COMPUTER NETWORKS

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Unit – 5 Link Layer and LAN Roadmap

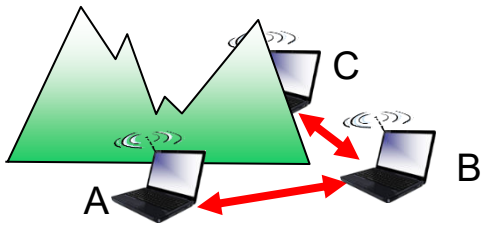
- Introduction
- Error detection, correction
- Multiple access protocols
- LANs
  - Addressing, ARP
  - Ethernet
  - Switches
- A day in the life of a web request
- Physical layer
  - Purpose, Signals to Packets
  - Analog Vs Digital Signals
  - Transmission Media
- Wireless LANs: IEEE 802.11

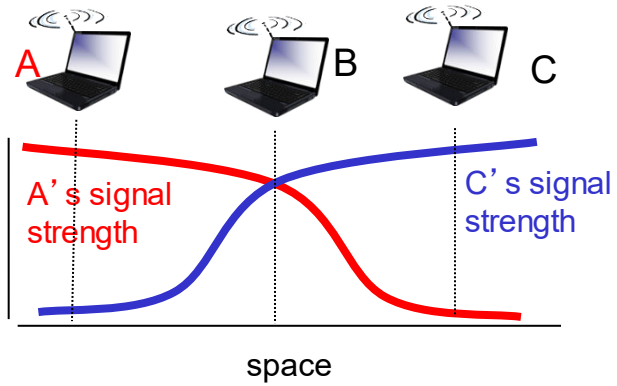
Class 55 : IEEE 802.11- Wireless LAN : Learning Objectives

- MAC Protocol
- Frame Format
- Addressing Mechanism

IEEE 802.11: multiple access

- avoid collisions: 2^+ nodes transmitting at same time
- 802.11: CSMA - sense before transmitting
  - don't collide with detected ongoing transmission by another node
- 802.11: *no* collision detection!
  - difficult to sense collisions: high transmitting signal, weak received signal due to fading
  - can't sense all collisions in any case: hidden terminal, fading
  - goal: *avoid collisions:* CSMA/CollisionAvoidance



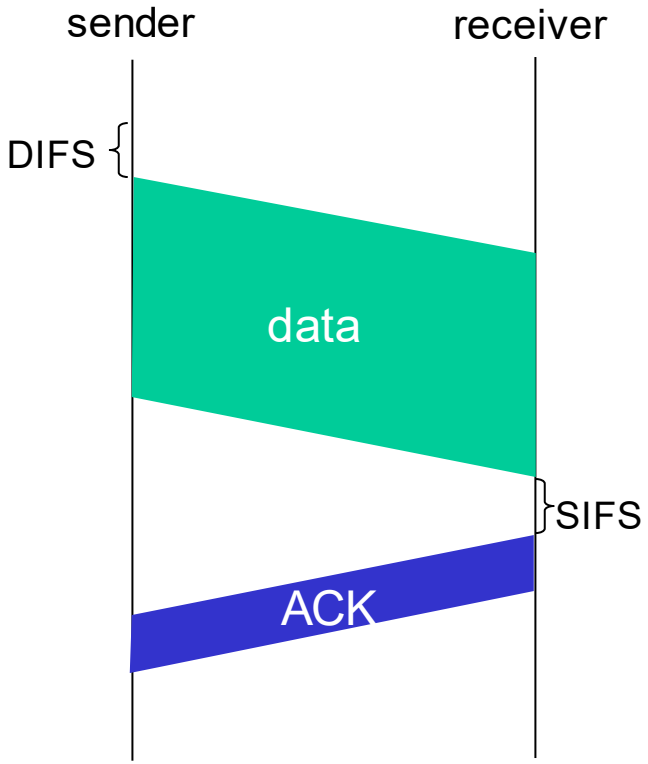


IEEE 802.11 MAC Protocol: CSMA/CA

802.11 sender

1 if sense channel idle for **DIFS** then
transmit entire frame (no CD)

2 if sense channel busy then
start random backoff time
timer counts down while channel idle
transmit when timer expires
if no ACK, increase random backoff interval, repeat 2



