CSET 2200 Lecture 5



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



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

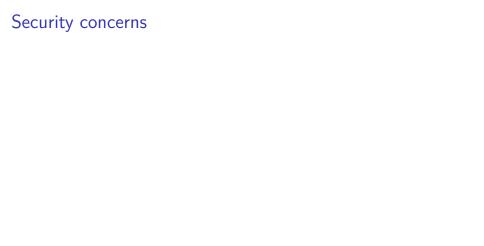
ARP Packet Format

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



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