Study guide terms

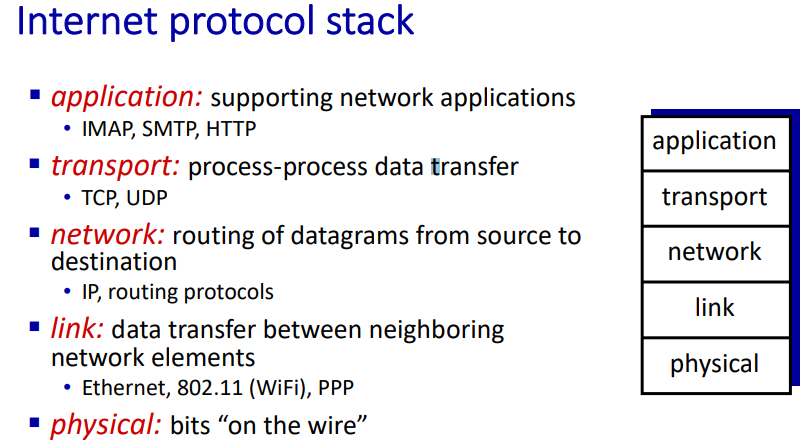
- KNOW - highest level

- UNDERSTAND - don’t need to know specifics, but understand how the pieces come together

