

Internet Protocol

Exercise 1: What is the difference between IP and "The Internet"? Does a network using IP have to be on the Internet? \longrightarrow no
Does someone using the Internet have to use IP? \longrightarrow yes

IP — protocol

Internet — network

Exercise 2: What is the value of the first byte of an IP packet that uses the shortest possible header? If first byte is 0x46, what is the length of the Options field in bytes?

0x45 \rightarrow 5 X 4-byte words in header

0x46 \rightarrow 6 X 4 byte words

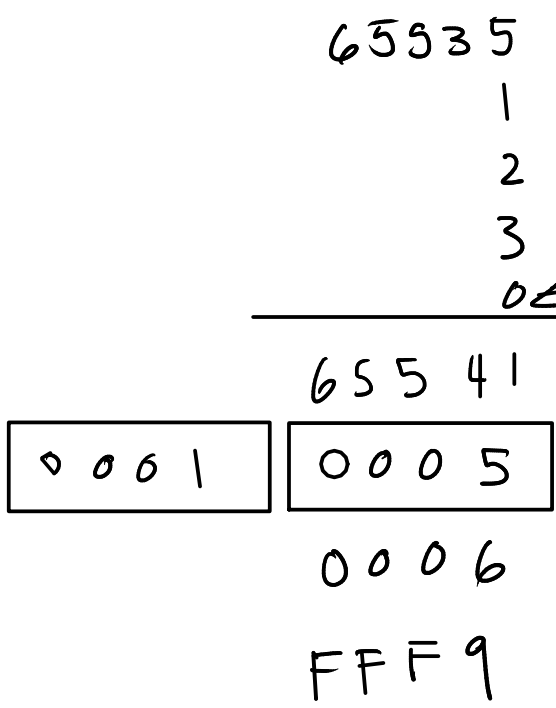
Options field is:

$$\begin{array}{r} 6 \times 4 = 24 \\ - \quad 5 \times 4 = 20 \quad (\text{minimum, no options}) \\ \hline 4 = \# \text{ of bytes in options field.} \end{array}$$

Exercise 3: A protocol header contains four 16-bit fields with decimal values 65535, 1, 2, and 3 that are to be included in an IPv4 checksum. What is the value of the header checksum?

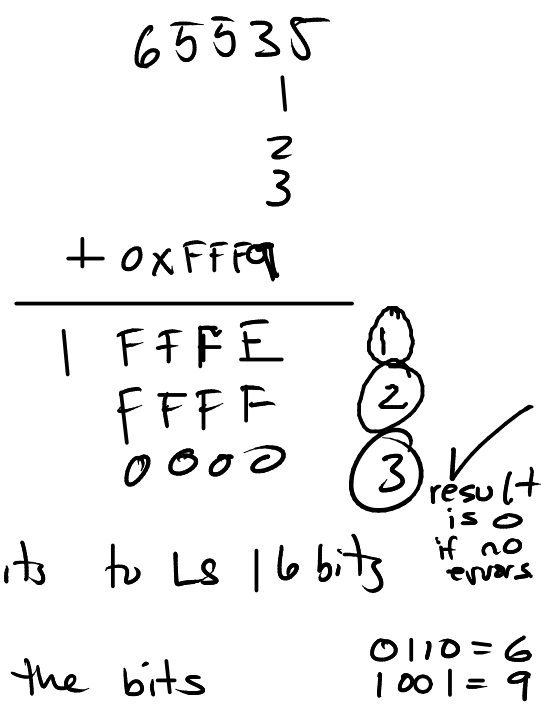
Steps
↓

- 1
- 2
- 3

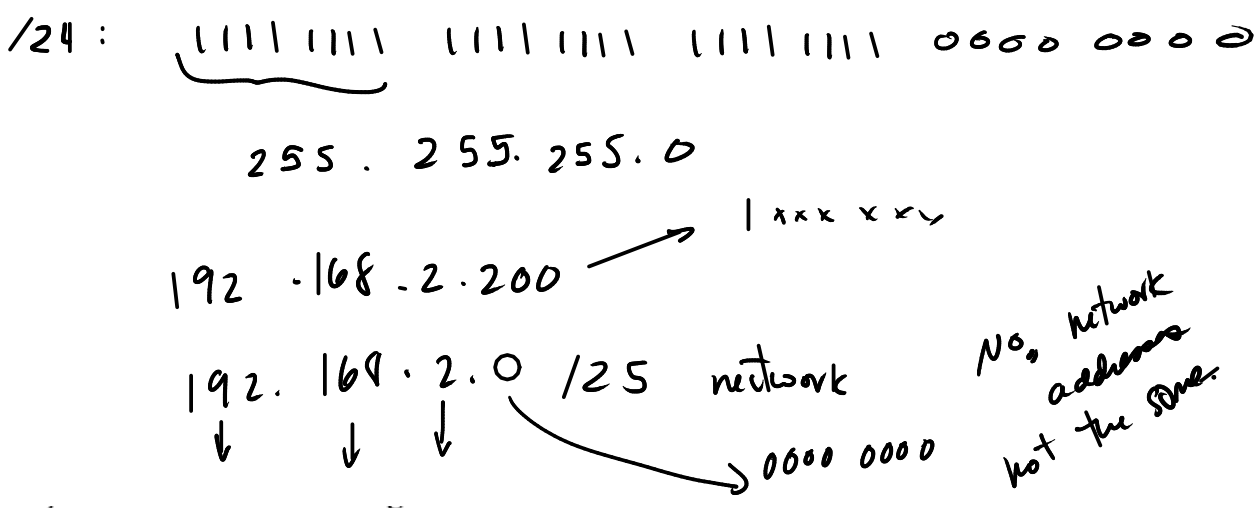


add up
add MS 16 bits to LS 16 bits
complement the bits

Check:



Exercise 4: What is the netmask in binary for a /24 network? What is it in decimal? How can the netmask be used to determine if one IP address is on the same network as another? Is the address 192.168.2.200 in the 192.168.2.0/25 network?



