CSET 2200 - Lecture 6

Layer 3 - IPv4

Review/Questions

Moving up the stack

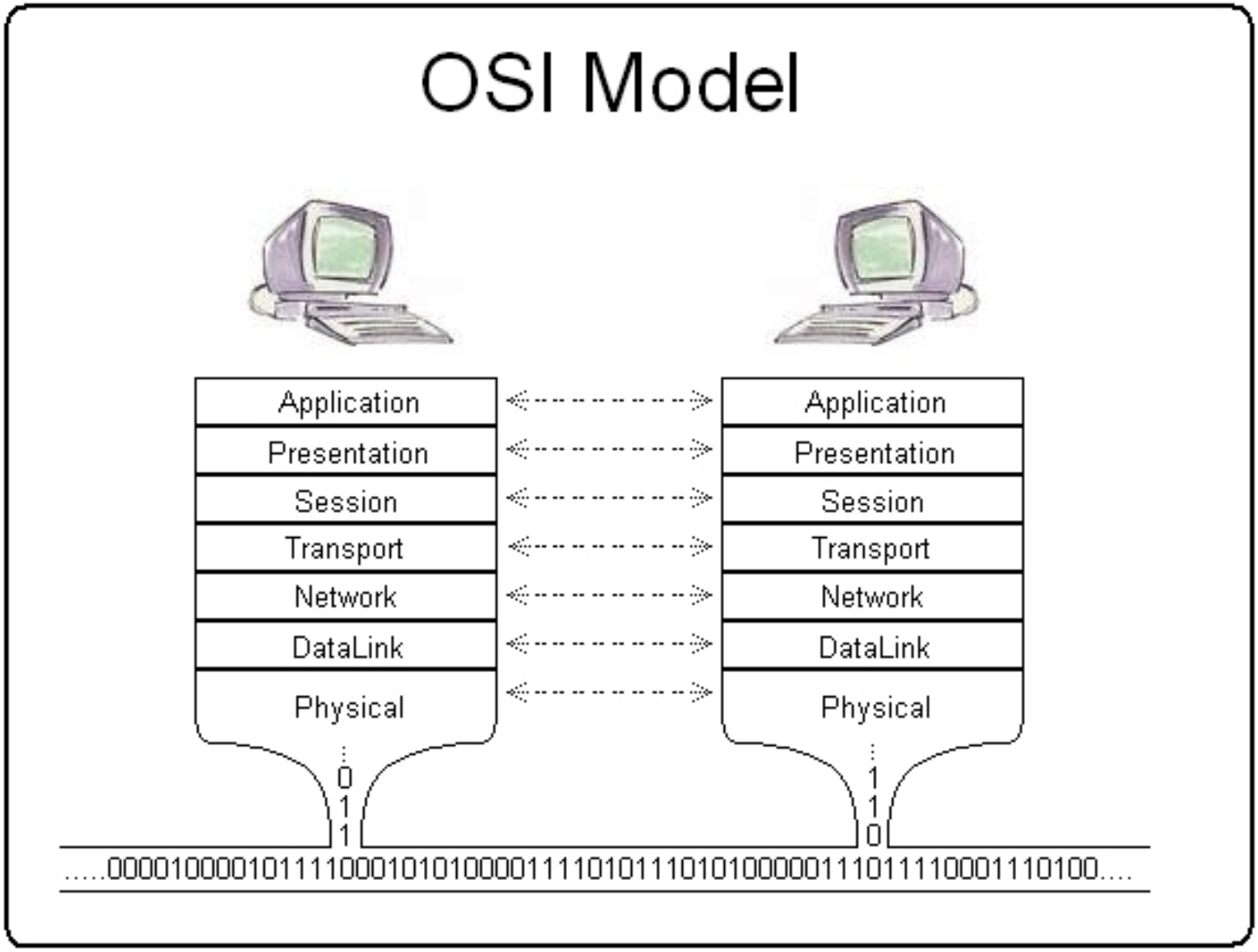

Figure 1: OSI Model

Moving up the stack

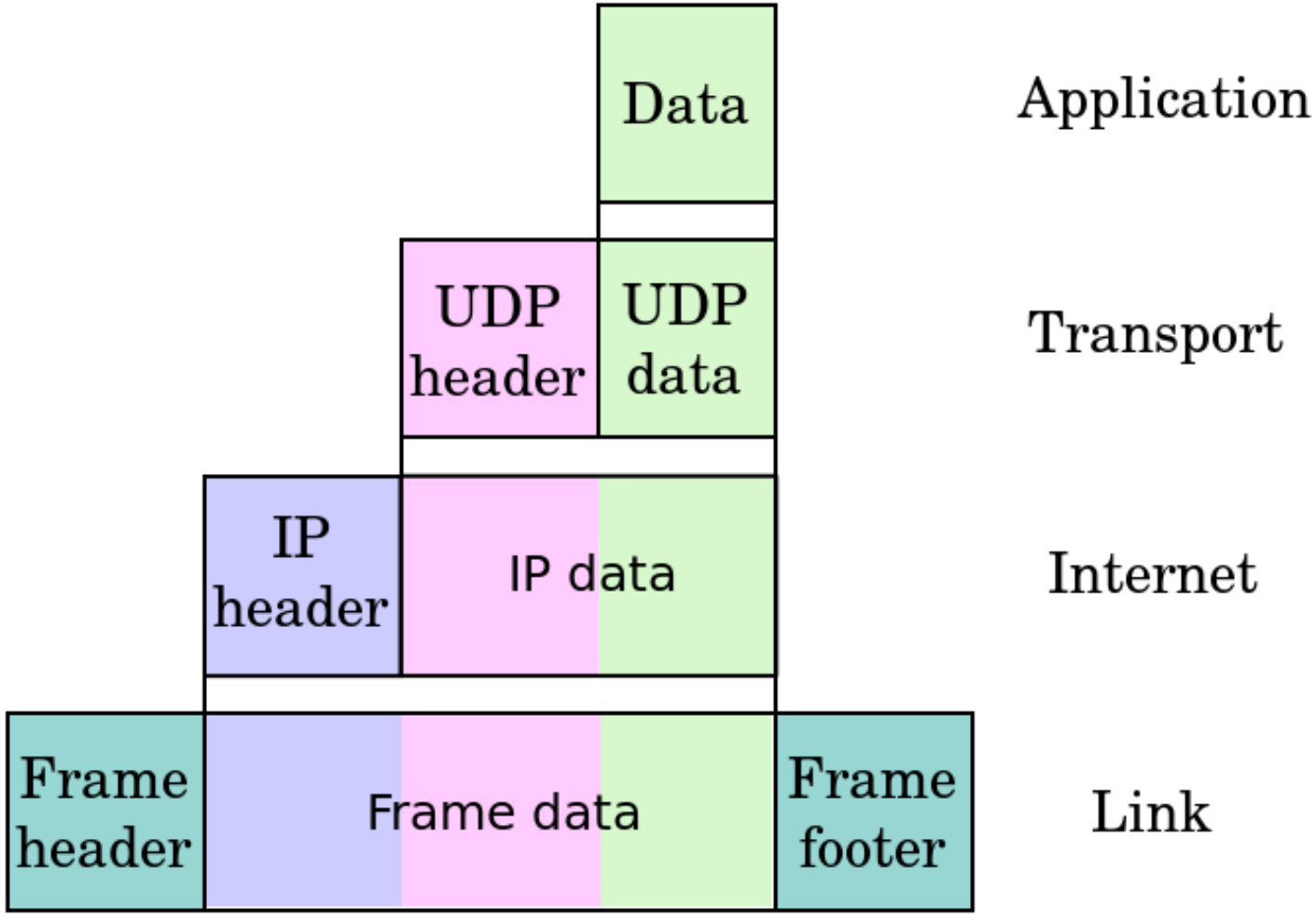

Figure 2: IP Model

Why do we need Layer 3

- Aggregation
- Decouple hardware from address

IPv4

- One of many Layer 3 protocols
- Main focus of this class
- Base layer of TCP/IP
- PDU called Packet

IPv4 (contd)

- Connectionless
- Best effort delivery
- Unreliable
- Layer 4 deals wth some of this

Packet consists of Header and Data

- Headers get much more complicated
- Contain address and other data

IPv4 Addresses

- 32 bit
- Normally written as “dotted quad” - a.b.c.d
- Allocated by IANA (Internet Assigned Numbers Authority)

IPv4 Addresses (contd)

- Address divided into hosts and network
- Multiple “networks” each containing given “hosts”
- Each network present on a logical layer 2 network

IPv4 Addresses (contd)

- Network size varies
- Originally varied based on multiple classes

Network Classes

- Originally 5 classses
- labelled A-E
- Only A-C used in practice, with D being Multicast

Quick binary refresher

- Binary 0 and 1
- Multiple bits into bytes
- We'll write least significant on right

Binary bits

- 128 64 32 16 8 4 2 1

Binary bits