- BE FAMILIAR WITH - lowest; just know the idea behind a word

## Computer Networks and the Internet

- Know the networking stack

****

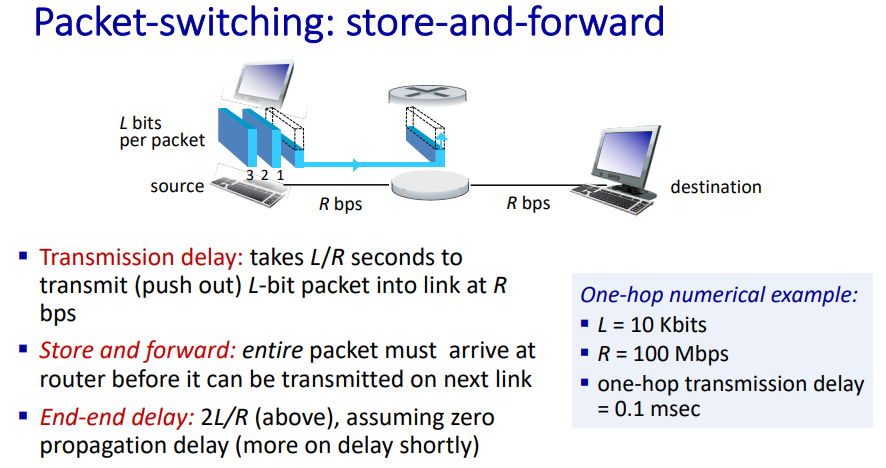
- Be familiar with how routers work

**Packet switches: forward**

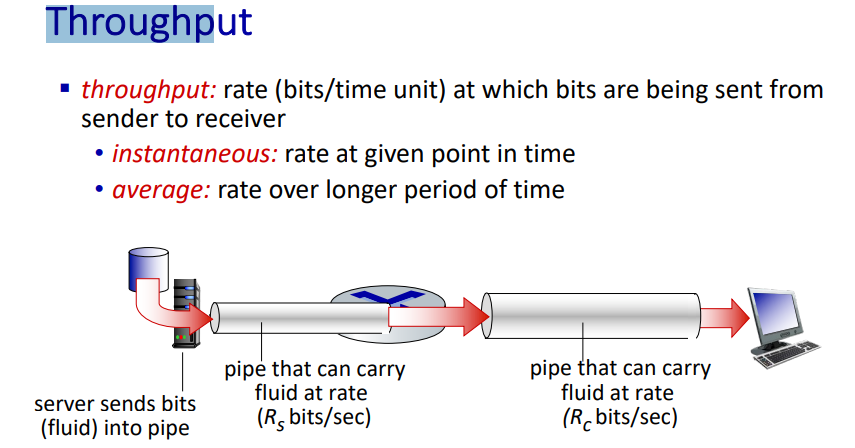
**packets (chunks of data)**

**§ routers, switches**

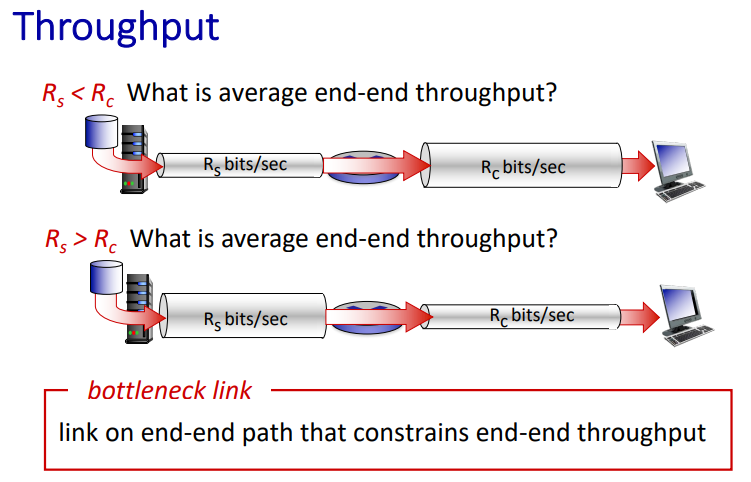
- Understand the different components of end-to-end delay of a packet



- Know how to calculate end-to-end delay



- Know how to calculate throughput and when a bottle neck occurs



## Application Layer

- Know what services the application layer provides

**Web and HTTP**

**§ E-mail, SMTP, IMAP**

**§ The Domain Name System**

**DNS**

**§ P2P applications**

**§ video streaming and content**

**distribution networks**

**§ socket programming with**

**UDP and TCP**

- Know the specifics of HTTP

**Uses TCP, stateless(no past client request info)**

**Persistent and Non-Persistent**

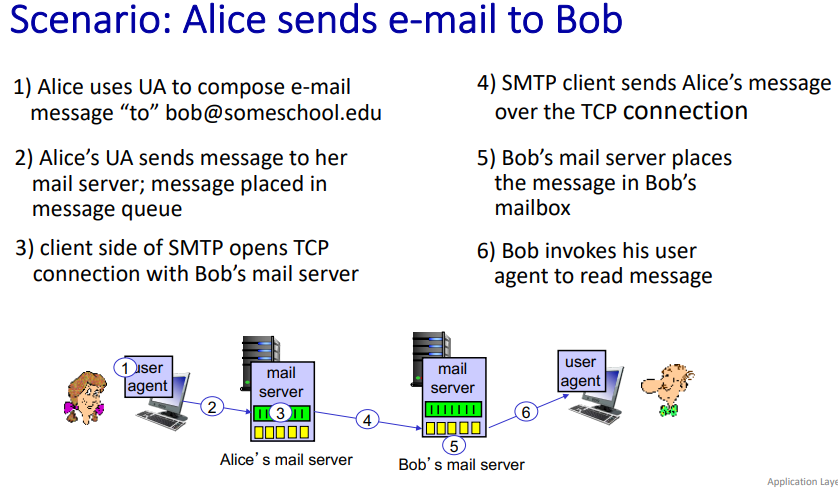
**two types of HTTP messages: request, response**

