Subnetting Problems

POLL

Subnetting is applicable for

a) Classful Addressing

b) Classless Addressing

c) Both A and B

d) None of the above

- What is the Network ID, Broadcast Address, First Usable IP, or Last Usable IP on the subnetwork that the node 192.168.1.15/26 belongs to?

Step 1. Convert the shorthand subnet mask to decimal.
/26 = 255.255.255. + Two additional subnet bits.
Go to your cheat sheet, start at the bottom (128) and count up two, starting with 128. You should get to 192.
Thus, our decimal subnet mask is 255.255.255.192

Step 2. Determine the block size.
The block size is listed in the block size column parallel to your decimal mask.
The block size is 64.

Step 3. What is my Network ID?
Since we are working in the fourth octet and the block size is 64, the first network is 192.168.1.0.

Step 4. What is the next Network ID?
Again, we look at our block size of 64 to determine the next network is 192.168.1.64.
Network ID (First IP in the subnet): 192.168.1.0
Broadcast address (last IP in the subnet): 192.168.1.63
First Usable IP (the address after the network ID): 192.168.1.1
Last Usable IP (the address before the broadcast address): 192.168.1.62

POLL 2

- How many subnets and hosts per subnet can you get from the network 192.168.1.0 255.255.255.224?

A) 30,30

B) 8,30

C) 8,8

Step 1: Determine the classful mask.
192 = Class C
Class C default mask = 255.255.255.0

Step 2: Determine how many additional subnet bits exist beyond the classful boundary.
Since this is a class C address, we are only going to look at the fourth octet. Since the decimal mask is 224, we know there were three subnet bits added (counting up from the bottom of our cheat sheet).

Step 3: Determine how many host bits remain.
We are still only working in the fourth octet. Since three bits went to the subnet instep 2, we have five host bits (0's) remaining.

Step 4: Find the exponents of both subnet bits and host bits using the cheat sheet:
Subnet Bits = 2^3 = 8
Host Bits = 2^5-2 = 30
The answer is 8 subnets and 30 hosts per subnet

- You have been asked to create a subnet mask for the 172.16.0.0 network. Your organization requires 900 subnets, with at least 50 hosts per subnet. What subnet mask should you use?

Step 1: Determine how many subnet bits (1's), you have to add to the classful boundary to cover the number of required subnets.

The IP address given was a class B address, making the first 16 subnet bits static.

- Using the cheat sheet, find the exponent of 2 that is equal to or greater than the number of subnets we require (900). We can quickly see that 10 additional subnet bits will give us 1,024 subnets. Make note of the corresponding subnet mask. In this case, 255.255.255.192. The third octet is eight 1's, and the four is two 1's. We can count up from the bottom on our cheat sheet to get to 192.

Step 2: Confirm the number of remaining 0's will cover our required hosts. In this case, there are 6 remaining 0's - 2^6-2=62, which is more than enough for our host requirements.

Our subnet mask is 255.255.255.192. Giving us 1024 subnets and 62 hosts per subnet.

An organization is granted the block 130.56.0.0/**16.** **The administrator wants** to create 1024 subnets.

- **a. Find the number of addresses in each subnet.**
- **b. Find the subnet prefix.**
- **c. Find the first and the last address in the first subnet.**
- **d. Find the first and the last address in the last subnet**

Poll 3

- What is the network ID portion of the IP address 191.154.25.66 if the default subnet mask is used? What if /24 is used

a) 191.154.0.0 and 191.154.25.0

b) 191.154.25.0 and 191.154.25.0

c) 191.154.0.0 and 191.154.0.0

- An organization is granted a block of addresses with the beginning address 14.24.74.0/24. The organization needs to have 3 subblocks of addresses to use in its three subnets: one subblock of 10 addresses, one subblock of 60 addresses, and one subblock of 120 addresses. Design the subblocks

Solution

There are 32 – 24 = 256 addresses in this block. The first address is 14.24.74.0/24; the last address is 14.24.74.255/24. To satisfy the third requirement, we assign addresses to subblocks, starting with the largest and ending with the smallest one.

a. The number of addresses in the largest subblock, which requires 120 addresses, is not a power of 2. We allocate 128 addresses. The subnet mask for this subnet can be found as *n1 = 32 − log2128 = 25. The first address in this block is 14.24.74.0/25; the last address is* 14.24.74.127/25.

b. The number of addresses in the second largest subblock, which requires 60 addresses, is not

a power of 2 either. We allocate 64 addresses. The subnet mask for this subnet can be found as *n2 = 32 − log264 = 26. The first address in this block is 14.24.74.128/26; the last address* is 14.24.74.191/26.

c. The number of addresses in the smallest subblock, which requires 10 addresses, is not a power of 2 either. We allocate 16 addresses. The subnet mask for this subnet can be found as *n3 = 32 − log216 = 28. The first address in this block is 14.24.74.192/28; the last address is* 14.24.74.207/28.

