# Lecture 16 - Internet Protocol

**Exercise 1**: What is the difference between IP and "The Internet"? Does a network using IP have to be on the Internet? — No, can be private.
Does someone using the Internet have to use IP? — Yes, if they want to communicate with other hosts.

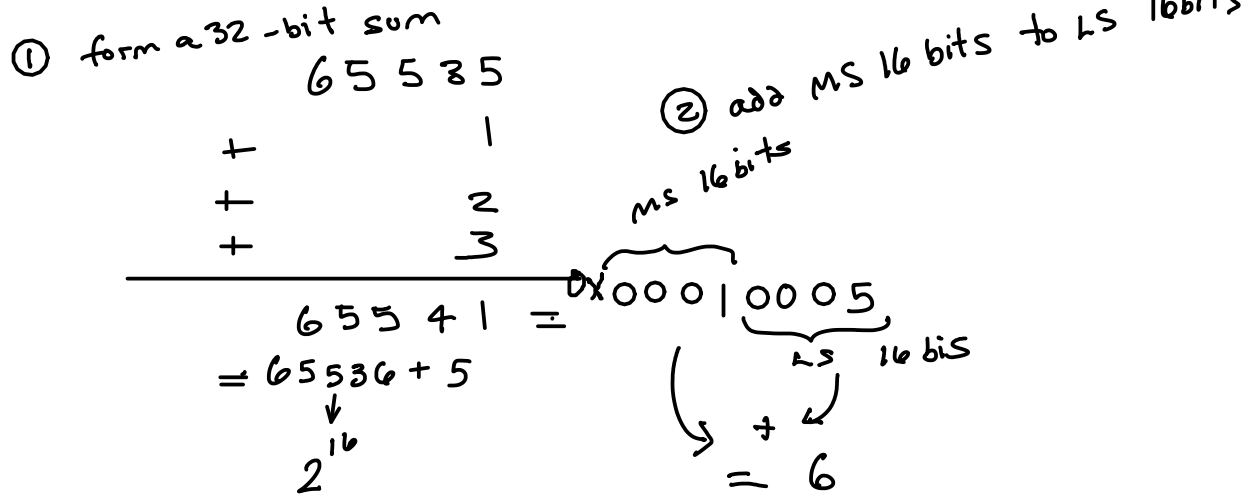
IP is a protocol.
The Internet is a network

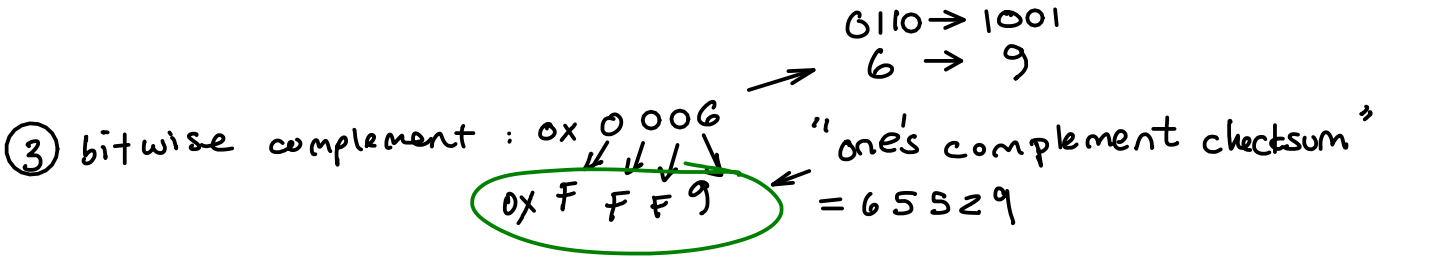
**Exercise 2**: What is the value of the first byte of IP frame that uses the shortest possible header? If first byte is 0x46, what is the length of the Options field in bytes?

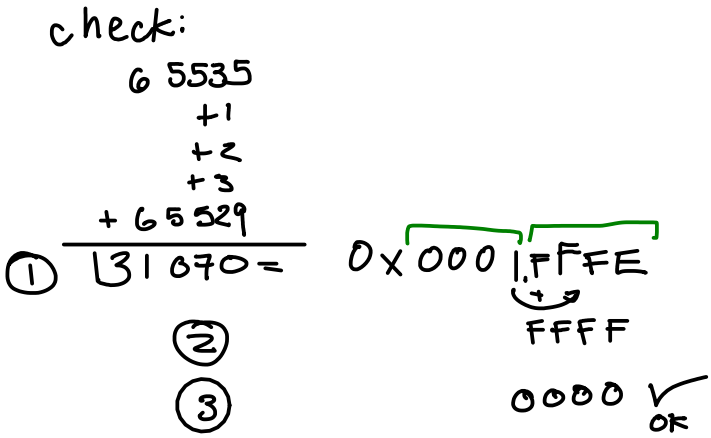
shortest IP header is 5 bytes
first byte is 4 bits for version = 0x4
4 bits for IHL = 0x5
first byte = 0x45

0x46 means 6 x 32-bit words in header (1 more than the minimum)
the additional 32 bits are the "options" field.
∴ the option field is 32 bits or 4 bytes.