**Post, head, put, get**

**Non-persistent HTTP response time = 2RTT+ file transmission time**

- Understand how SMTP works

**simple mail transfer protocol:**

****

- Know what services DNS provides and how it works

**Domain Name System**

**query and reply**

**implemented as application-layer protocol**

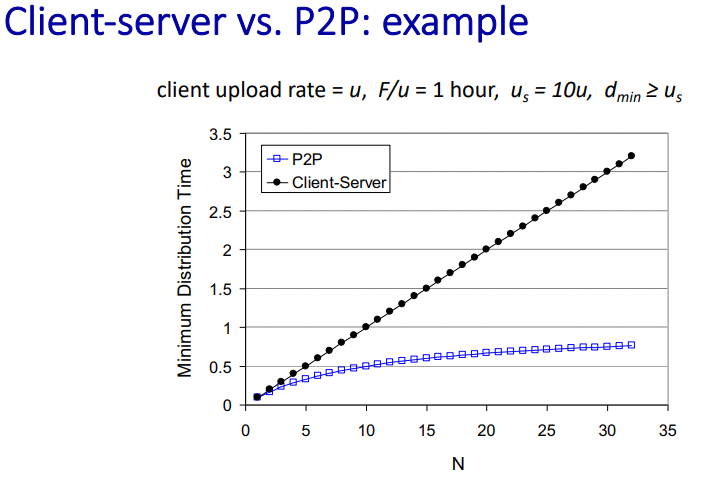
- Understand how P2P networks work and why they are better than regular networks for certain tasks

