

# CSET 2200 Lecture 11

# Questions

# Summary of TCP

AKA - What you actually need to remember

- ▶ Stream Oriented
- ▶ Reliable
  - ▶ In order delivery
  - ▶ Error Handling
- ▶ Provides Virtual Circuits
- ▶ Multiplexed

# Summary of TCP

- ▶ Three Way Handshake initiates
  - ▶ SYN
  - ▶ SYN/ACK
  - ▶ ACK
- ▶ Four Way connection teardown
  - ▶ FIN
  - ▶ ACK
  - ▶ FIN
  - ▶ ACK

# Summary of TCP

- ▶ Each packet sent gets an ACK
- ▶ Up to window size can be sent without an ACK
- ▶ Newer TCP does Window Scaling to get bigger

# Questions

## Layer 4 - UDP/ICMP

- ▶ UDP - User Datagram Protocol
- ▶ ICMP - Internet Control Message Protocol

# UDP

- ▶ User Datagram Protocol
- ▶ Connectionless
- ▶ Unordered
- ▶ No guaranteed delivery



## UDP (contd)

- ▶ PDU is datagram
- ▶ Stateless
- ▶ Can support broadcast

## UDP (contd)

- ▶ Used when overhead of TCP too high
- ▶ Delay sensitive such as video or voice
- ▶ Broadcast and unidirectional well suited for some applications

# UDP Header

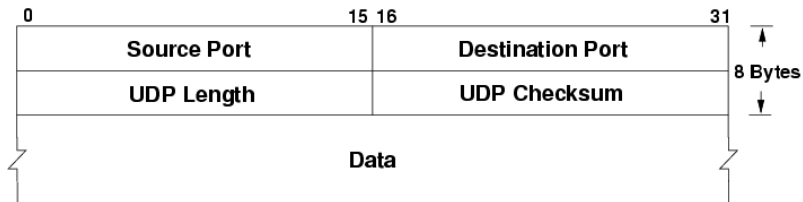


Figure 1: UDP Header

# ICMP

- ▶ Internet Control Message Protocol
- ▶ “Control Messages” for IP
- ▶ Technicall Internet Layer
- ▶ Still Layer 4 in OSI model

# ICMP (contd)

- ▶ Used by many internet utilities
  - ▶ ping
  - ▶ traceroute
- ▶ Also used to send errors
  - ▶ Destination Unreachable
- ▶ Many misc functions

# ICMP Header

ICMP Header Format																																	
Offsets	Octet	0							1							2							3										
Octet	Bit	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
0	0	Type							Code							Checksum																	
4	32	Rest of Header																															

Figure 2: ICMP Header

## Type Field

- ▶ 0 = Echo Reply
- ▶ 3 = Destination Unreachable
- ▶ 5 = Redirect
- ▶ 8 = Echo Request
- ▶ 11 = Time Exceeded

# Code

- ▶ Depends on Type
- ▶ Type 3 has many, 5 and 11 a few
- ▶ Type 3
  - ▶ 0 = Destination Network Unreachable
  - ▶ 1 = Destination Host Unreachable
  - ▶ 4 = Fragmentation Required - DF Set
  - ▶ 9 = Host Admin denied
  - ▶ 10 = Network Admin Denied
  - ▶ 13 = Communication Admin Denied



# Ping

- ▶ Sending host sends echo request
- ▶ Receiving host replies with echo reply
- ▶ Payload data the same

# Traceroute

- ▶ Host sends packet with ttl of 1
  - ▶ ICMP Echo request, UDP or TCP
- ▶ TTL expires, router or host replies with ICMP Type 11
- ▶ Increment TTL and send again until response received from target

# Questions

End of Layer 4

# Subnetting

## Next class

- ▶ Discussion of layers 5/6
- ▶ Start of discussions on some Layer 7 protocols