802.11 receiver

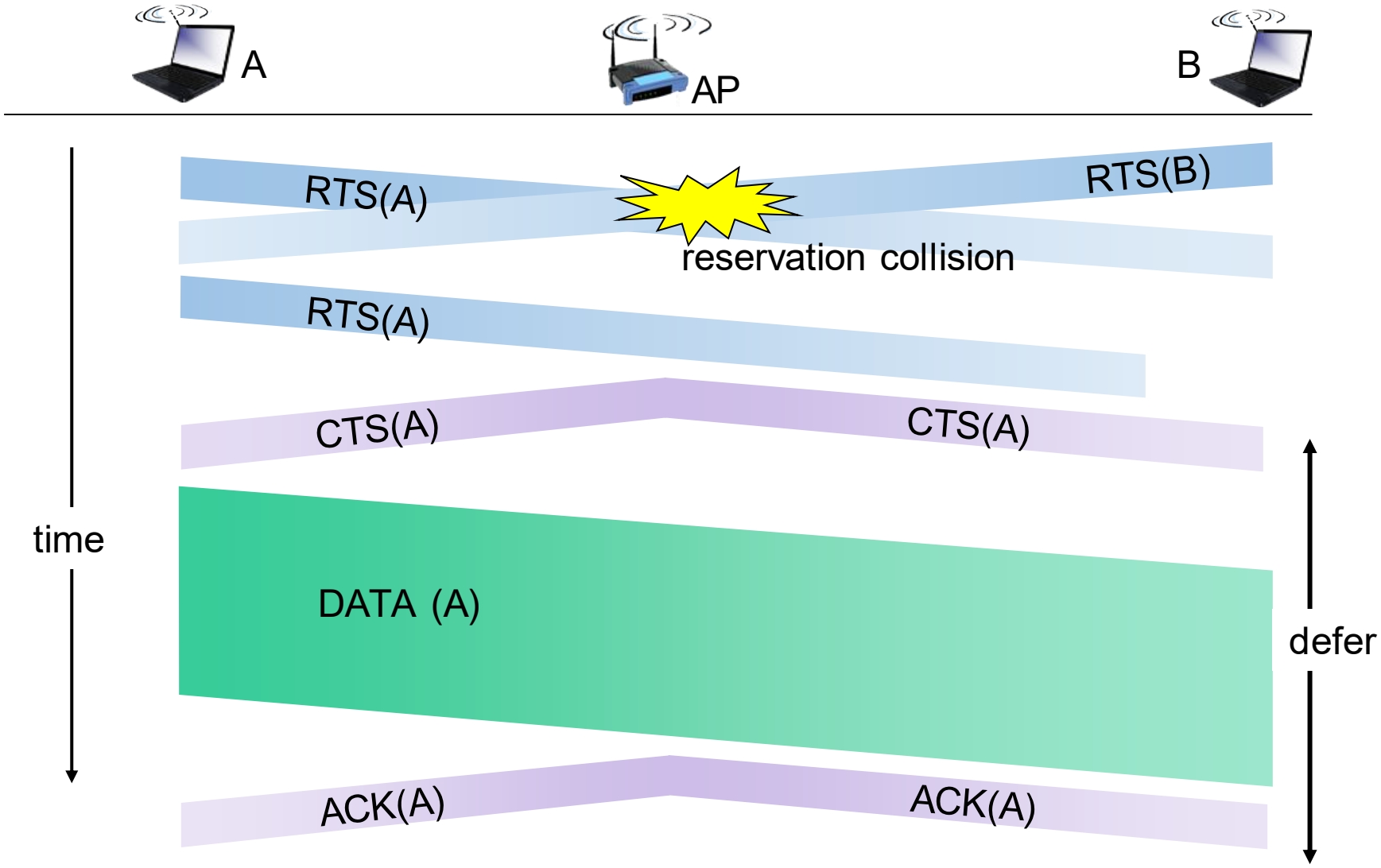
if frame received OK
return ACK after **SIFS** (ACK needed due to hidden terminal problem)

Avoiding Collisions (more)

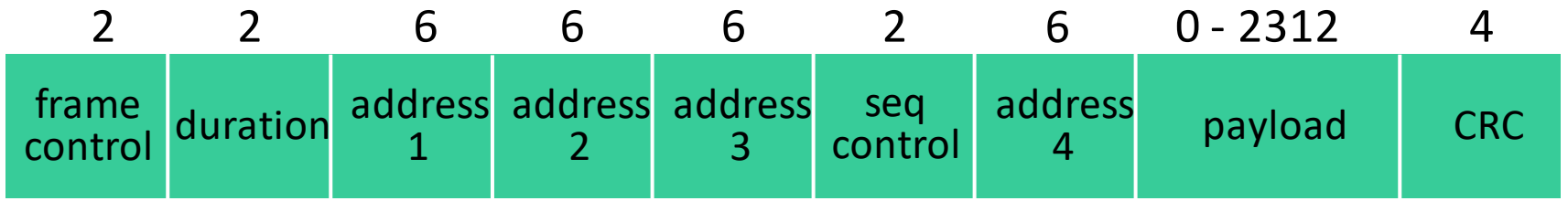
idea: sender "reserves" channel use for data frames using small reservation packets

