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 receives 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
- Propogation takes time
- Need to be able to catch colissions

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 seperate, 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
  - ▶ Propgates 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 intential 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