

CSc 450/550

Computer Networks

Medium Access Control

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Summer 2006

7/17/06

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1

Review

- Link layer
 - framing
 - error control
 - flow control
- How about you have more than one sender and one receiver share a link?

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2

Medium access control

- Type of links
 - point-to-point link
 - e.g., PPP, switched Ethernet
 - broadcast link (shared medium)
 - e.g., traditional Ethernet, 802.11
 - collision by concurrent transmission
- Medium access
 - deterministic allocation: FDM/TDM/CDM
 - contention-based: ALOHA, CSMA, CSMA/CD

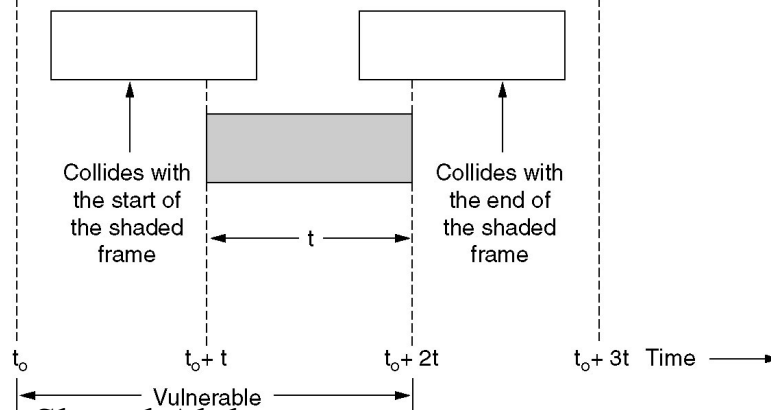
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3

Aloha

- Pure Aloha: transmit, if collision, random back off



- Slotted Aloha: transmit in next slot, if collision, ...

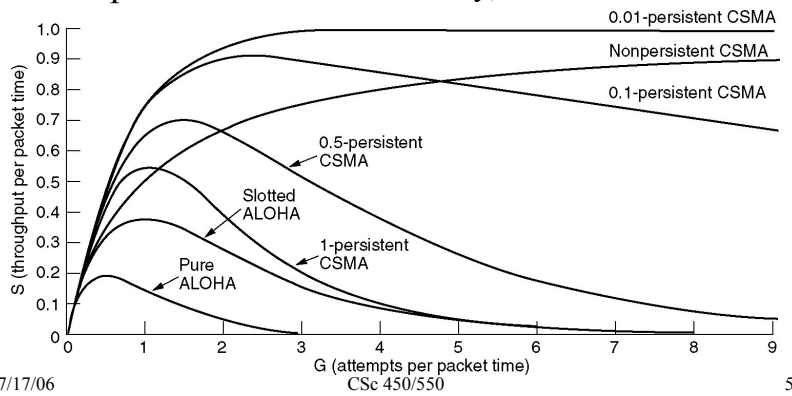
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4

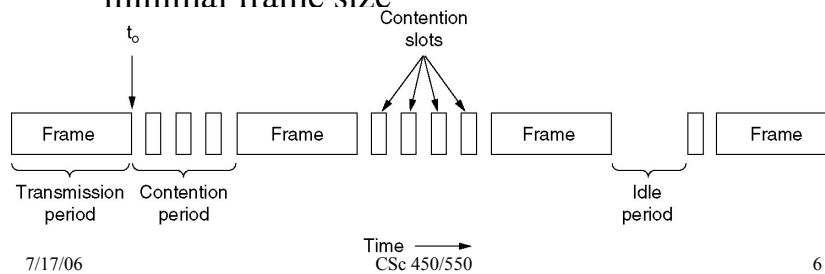
Carrier sense multiple access

- p-persistent CSMA: if busy, wait; if idle, transmit w/ p
- Non-persistent CSMA: if busy, back-off



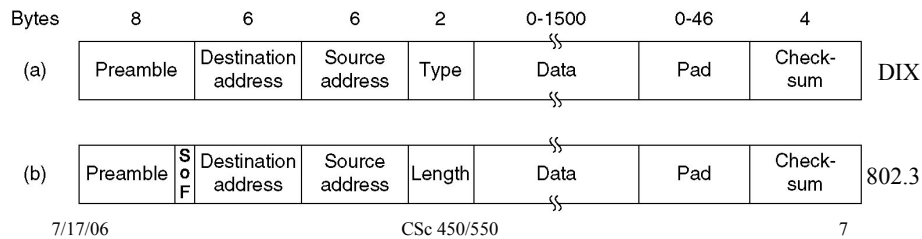
CSMA/collision detection

- CSMA
- CD: if collision, abort! and back off
 - need: receiving while sending
 - minimal frame size