- sender first transmits *small* request-to-send (RTS) packet to BS using CSMA
  - RTSs may still collide with each other (but they're short)
- BS broadcasts clear-to-send CTS in response to RTS
- CTS heard by all nodes
  - sender transmits data frame
  - other stations defer transmissions

Collision Avoidance: RTS-CTS exchange



802.11 frame: addressing



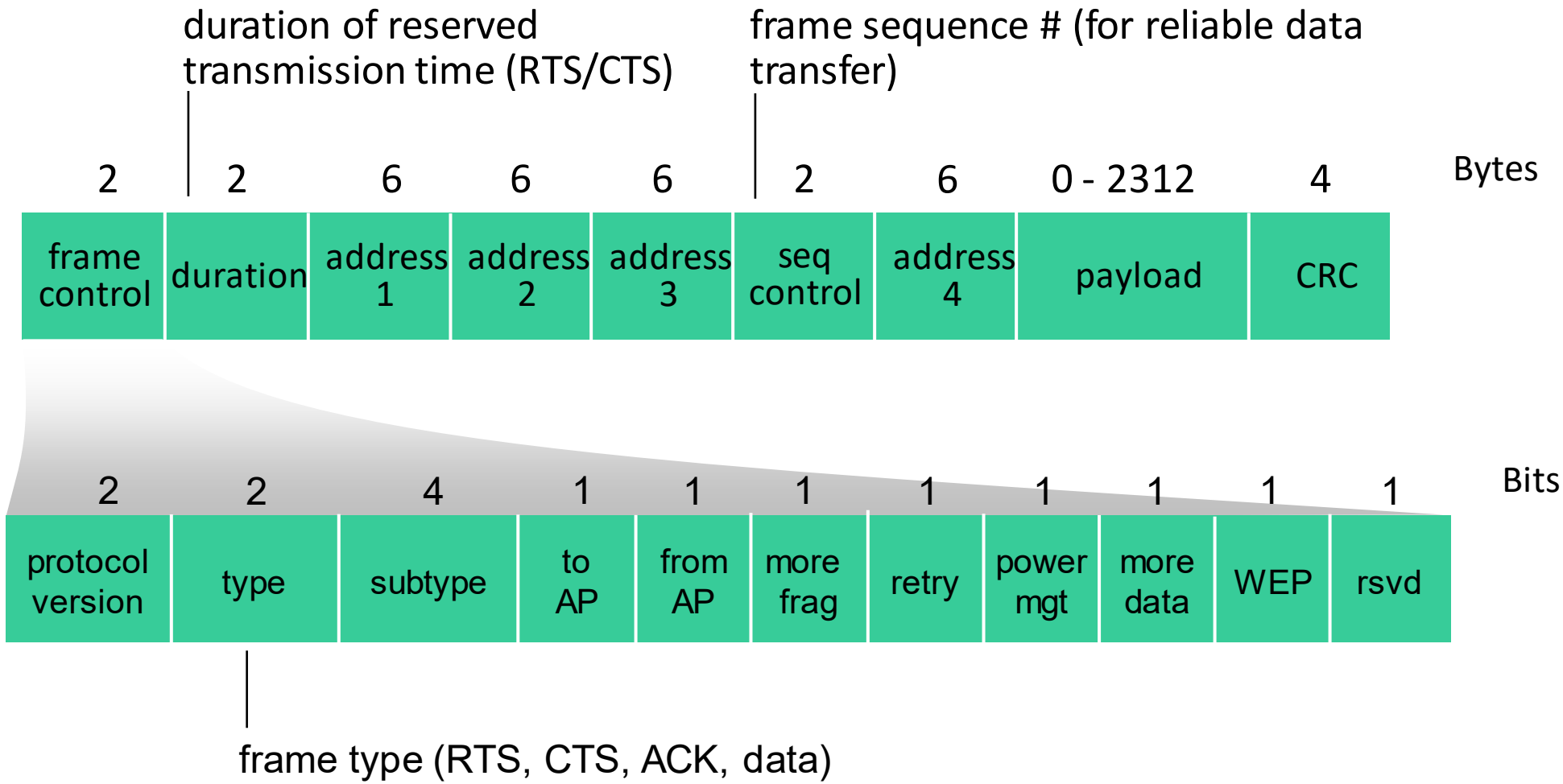
Address 1: MAC address of wireless host or AP to receive this frame

