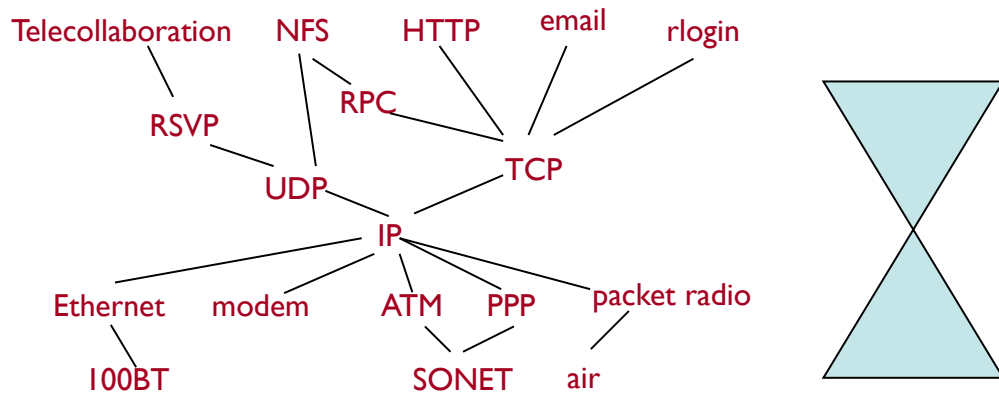
10 MB Object

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

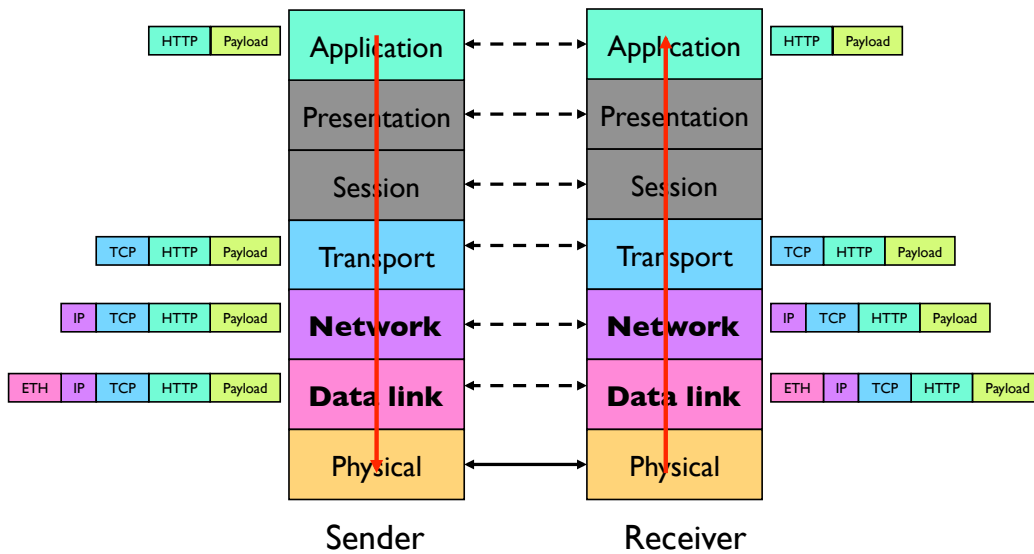
OSI Model



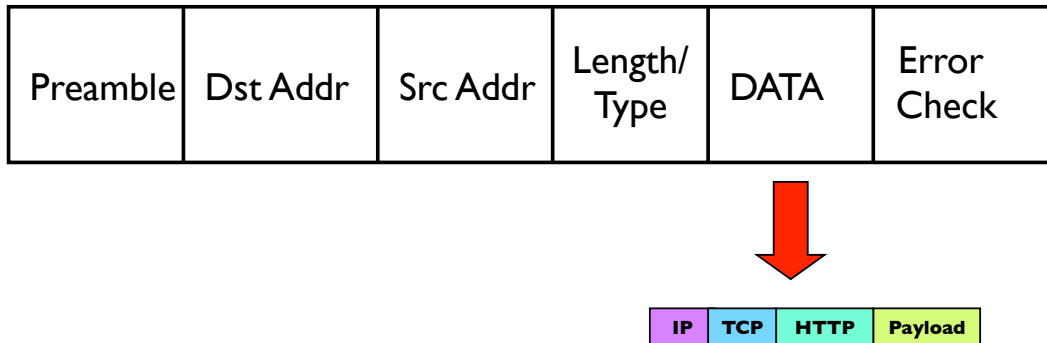
IP Hourglass



Protocol Encapsulation



Ethernet/Wifi (Data Link, Layer 2)



Internet Protocol (Network, Layer 3)

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

Dynamic Host Configuration Protocol (DHCP)

Your computer



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



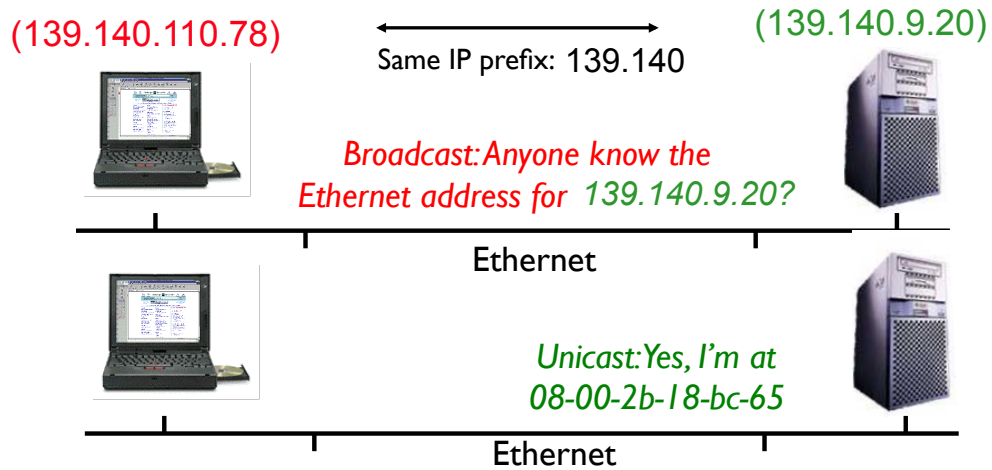
Local DHCP server



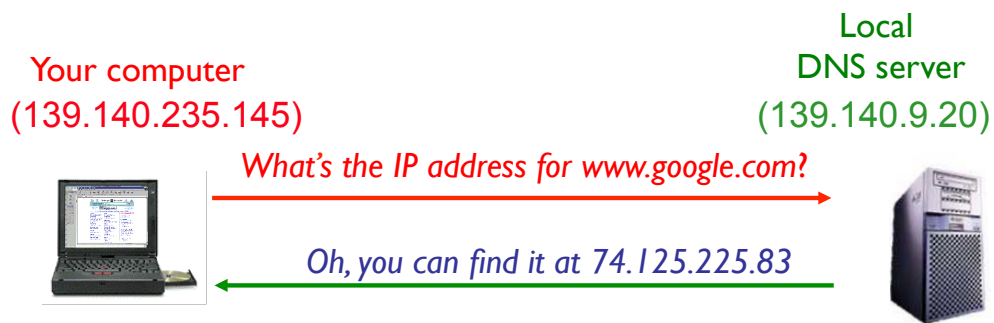
*Hi, I assigned you IP 139.140.235.145,
DNS is at 139.140.9.20,
gateway router is at 139.140.235.129*



Address Resolution Protocol (ARP)



Domain Name System (DNS)



Routing