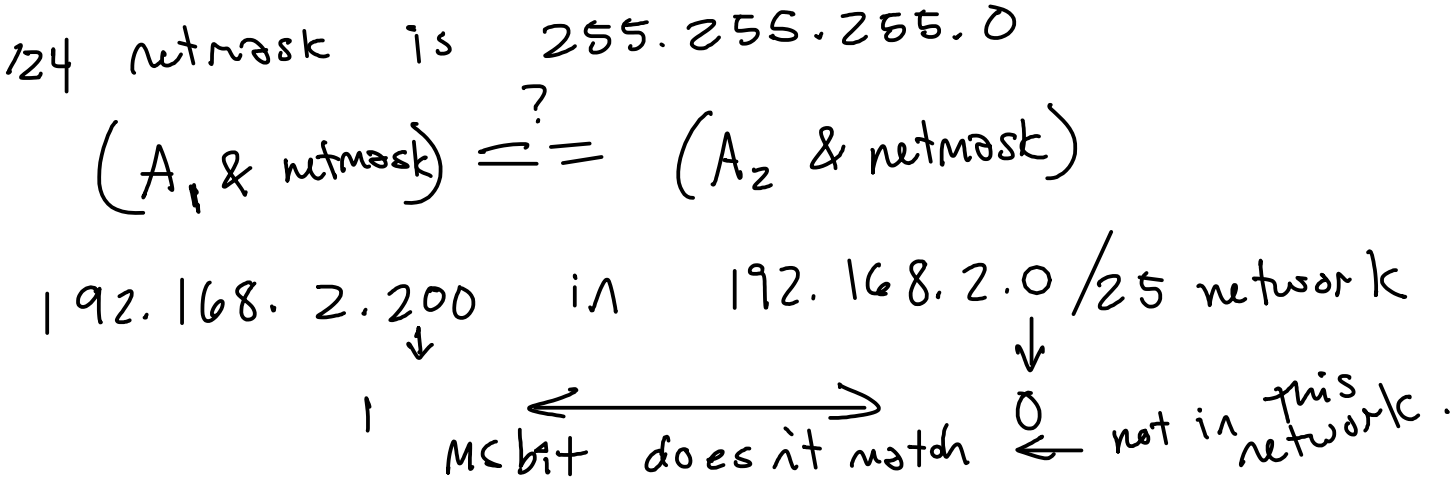
**Exercise 3**: A protocol header contains four 16-bit fields with decimal values 65535, 1, 2, and 3 that are to included in an IPv4 checksum. What is the value of the header checksum?




**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 5**: Who "owns" the 24.80.0.0/13 network?

according to whois.arin.net,
Shaw ⟶

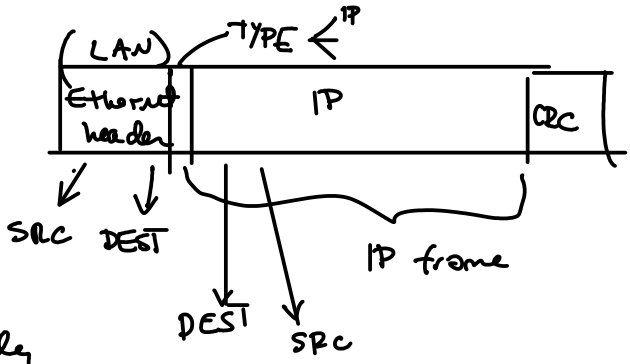
**WHOIS-RWS**

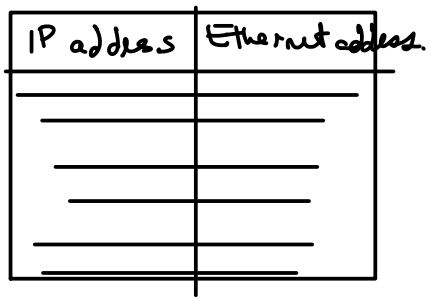
| Network | |
|---|---|
| Net Range | 24.80.0.0 - 24.87.255.255 |
| CIDR | 24.80.0.0/13 |
| Name | SHAW-COMM |
| Handle | NET-24-80-0-0-1 |
| Parent | NET24 (NET-24-0-0-0-0) |
| Net Type | Direct Allocation |
| Origin AS | |
| Organization | Shaw Communications Inc. (SHAWC) |
| Registration Date | 2001-07-12 |
| Last Updated | 2012-03-02 |

