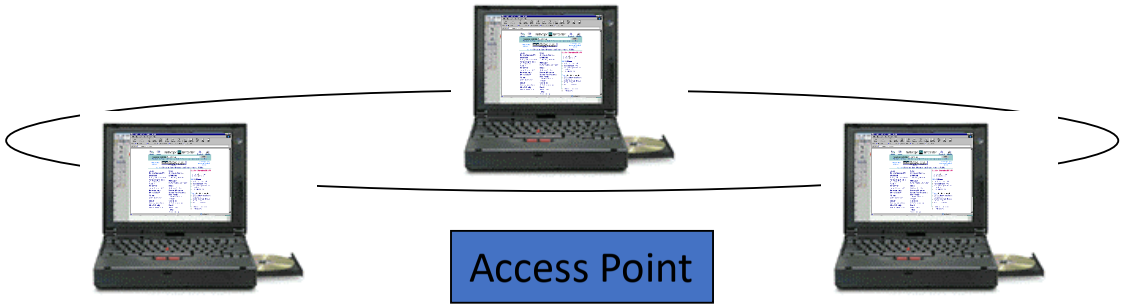
WiFi

802.11 Wireless LANs

- Dominant standard with a many PHY/MAC options/features



- Wireless plus wired infrastructure

WiFi uses CSMA/CA

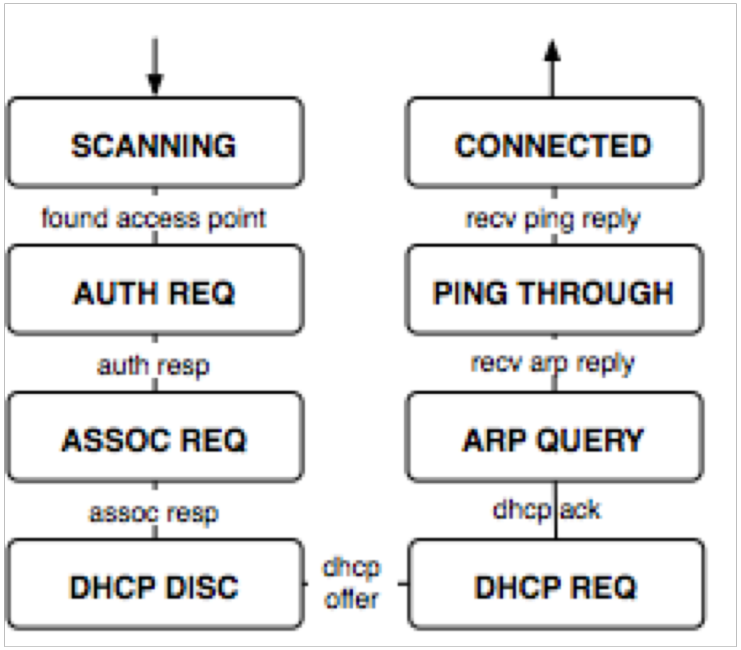
- Carrier Sensing Multiple Access/ Collision Avoidance

- We'll first look at how WiFi works and then discuss CSMA/CA

How does WiFi operate?

- WiFi usually works in infrastructure mode.
  - WiFi node scans for APs in different channels
  - (WiFi AP can send data is several channels)
  - When WiFi detects AP
    - It sends an authorization request
    - It then associates with the AP
    - Then WiFi can start sending data to the AP

Steps involved in establishing connection



802.11 in ad hoc mode

- Connectivity between WiFi devices, no AP
  - Why do want to do this?
  - Example, WiFi-Direct.

802.3 vs. 802.11

- Ethernet has one shared collision domain
  - All hosts on a LAN can observe all transmissions
- Wireless radios have smaller range compared to overall system
  - Collisions are local
  - Collision are at the receiver, not the sender

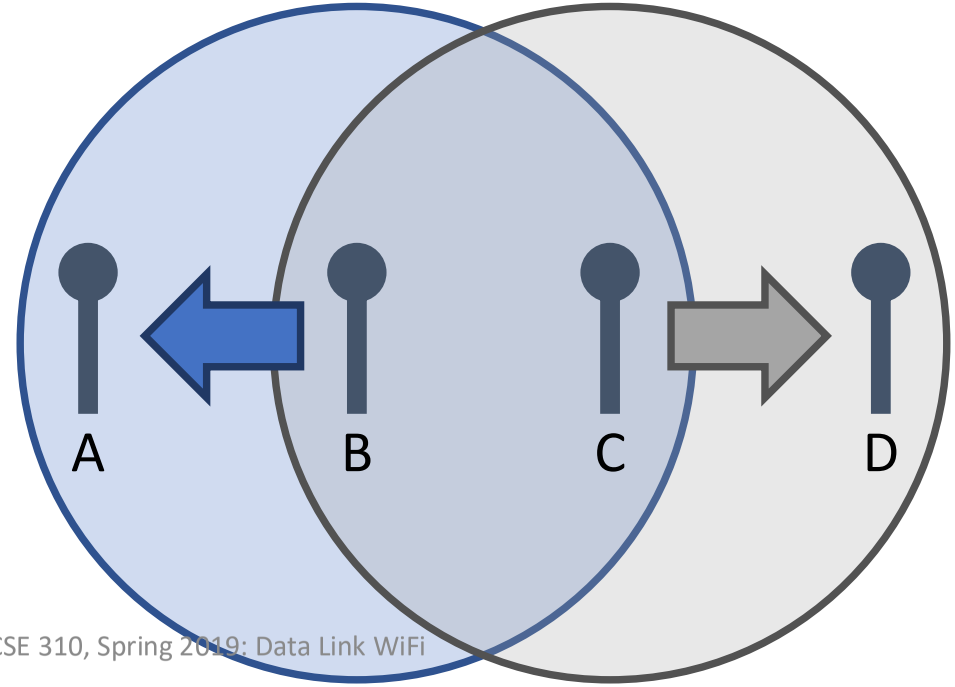
Carrier sensing in WiFi

- 802.11 uses CSMA/CA not CSMA/CD
  - Collision avoidance, rather than collision detection