Exercise 6: Does the header checksum change each time a packet is forwarded? Why?

yes. because TTL was decremented.

router:

Destination	Gateway	Subnet Mask	Metric	Interface
192.168.1.0	*	255.255.255.0	0	br0 (LAN)
204.191.0.0	*	255.255.0.0	0	vlan1 (WAN)
127.0.0.0	*	255.0.0.0	0	lo
default	204.191.1.1	0.0.0.0	0	vlan1 (WAN)

Exercise 7: For the routing table above, what port ("Interface") would be used by packets with the following destination IP addresses: 127.0.0.255? 192.168.1.1? 192.168.2.1? 204.191.10.32?

127.0.0.255 → lo (loopback) port

192.168.1.1 → br0 port

192.168.2.1 → vlan1 port (default)

204.191.10.32 → vlan1 port

Exercise 8: What pairs of values are stored in an ARP cache? What addresses from a received packet need to be examined to validate an ARP cache entry?

MAC { dest
src

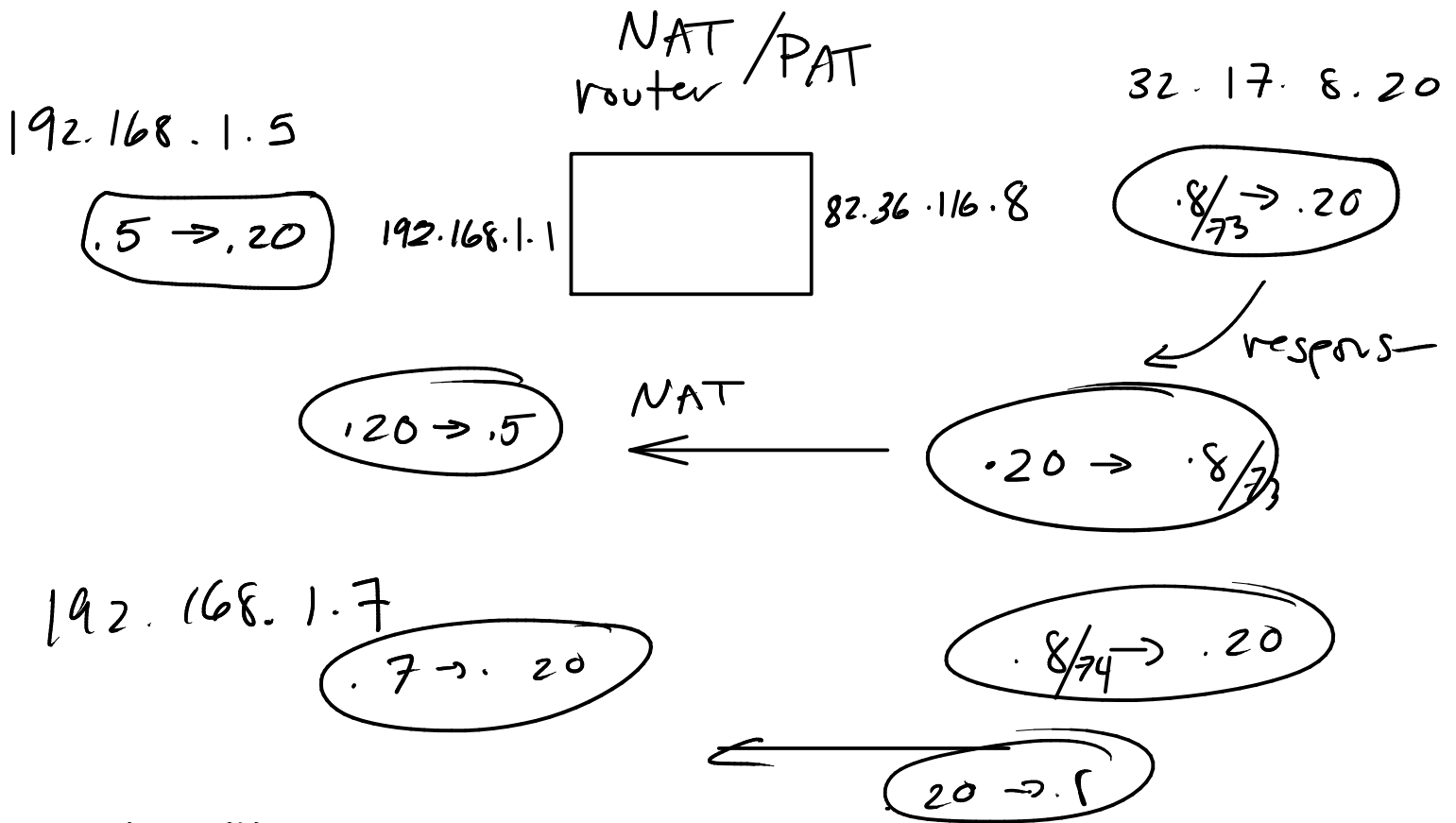
IP { src
dest

IP address ↔ MAC address

can use src MAC & src IP address to validate ARP cache entries.

Exercise 9: When a host boots up, what must it send out first, an ARP request or a DHCP request?

DHCP request → no IP address assigned before DHCP & IP configuration



Exercise 10: A host with a (private) address 192.168.1.10 is behind a NAT router with an (public) address of 172.12.192.15. The host sends a packet to a host at address 74.125.225.113 requesting a web page. Show the source/destination address pairs of the request and response packets on the private and public sides of the router.

→ da at home