

# CSET 2200 Lecture 5

## Questions/Review

# Ethernet Devices

Shared bus

# Repeater

- ▶ Layer 2 device
- ▶ Used to extend cable reach
- ▶ Limitations on max number

# Hub

- ▶ Layer 2 device
- ▶ Retransmits all received frames on every port
- ▶ Basically a multiport repeater

## Hub (contd)

- ▶ No memory (forwards packets as received)
- ▶ Half Duplex
- ▶ Only single speed supported

## Hub (contd)

- ▶ Limit to number of segments and hubs (4 3 2)
- ▶ Electrical properties limit this
- ▶ Propagation takes time
- ▶ Need to be able to catch collisions



## Hub (contd)

- ▶ Mostly phased out these days for switches
- ▶ Sometimes used as active taps

# Bridge

- ▶ Bridges join two collision domains
- ▶ Have some intelligence to handle traffic flow
- ▶ Have memory, usually store and forward
- ▶ Allow networks to get grow
- ▶ Limit collisions

# Switch

- ▶ Switches address many issues hubs have
- ▶ Technically a type of bridge
- ▶ Limit traffic to necessary ports
- ▶ Each port has it's own collision domain

## Switch (contd)

- ▶ Required for full duplex communication
- ▶ In Full duplex mode essentially a PtP link
- ▶ Collissions impossible with only two stations

## Switch (contd)

- ▶ Also help with network size
- ▶ Since each segment is separate, we don't have delay concerns
- ▶ Build an internal address table
- ▶ Learns by observing incoming traffic
- ▶ Once port of a MAC address known, does not flood packet

## Switch (contd)

- ▶ Loops still a problem
- ▶ Addressed in various ways we'll cover later

# Types of Switching

- ▶ Store and Forward
  - ▶ Receives entire packet before forwarding
  - ▶ Drops packets with errors
- ▶ Cut Through
  - ▶ Only looks at frame dest address then forwards
  - ▶ Propagates errors
- ▶ Fragment Free
  - ▶ Looks at first 64 bytes then cut through
- ▶ Adaptive
  - ▶ Switches between above modes based on types

# Questions



# Switching Gears

- ▶ Remaining Layer 2 topics
  - ▶ VLANs
  - ▶ Spanning Tree
  - ▶ Design
- ▶ Will revisit after some L3 as it makes sense

Layer2 on to Layer3

# Diagram

## Basic Layer 3

- ▶ In TCP/IP this is IP
- ▶ Stands for Internet Protocol
- ▶ Usually IPv4 is what is referred to
- ▶ Addresses in dotted quad (129.2.3.4)

## Layer 3 networks

- ▶ Each network defined as a network and a mask
- ▶ Each Layer 3 network has a network address and a broadcast
- ▶ Similar in function to broadcast at layer 2
- ▶ Uses to decide if packet is local

## Mapping Layer 2 to Layer 3

- ▶ Need a way to map a given layer 3 address to a given layer 2 address
- ▶ Answer is ARP (Address Resolution Protocol)

# ARP

- ▶ Layer 2 protocol to aid layer 3
- ▶ Implemented on many technologies
- ▶ Replaced in IPv6 with Neighbor Discovery Protocol
- ▶ Defined in RFCs 826 and 903

## ARP (contd)

- ▶ Hosts use ARP to find a layer 2 address given a layer 3
- ▶ Request Packets are sent to the broadcast ethernet address
- ▶ Response packets are normally sent to the requestor



# ARP Packets

- ▶ Layer 2 EtherType of 0x0806 for Ethernet
- ▶ Length of Packet is determined by Layer 2 and layer 3 protocol
- ▶ For our purposes we care about Ethernet and IPv4

# ARP Packet Format

Length	Purpose
2	Hardware Type (1)
2	Protocol Type (0x0800)
1	Hardware Addr Length (6)
1	Protocol Addr Length (4)
2	Operation
6	Sender Hardware Address
4	Sender Protocol Address
6	Target Hardware Address
4	Target Protocol Address

## Other ARP stuff

- ▶ Operation is 1 for request, 2 for reply
- ▶ Hosts normally cache arp
- ▶ Some hosts send intentional arp broadcast
- ▶ Prepopulates caches

## Some examples

# Security concerns

# Questions

## Next Lesson

- ▶ Starting on real layer 3
- ▶ Now it gets more interesting
- ▶ <https://en.wikipedia.org/wiki/IPv4>
- ▶ Book 20, 21
- ▶ We'll be here for a bit