**self scalability – new peers bring new service capacity, and new service demands**

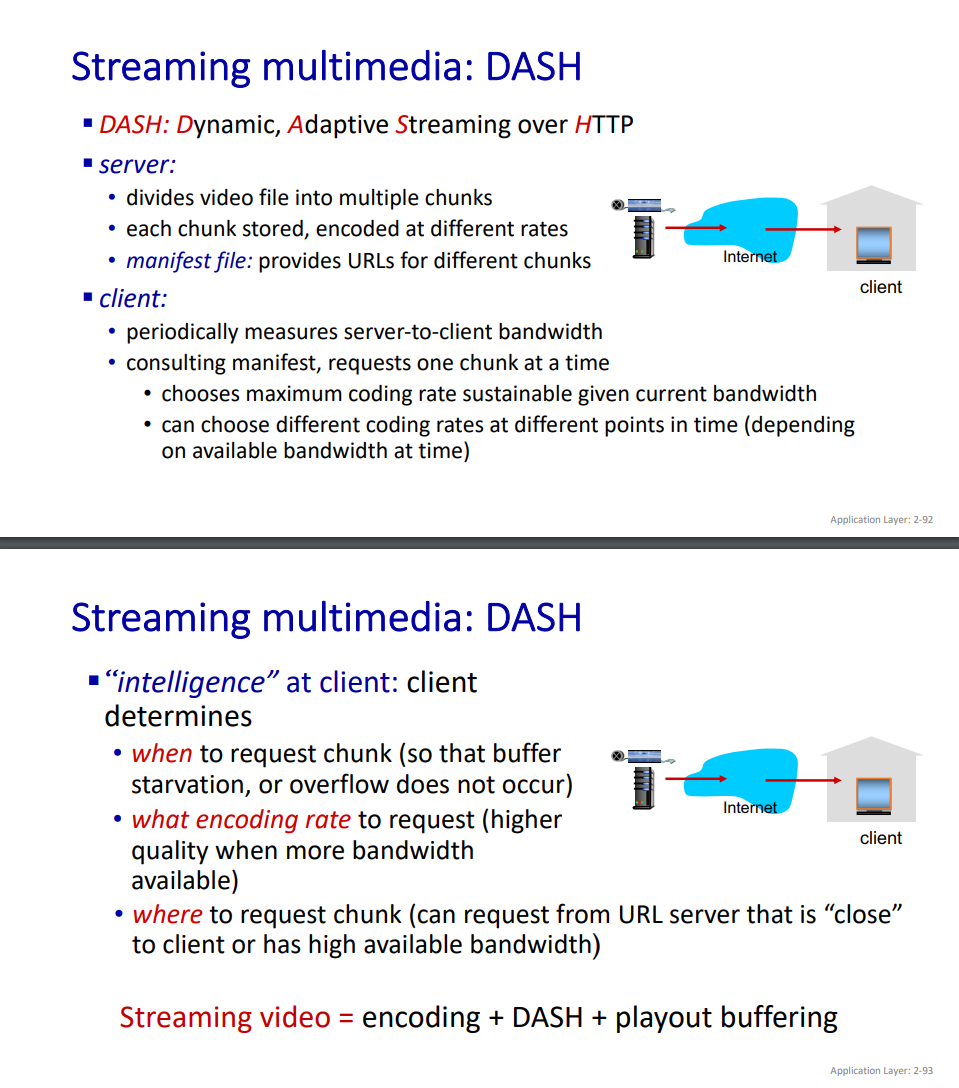
**no always-on server**

**time to send one copy: F/us •**

**time to send N copies: NF/us**

****

- Understand how HTTP streaming and DASH work



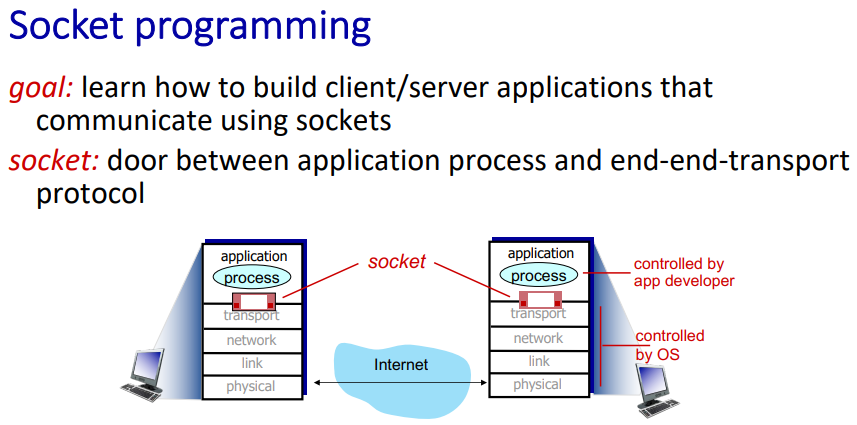
- Know about CDNs

**content distribution networks**

**distributed, application-level infrastructure**

**constant(SBR) vs variable(VBR) bit rate**

- Know about socket programming



- Know what services TCP and UDP provide

**UDP: unreliable datagram**

**TCP: reliable, byte stream-oriented**

## Transport Layer

- Know what services the transport layer provides

- Understand multiplexing and demultiplexing

- Know the specifics of UDP

- Understand the principles of reliable data transfers

- Know the services TCP provides and what the services mean

- Understand the TCP segment structure

- Understand how TCP calculates its timeout value

- Understand how TCP achieves reliable data transfer

- Know TCP fast retransmit

- Understand what flow control is and know how TCP deals with it

- Know how TCP sets up a connect and why it is designed like that

- Understand what causes congestion

- Understand the principles of congestion control