Ethernet

- Pervasive!
 - speed: 10Mbps, 100Mbps, 1Gbps, 10Gbps
 - medium: coaxial, twist-pair, fiber
 - topology: bus, tree, star; range: LAN, MAN



Ethernet frame

- Destination/source addresses (6-bit each)
- Type (2-byte): e.g., 0x0800 (IP)
 - length in 802.3 frame with 802.2 LLC
- Data: 0~1500 bytes
- Pad: 0~46 bytes
 - minimal frame length
- CRC: 4-byte
- CSMA/CD with binary exponential backoff

Wireless LAN

- Very popular!
 - 802.11a: 5GHz, 54Mbps, 30ft
 - 802.11b: 2.4GHz, 11Mbps, 100ft
 - 802.11g: 2.4GHz, 54Mbps, 100ft
 - 802.11n: new radio, 2.4GHz, 540Mbps
- Infrastructure mode
 - access point
- Ad-hoc mode

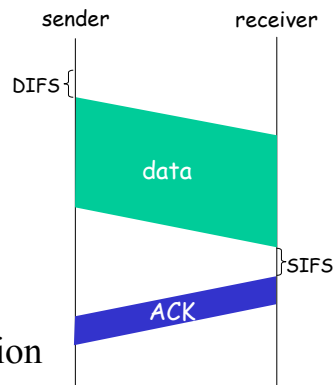
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9

CSMA/CA

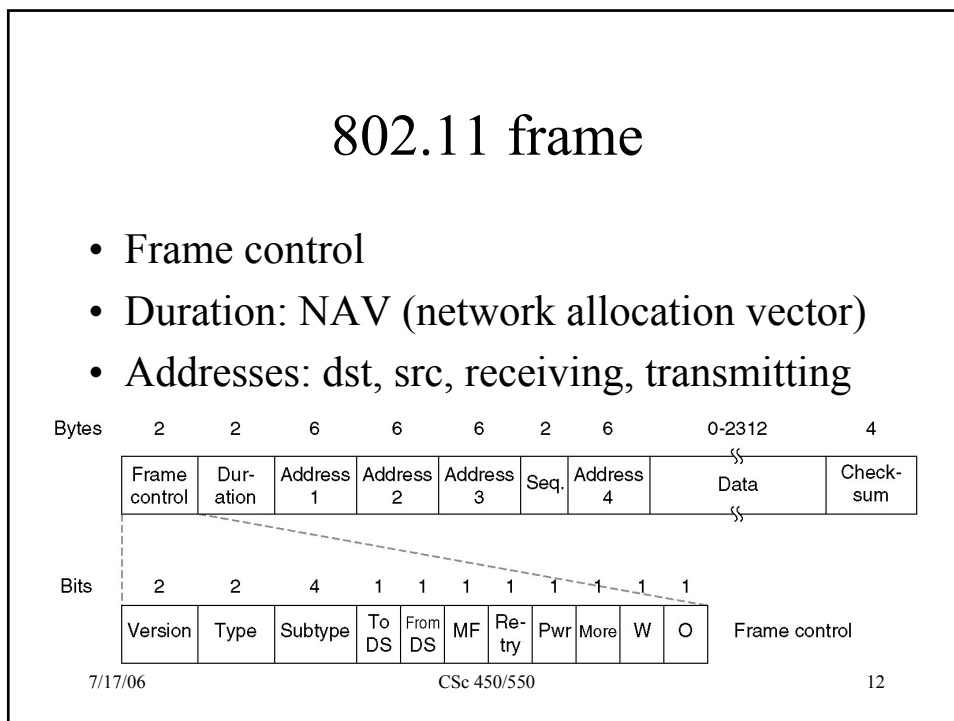
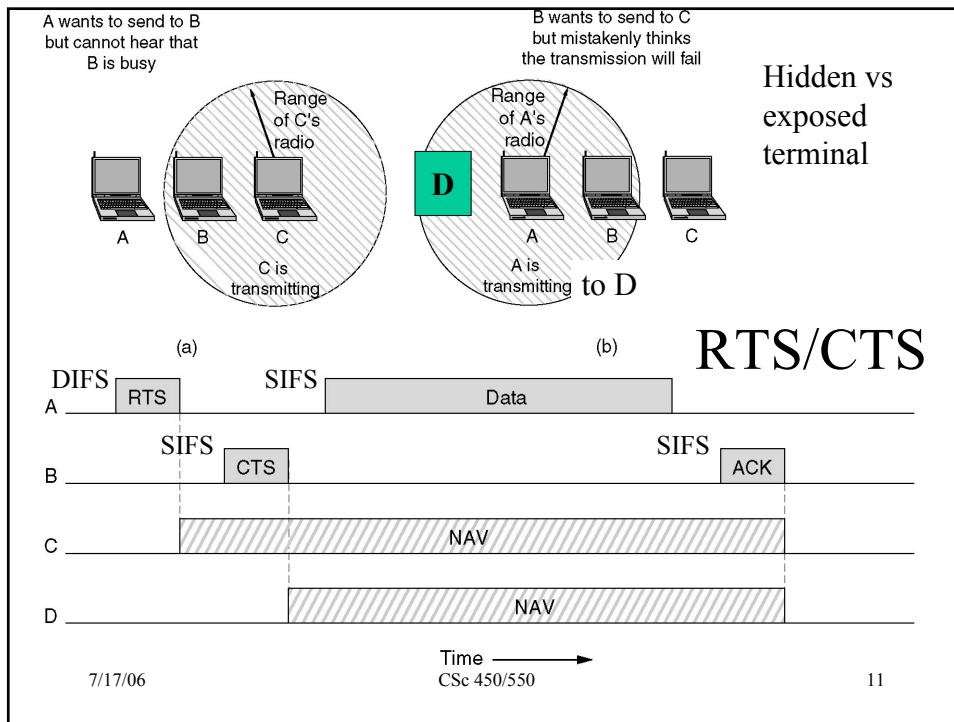
- CSMA
- CA: collision avoidance
 - if idle for DIFS, transmit
 - if busy, random backoff
 - count down when idle
 - transmit when count to 0
 - if no ack, collision or corruption
 - exponential backoff
 - CW: contention window