- High level problem: reachability is not symmetric

Reachability in Wireless

- Just because A can reach B, and B can reach C, doesn't mean A can reach C
- This means collision cannot be detected at the receiver

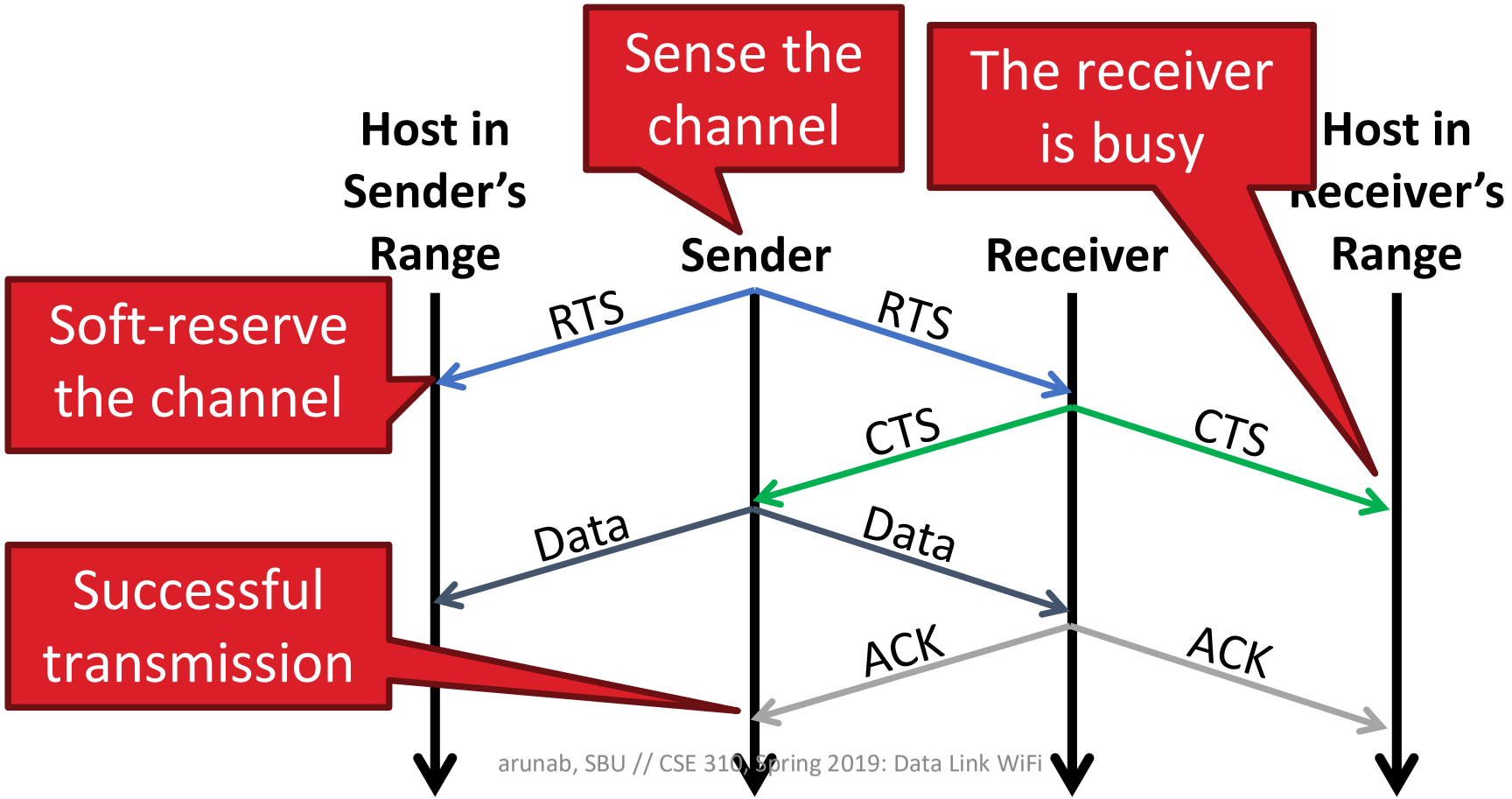


802.11 uses RTS/CTS for CSMA/CA

- To sense the channel, send a Request to Send (RTS)
- If the receiver receives the RTS and can allow transmission, it sends a Clear to Send (CTS)
- All senders/receivers with the RTS/CTS range of the sender/receiver refrain from sending.

CSMA/CA

- **M**ultiple **A**ccess with **C**ollision **A**voidance



Collisions in CSMA/CA

- What if sender does not receive CTS or ACK?
  - Assume collision
  - Enter exponential backoff mode

WiFi standardization

- Alphabet soup
- 802.11b, a, n, ac, p, ….

801.11 is Complicated

- We've only scratched the surface of 802.11
  - Variable sending rates to combat noisy channels
  - Mesh networks and mesh routing
  - Power saving optimizations
    - How do you sleep and also guarantee no lost messages?
  - Security and encryption (WEP, WAP, 802.11x)
- This is why there are courses on wireless networking