- You work for a large communications corporation named GlobeComm which has been assigned a Class A network address. Currently, the company has 1,000 subnets in offices around the world. You want to add 100 new subnets over the next three years, and you want to allow for the largest possible number of host addresses per subnet.

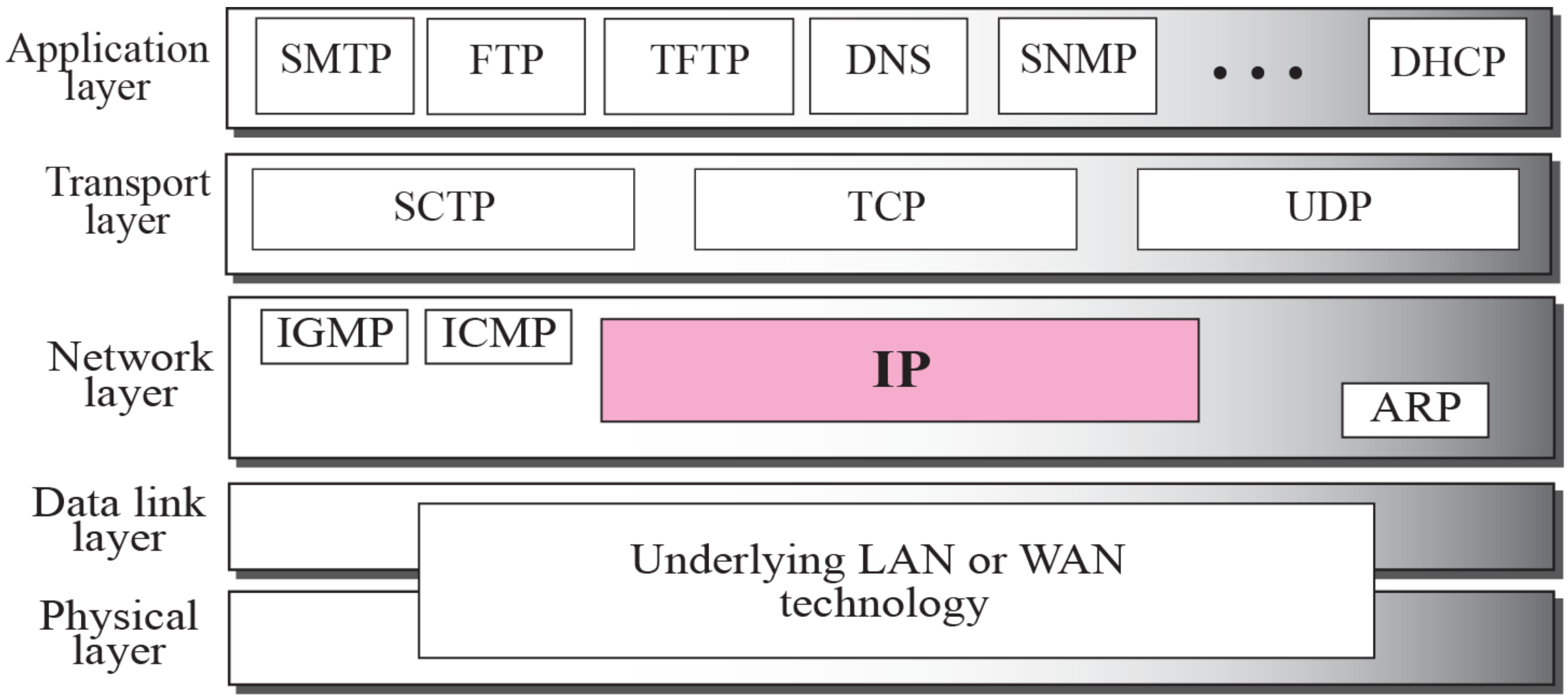
  How many bits required?

- An ISP is granted the block 80.70.56.0**/21. The ISP needs to allocate** addresses for two organizations each with 500 addresses, two organizations each with 250 addresses, and three organizations each with 50 addresses.
- **a. Find the number and range of addresses in the ISP block.**
- **b. Find the range of addresses for each organization and the range of unallocated** addresses

INTRODUCTION IPv4

The Internet Protocol (IP) is the transmission mechanism used by the TCP/IP protocols at the network layer.