- Know AIMD

- Know how TCP deals with congestion control

- Understand TCP fairness

## Network Layer

- Know the services that the network layer provides

- Understand the difference between data plane and control plane

- Be familiar with longest prefix matching

- Know the IPv4 header fields

- Understand how IP addresses work

- Understand how DHCP works

- Know how NATing works

- Be familiar with IPv6

- Be familiar with different routing approaches

## Link Layer

- Understand the services the link layer provides

- Know the different multiple access protocols and their pros/cons

- Know how ARP works

- Be familiar with Ethernet header

- Understand the differences between switches and routers

## Concurrency

- Understand the differences between processes, threads, and micro-threads

- Know some of the pitfalls of dealing with shared memory

**What if two threads are writing to one memory location at once?**

**• Atomic operations**

**• Synchronization techniques**

**• Locks/Mutex**

**• Semaphore**

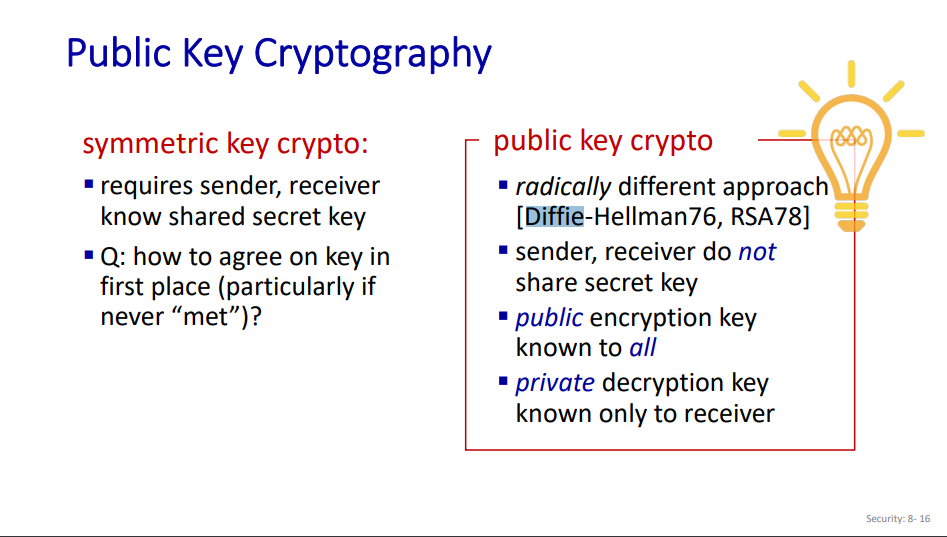
**• Message Queue**

## Security

- Know different principles of network security and how they are different

- Understand symmetric key encryption, public/private key encryption and how they are different