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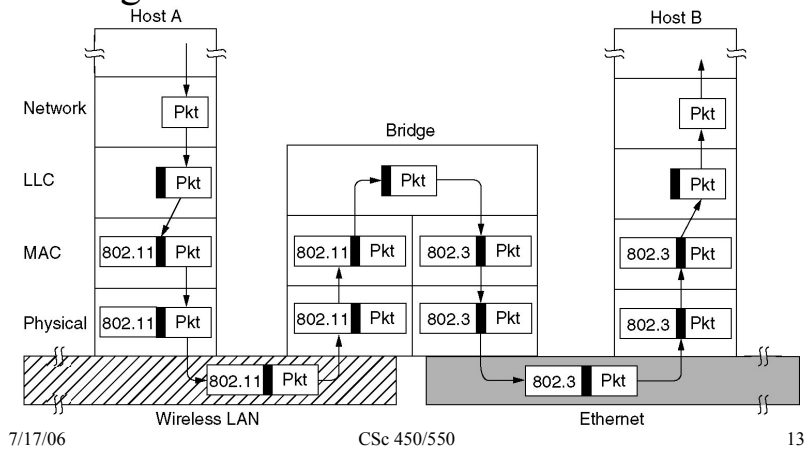
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10



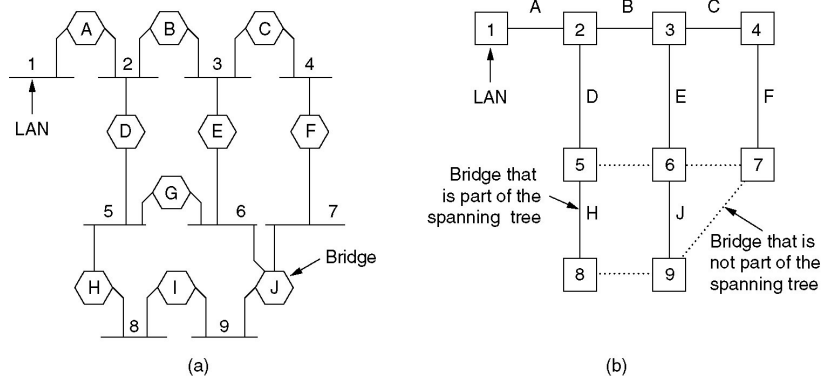
Layer 2 internetworking

- Bridge



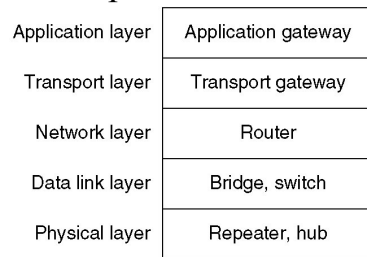
Spanning tree

- A tree of shortest paths

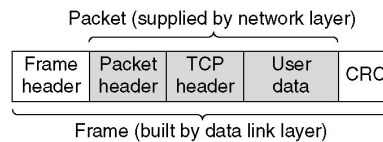


Architecture, again!

- Network architecture
 - services
 - protocols



(a)



(b)

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15

This lecture

- MAC
 - Ethernet
 - Aloha, slotted Aloha
 - CSMA, CSMA/CD
 - 802.11
 - CSMA/CA
 - RTS/CTS
 - internetworking
 - spanning tree

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16