COMP90007 Internet Technologies

Week 7 Workshop

Semester 2, 2020

Suggested solutions

Question 1

What are the benefits and disadvantages of Transparent fragmentation in Network Layer?

Ans. Good design paradigm and encapsulation of fragmentation within each network. Transparent fragmentation is straightforward to implement and use but has problems. For one thing, the exit router must know when it has received all the pieces, so either a count field or an ‘‘end of packet’’ bit must be provided. Also, because all packets must exit via the same router so that they can be reassembled, the routes are constrained. By not allowing some fragments to follow one route to the ultimate destination and other fragments a disjoint route, some performance may be lost. More significant is the amount of work that the router may have to do. It may need to buffer the fragments as they arrive, and decide when to throw them away if not all of the fragments arrive. Some of this work may be wasteful, too, as the packet may pass through a series of small packet networks and need to be repeatedly fragmented and reassembled.

Question 2

Convert the IP address 11000001, 01010010, 11010010, 00001111 to dotted decimal notation.

Ans. 193.82.210.15

Question 3

Convert the IP address 240.68.10.10 to binary format

Use the following key:

10000000	2^7	128
01000000	2^6	64
00100000	2^5	32
00010000	2^4	16
00001000	2^3	8
00000100	2^2	4
00000010	2^1	2
00000001	2^0	1

Ans. 1111 0000 . 0100 0100 . 0000 1010 . 0000 1010

Question 4

A network on the Internet has a subnet mask of 255.255.240.0. What is the maximum number of hosts that it can handle?

Answer:
255.255.240.0 in binary is 11111111 11111111 11111111 11110000 0000000

The mask is 20 bits long, so the network part is 20 bits. The remaining 12 bits are for the host, so 4096 host addresses exist.

Question 5

IPv6 uses 16 bytes addresses. If a block of 1 million addresses is allocated every picosecond, how long will the addresses last?

Answer:
With 16 bytes there are 2^{128} or addresses. If we allocate them at a rate of $10^{6}/10^{-12} = 10^{18}$ addresses per second. Therefore it will take 3.4×10^{20} seconds to run out of IP addresses, which is about 10^{13} years.

This number is 1000 times the age of the universe. Of course, the address space is not flat, so they are not allocated linearly, but this calculation shows that even with an allocation scheme that has an efficiency of 1/1000 (0.1 percent), one will never run out.

Question 6

A router an entry in its table that can be represented with mask as 135.46.56.0/21. What is the maximum number of hosts that this network can represent?

Ans. 21 bits means network has 21 bits reserved, and remaining 11 bits are for hosts.

Hence maximum number of hosts is 2^11 = 2048

Question 7

If there are *n* independent paths between two nodes in a network, and the probability that an individual path is working is *p*, what is the probability of these two nodes being connected? Assume path failures are independent.

Hint: first try to calculate what is the probability that all paths have failed

Answer:

Pr(nodes connected)
= 1 − Pr(no connection)
= 1 − Pr(all paths failed)
= 1 − Pr(individual path failure)^n *(assuming independent events)*
= 1 − [1 − Pr(individual path working)]^n
= 1 − (1 − p)^n