**Exercise 6**: For the routing table above, what port ("Interface") would be used by frames 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 port
192.168.1.1 ⟶ br0
192.168.2.1 ⟶ vlan1
204.191.10.32 ⟶ vlan1

**Exercise 7**: What pairs of values are stored in an ARP cache? What addresses from a received frame need to be examined to validate an ARP cache entry?




typically

→ SRC LAN & SRC IP address

**Exercise 8**: When a host boots up, what must it send out first, an ARP request or a DHCP request?

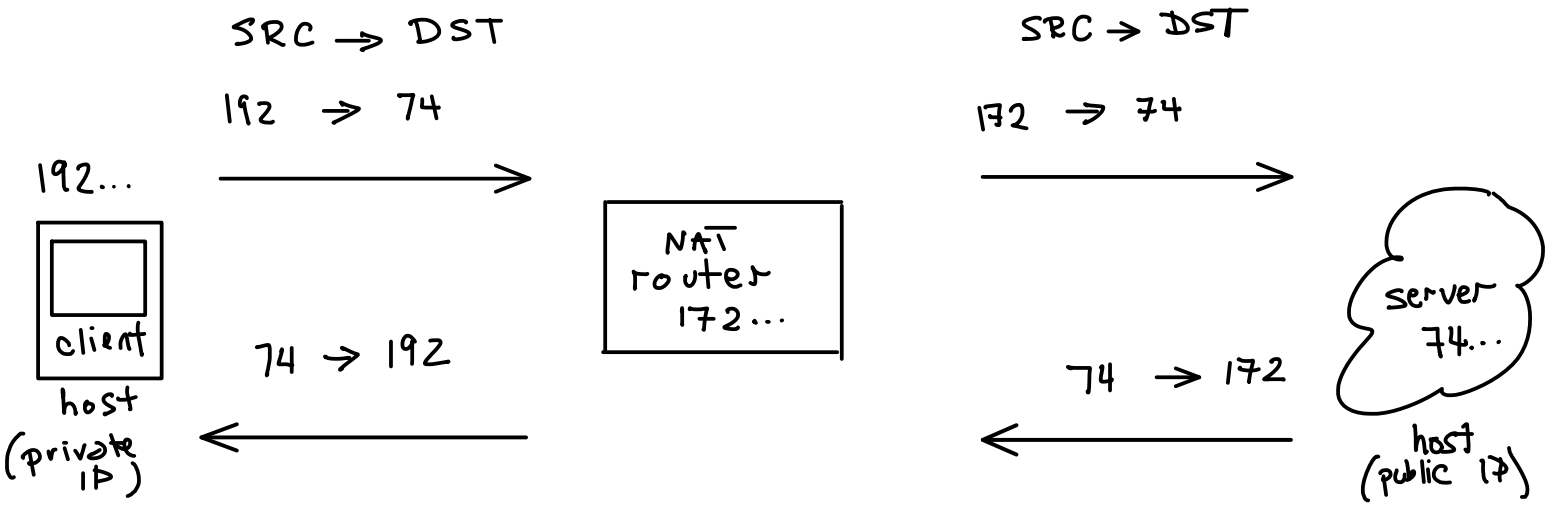
neither:

ARP — don't need own IP address

DHCP — don't need dest IP addr or LAN

**Exercise 9**: 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 frame to a host at address 74.125.225.113 requesting a web page. Show the source/destination address pairs of the request and response frames on the private and public sides of the router.

abbreviate: 192 = 192.168.1.10
172 = 172.12.195.12
74 = 74.125.225.113




**Exercise 10**: Can a host's DNS server be configured using a host name? Why or why not? Assuming a host has an empty DNS cache, what queries would it generate to look up the IP address of the host mx.bcit.ca?

① No. To reach the DNS server we need its IP address, but we can't get it without access to the DNS server.

② A recursive DNS query would require the following queries to look up mx.bcit.ca:

1. query the root DNS server for the IP address of the DNS server for ".ca"
2. query the DNS server for "ca" for the IP address of the DNS server for "bcit.ca"
3. query the DNS server for "bcit.ca" for the IP address of "mx.bcit.ca"