- Understand the Diffie-Hellman algorithm



- Know the necessary ingredients for proper authentication

**Public Key, Private Key, Nonce, Hash, Seq num**

- Understand digital signatures and what benefits they provide

- Understand how to provide message integrity

- Be familiar with hashing

- Be familiar with how TLS works

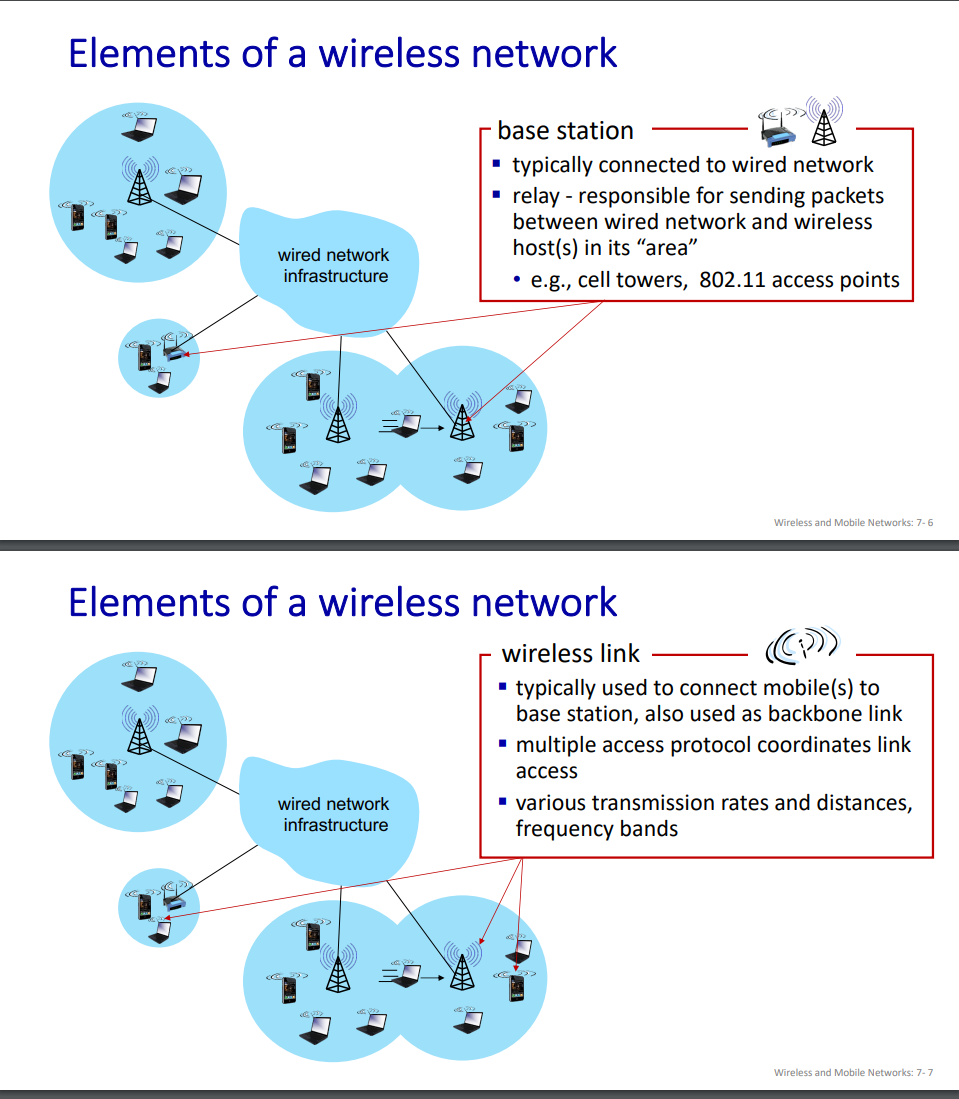
- Understand what services TLS provides

- Understand the difference between TLS and VPNs

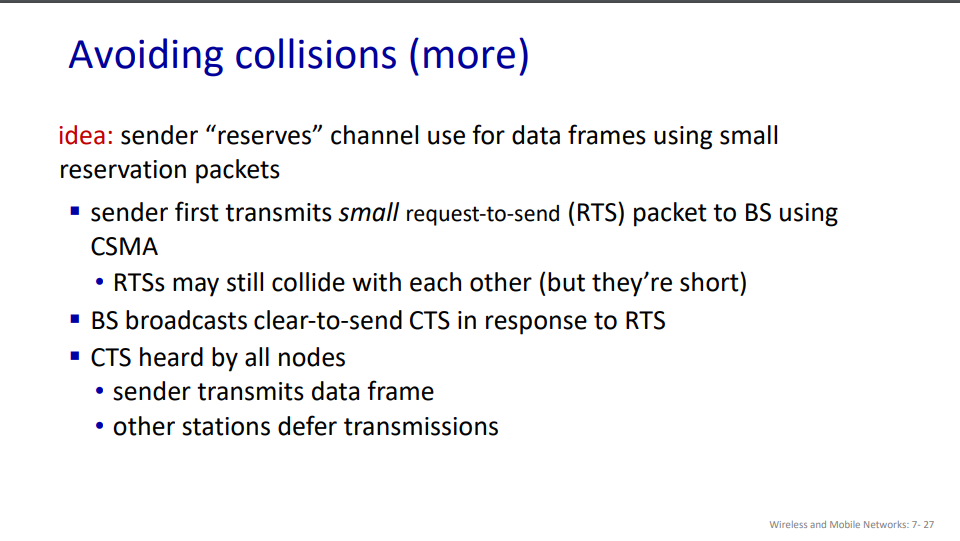
## Wireless

- Know the challenges associated with wireless networks, compared to wired networks

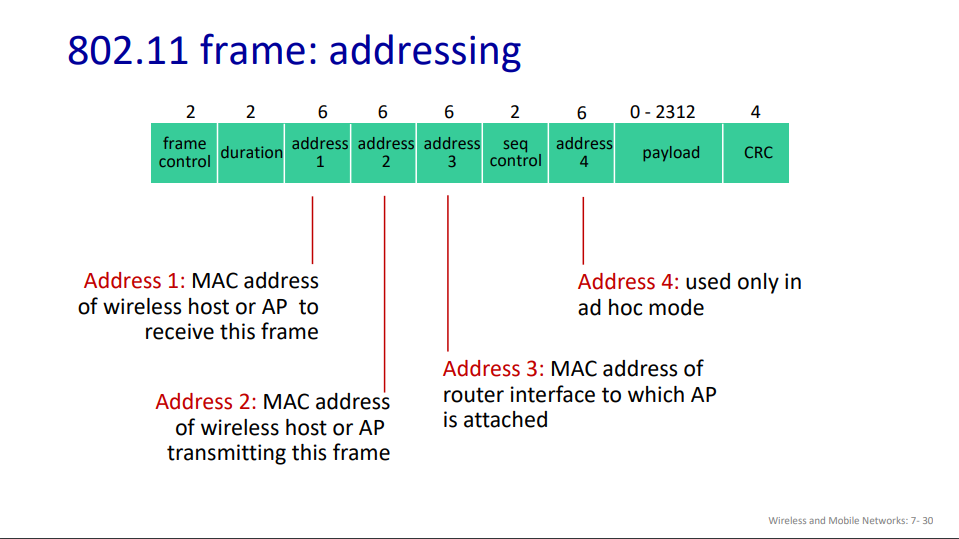
- Understand how stations associate with access points