Address 2: MAC address of wireless host or AP transmitting this frame

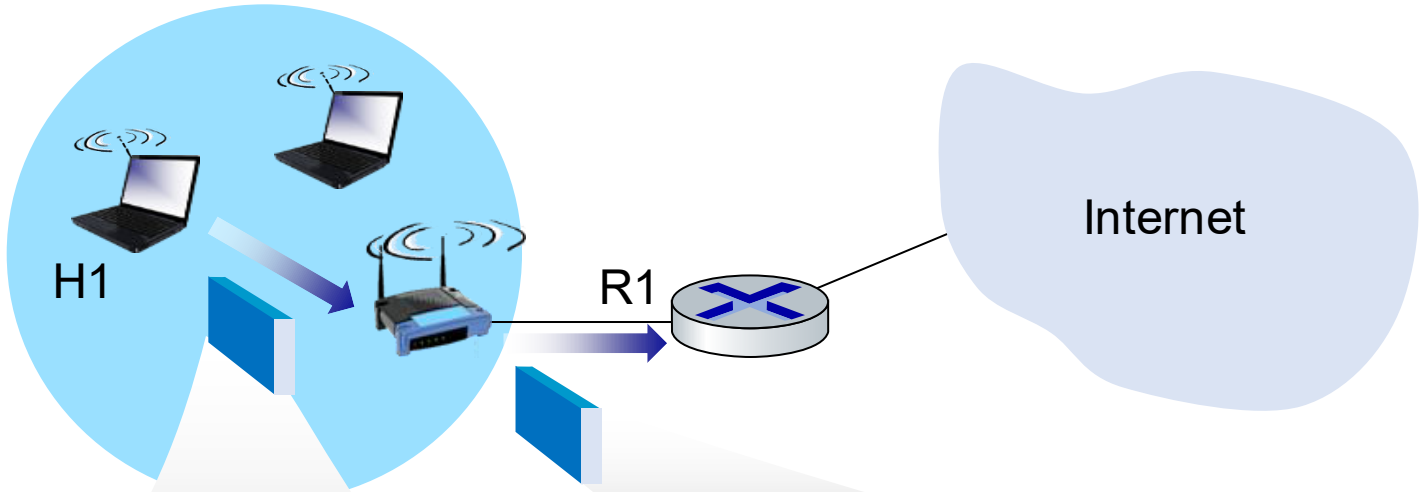
Address 3: MAC address of router interface to which AP is attached

Address 4: used only in ad hoc mode

802.11 frame: addressing



802.11 frame: addressing



802.3 Ethernet frame

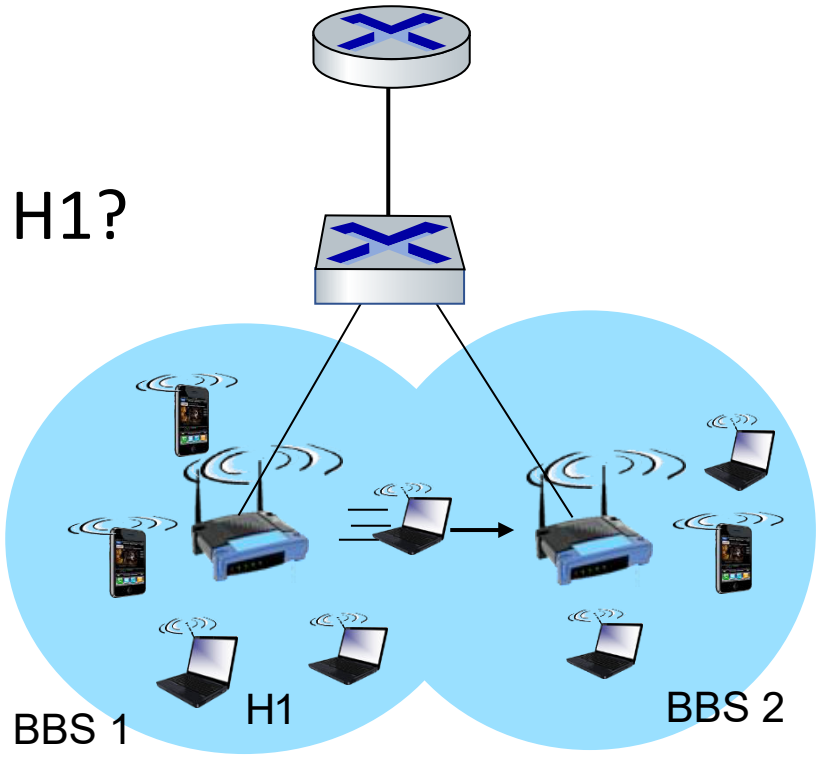
	R1 MAC addr	H1 MAC addr	
	MAC dest addr	MAC source addr	

	AP MAC addr	H1 MAC addr	R1 MAC addr	
	address 1	address 2	address 3	

802.11 WiFi frame

802.11: mobility within same subnet

- H1 remains in same IP subnet: IP address can remain same
- switch: which AP is associated with H1?
  - self-learning : switch will see frame from H1 and “remember” which switch port can be used to reach H1



Suggested Readings

Thank You
For Your Attention

THANK YOU

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