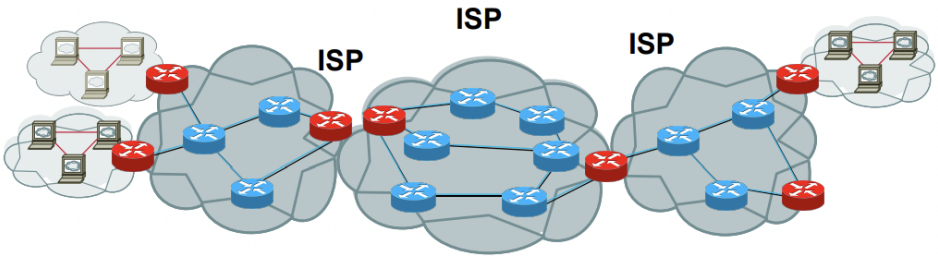
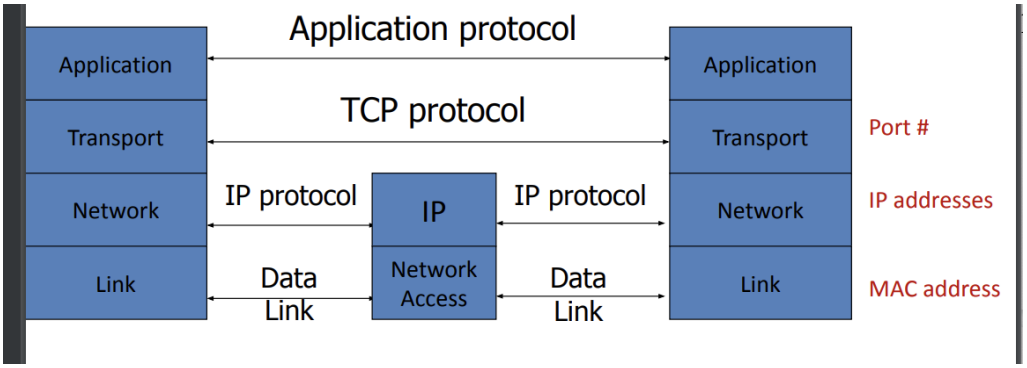
CAS CS 357

InClass Note 17

1. Diagram
   a. 

   b. AS autonomous system → big networks that make up the internet (large network or group of networks that has unified routing policy)
   c. BGP (Border Gateway Protocol) → routing protocol for internet
   d. Each of the internets are autonomous to each other
   e. Blue, red icons → routers
   f. Routers make decision on where to send the data once it receives them (send it to other router)
   g. Decisions on where to send the data are made by using routing protocols
   h. Every information on internet is divided into many pieces and are combined into packages
   i. TCP (end to end protocol → run from client to server) → makes sure that the packages arrive at the destination in order (send the data through TCP)
   j. DNS is what maps urls to ips
2. TCP Protocol Stack

a. 

b. Application → HTTP

c. Underneath application/above Transport → TLS

d. Transport → TCP

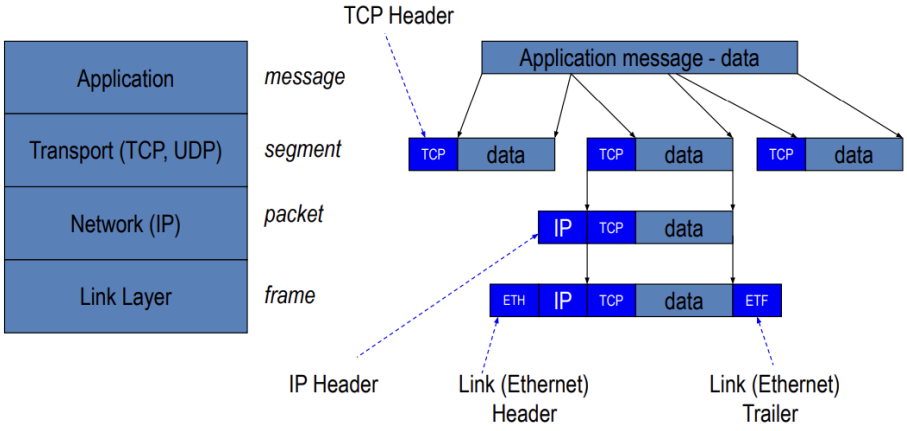
e. Network → IP

f. Network Access → routers

g. Link → Ethernet

h. Port # (layer 4), IP address (layer 3), MAC address (layer 2)

3. Data Formats

a. 

b. Application message - data → HTTP message (the HTTP message is encrypted)

c. Break the data into pieces (3 pieces in this case)