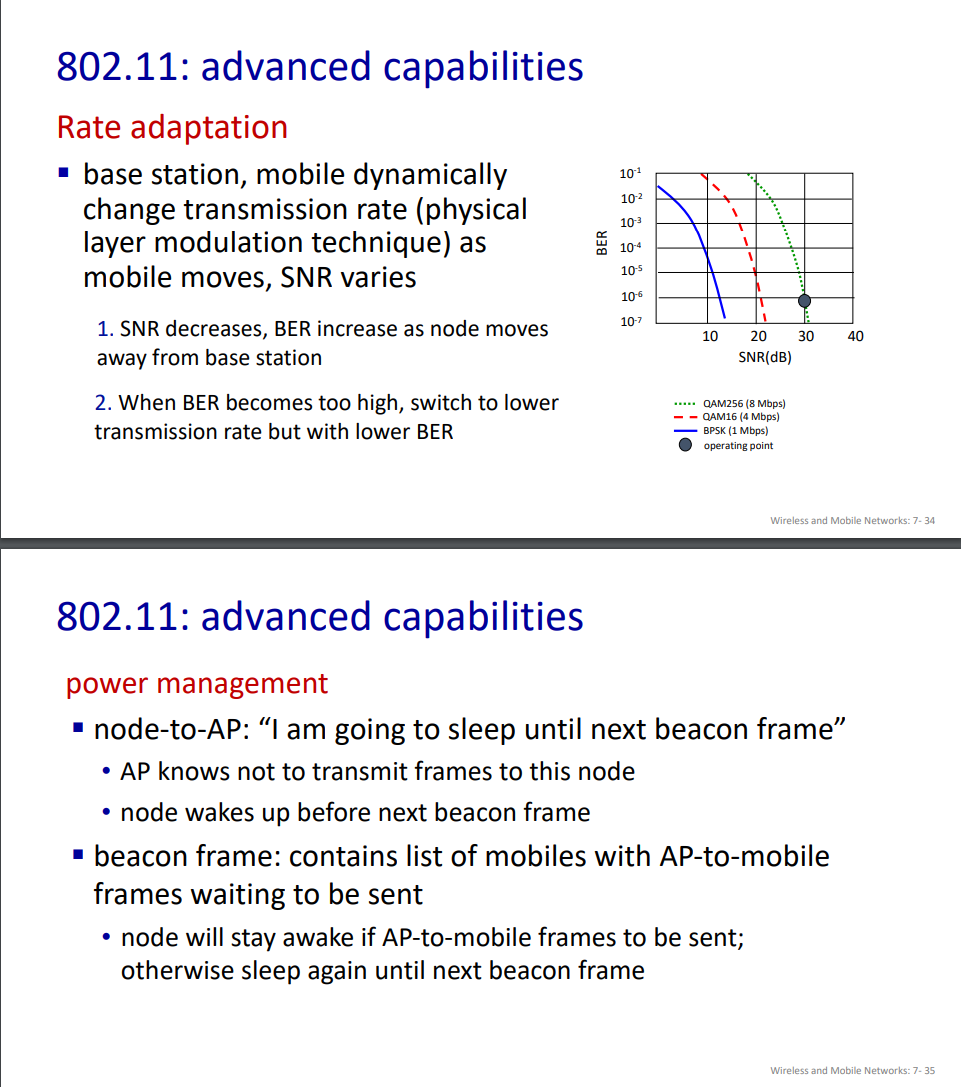
- Understand the way 802.11 avoids collisions



- Be familiar with the 802.11 header



- Be familiar with 802.11's advanced capabilities



- Be familiar with the trade-offs made by various wireless protocols