- 128 64 32 16 8 4 2 1
- 1 1 0 0 0 0 0 1

Binary bits

- 128 64 32 16 8 4 2 1
- 1 1 0 0 0 0 0 1
- $128 + 64 + 1$

Binary bits

- 128 64 32 16 8 4 2 1
- 1 1 0 0 0 0 0 1
- $128 + 64 + 1$
- 193

Class A Network

- Addresses start with 0xxxxxxx
- 0.0.0.0 - 127.255.255.255
- 128 networks
- 2^24 hosts (16777216) per network

Class B Network

- Addresses start with 10xxxxxx
- 128.0.0.0 - 191.255.255.255
- 16384 networks
- 2^16 hosts (65536) per network

Class C Network

- Addresses start with 110xxxxx
- 192.0.0.0 - 223.255.255.255
- 2^21 networks (2097152)
- 256 hosts per network

Class D Network

- Addresses start with 1110xxxx
- 224.0.0.0 - 239.255.255.255
- Multicast

Class E Network

- Addresses start with 1111xxx
- 240.0.0.0 - 255.255.255.255
- Experimental

Reserved Addresses

- 0.0.0.0/8 - Current Network
- 10.0.0.0/8 - Private Network (RFC1918)
- 127.0.0.0/8 - Loopback
- 169.254.0.0/16 - Link-Local
- 172.16.0.0/12 - Private Network (RFC1918)
- 192.168.0.0/16 - Private Network (RFC1918)

Other address info

- First usable typically network
- Last is broadcast
- We'll get to the current way addresses assigned soon

Questions

Next class

- More IP subnetting
- Basic Routing
- https://en.wikipedia.org/wiki/Classless_Inter-Domain_Routing
- Book chapter 21