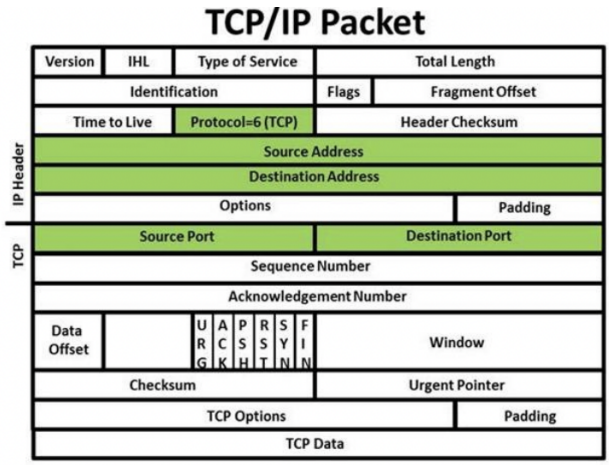
d. Give each data a TCP header

e. Give each data an IP header

f. Give each data Link Header and Link Trailer

g. This is how the message gets sent over the internet

4. TCP/IP Packet

a. 

b. There are two headers → IP header and TCP header

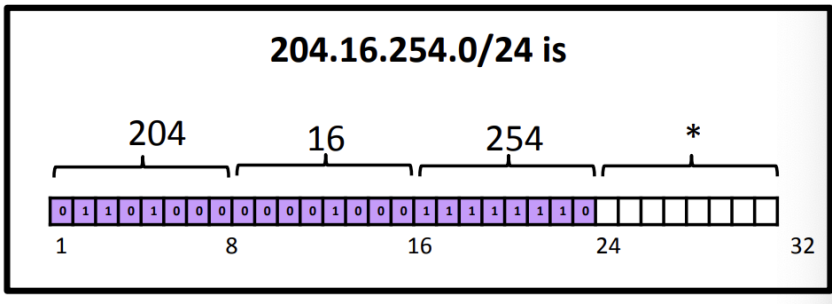
c. IP header has information following:

- Destination address → Destination IP (when sending information to an address, set their packages to the destination IP)
- Source Address → the IP address of the sender of the packages
- Protocols → the specific method to deliver information (is it using TCP? UDP? Or etc) → not all information goes through TCP but other methods exist

d. Data → TCP Data is data

e. Destination Address → Destination IP (when sending from information to an address, people set their packages to the destination IP)

5. IP Prefixes & Addresses

a. 

b. Every IP Address ranges from 0.0.0.0 to 255.255.255.255 → there are 2^32 total addresses

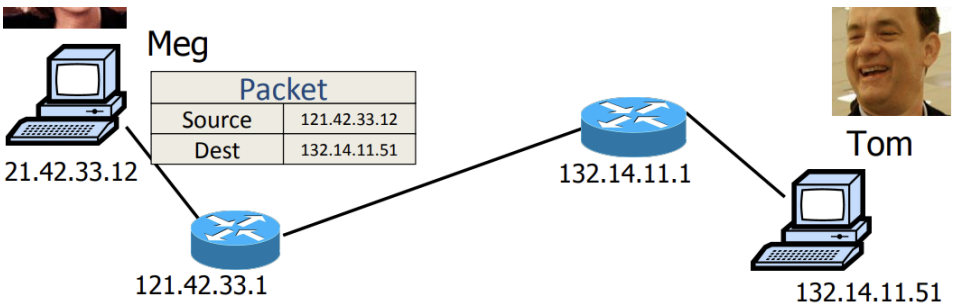
c. Each position of the IP are 8 bits

d. The example above is "slash 24" → refers to how many bits are contained in the network (leaves 32-24 = 8 bits to contain host address)

e. How many addresses are there in "slash 24"? → 2^(32-24) = 2^8 = 255

f. How many addresses are there in "slash 8"? → 2^(32-8) = 2^24 → huge number

6. IP Packet Forwarding

a. 

ROUTING TABLE	
Destination Prefix	Next Hop IP
132.14.0.0/16	132.14.11.1
132.0.0.0/8	13.23.45.55

b. Source IP → Meg's computer

c. Destination IP → Tom's computer

d. When packet hits the router 121.42.33.1, it consults the routing table and decides where to send the packet

e. The routing table includes destination prefix and Next Hop IP address
f. When sent the destination IP to the router, we choose the most specific subset of the IP address and sent it to accordingly to the next router
g. If routing table is attacked → the information might never arrive to the destination or might arrive at the wrong destination (to the adversary)