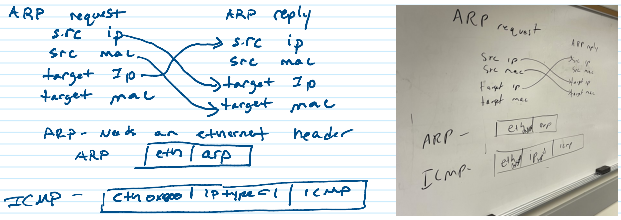
Consolidated Notes

Friday, October 28, 2022 6:05 PM



Internet Control Message Protocol (ICMP)

ICMP will have the following layout:
0

Eth type = 0x800	IP protocol = 1	ICMP type #

ICMP type #:
0 = echo reply (used to ping)
8 = echo request (used to ping)

The ARP header (bytes 12-??) must follow the Ethernet (bytes 0 - 11)
We must parse all the data to see what we have. We will take bytes 0-11 and copy them into a Eth header struct.

Then take bytes 12 to 42(for example) and copy that into an ARP struct.

ARP request have to broadcast everywhere

Eth	**ARP**
Source [source mac]	Operation (request or reply) set based on our needs
Destination [ff:ff:ff:ff:ff:ff] (Broadcast mac address)	Fixed values for every ARP request/reply
Type = 0x806 (ARP Packet)	Hardware type = 1(Ethernet)
	Hardware length = 6 bytes
	Protocol Type = 0x800
	Protocol Length = 4 bytes (for an IP address)
	Source Protocol Address [source IP]
	Source Hardware Address [source mac]
	Target Protocol Address [target IP]
	Target Hardware Address [00:00:00:00:00:00]

Eth all ff
ARP all 00

0 - 11 bytes 12 - ?? bytes

ARP Reply has to be unicast to who made the request

Eth	**ARP**
Source [target mac]	Operation (request or reply) set based on our needs
Destination [Source mac] (unicast)	Fixed values for every ARP request/reply
Type = 0x806 (ARP Packet)	Hardware type = 1(Ethernet)
	Hardware length = 6 bytes
	Protocol Type = 0x800
	Protocol Length = 4 bytes (for an IP address)
	Source Protocol Address [target IP]
	Source Hardware Address [target mac]
	Target Protocol Address [source IP]
	Target Hardware Address [source mac]

If the requested address does not exit we the requester will not receive an ARP response.
The owner of the address is the only one that can respond.

0 - 11 bytes 12 - ?? bytes

Ignore all other packet types. No other packets should occur

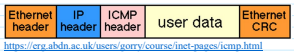
In this event we must send an ICMP "Host unreachable error message"

Or if the packet had too many hops send an ICMP "Time exceeded
If someone pings your router you must respond

Reply

Eth	**IP**	**ICMP Type**
Type = 0x800 (IP Packet)	IP Protocol =1	Type = 0
source	if its not 1 avoid it	checksum
dest		id
	ip source	sequence
	ip dest	64 bits of data
	Protocol one means that ICMP is next	

A response to a ping is an ICMP echo response packet



https://erg.abdn.ac.uk/users/gorry/course/inet-pages/icmp.html

Library Document

Ethernet
https://sites.uclouvain.be/SystInfo/usr/include/net/ethernet.h.html

ARP + Ethernet
https://sites.uclouvain.be/SystInfo/usr/include/netinet/if_ether.h.html

ARP
https://sites.uclouvain.be/SystInfo/usr/include/net/if_arp.h.html

ICMP
https://sites.uclouvain.be/SystInfo/usr/include/netinet/ip_icmp.h.html

IP
https://sites.uclouvain.be/SystInfo/usr/include/netinet/ip.h.html

Library variable topology

ICMP
http://www.tcpipguide.com/free/t_ICMPv4EchoRequestandEchoReplyMessages-2.htm

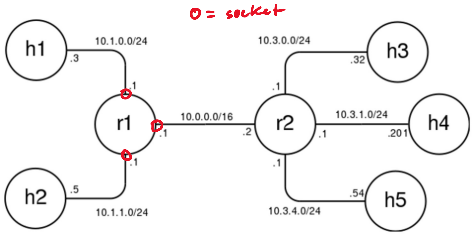
ARP
http://www.tcpipguide.com/free/t_ARPMessageFormat.htm

IP
http://www.tcpipguide.com/free/t_IPDatagramGeneralFormat.htm

Request

Eth	**IP**	**ICMP Type**
Type = 0x800 (IP Packet)	IP Protocol =1	Type = 8
		checksum
	Protocol one means that ICMP is next	id
		sequence
		64 bits of data

A ping is an ICMP echo request packet



Criteria	Points
Router accepts packets on packet sockets	5
Builds correct ARP response (including ethernet header)	10
Builds correct ICMP echo reply (including ethernet and ip headers)	10
Correctly uses packet socket to send responses as appropriate	5
All of the above work on all router interfaces	5