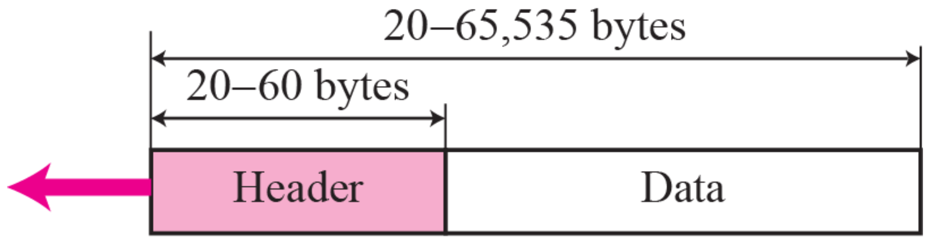
Figure ***Position of IP in TCP/IP protocol suite***



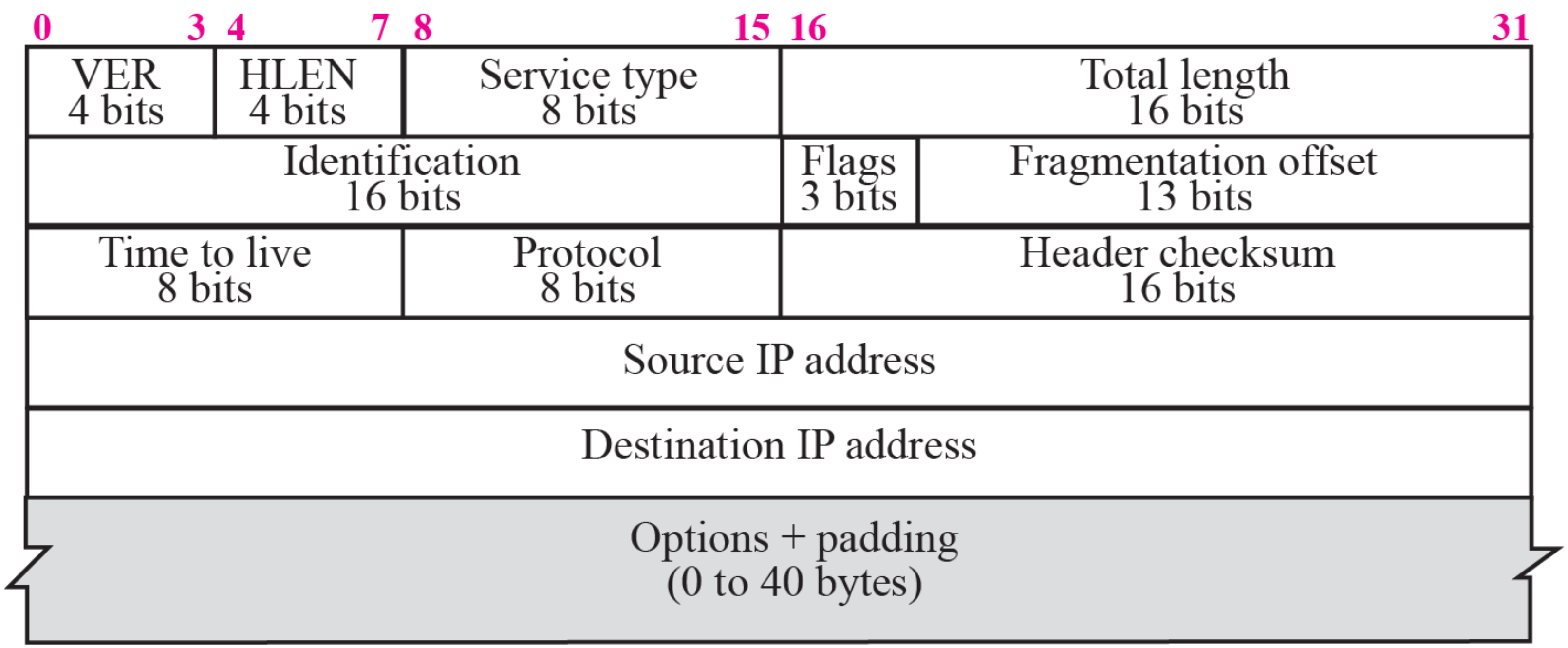
DATAGRAMS

Packets in the network (internet) layer are called *datagrams*. A ***datagram*** is a ***variable-length packet*** consisting of two parts: ***header and data***. The header is **20 to 60 bytes** in length and contains information essential to **routing and delivery**. It is customary in TCP/IP to show the header in 4-byte sections. A brief description of each field is in order.

IP datagram



a. IP datagram



b. Header format

POLL 1

- IP Datagram Header Size ranges from

a) 20 – 60 bits

b) 20 – 60 bytes

c) 20 – 60 nibbles

d) 20 – 40 bytes