Home Page: http://www.public.asu.edu/~bhao2

Homework 4

Problems:

3, 10.a, 13, 16, 18, 19, 27a, 28, 35.

Question: 3

A bare-bones forwarding table in a VC network has four columns. What is the meaning of the values in each of these columns? A bare-bones forwarding table in a datagram network has two columns. What is the meaning of the values in each of these columns?

Answer:

Forwarding table in a VC network:

- Incoming Interface
- Incoming VC number
- Outgoing Interface
- Outgoing VC number

Forwarding table in a datagram network:

- Destination address
- Outgoing Interface.

Question: 10a

Consider a datagram network using 32-bit host addresses. Suppose a router has four links, numbered 0 through 3, and packets are to be forwarded to the link interfaces as follows:

Destination Address Range	Link Interface
11100000 00000000 00000000 00000000 through 11100000 00111111 11111111 11111111	0
11100000 01000000 00000000 00000000 through 11100000 01000000 11111111 11111111	1
11100000 01000001 00000000 00000000 through 11100001 01111111 11111111 11111111	2
otherwise	3

a. Provide a forwarding table that has five entries, uses longest prefix matching, and forwards packets to the correct link interfaces.

Answer:

Prefix Match	Link Interface
11100000 00	0
11100000 01000000	1
11100001	2
11100000 01000001	2
Otherwise	3

Question: 13

Consider a router that interconnects three subnets: Subnet 1, Subnet 2, and Subnet 3. Suppose all of the interfaces in each of these three subnets are required to have the prefix 223.1.17/24. Also suppose that Subnet 1 is required to support at least 60 interfaces, Subnet 2 is to support at least 90 interfaces, and Subnet 3 is to support at least 12 interfaces. Provide three network addresses (of the form a.b.c.d/x) that satisfy these constraints.

Answer:

223.1.17/24 (Network ID)	11011111 00000001 00010001 ????????
Subnet 1	11011111 00000001 00010001 0???????
Subnet 2	11011111 00000001 00010001 10??????
Subnet 3	11011111 00000001 00010001 11??????

All	223.1.17/24
Subnet 1	223.1.17.0/25
Subnet 2	223.1.17.128/26
Subnet 3	223.1.17.192/26

Question: 16

Consider a subnet with prefix 128.119.40.128/26. Give an example of one IP address (of form xxx.xxx.xxx.xxx) that can be assigned to this network. Suppose an ISP owns the block of addresses of the form 128.119.40.64/26. Suppose it wants to create four subnets from this block, with each block having the same number of IP addresses. What are the prefixes (of form a.b.c.d/x) for the four subnets?

Answer:

IP address range: 128.119.40.128 - 128.119.40.191

Note: 128.119.40.128(last 8 bits: 10000000, reserved address), 128.119.40.191(last 8 bits: 10111111, reserved address, broadcast)

Four subnets:

- 128.119.40.64/28
- 128.119.40.80/28
- 128.119.40.96/28
- 128.119.40.112/28

Question: 18

Use the whois service at the American Registry for Internet Numbers (http://www.arin.net/whois) to determine the IP address blocks for three universities. Can the whois services be used to determine with certainty the geographical location of a specific IP address? Use www.maxmind.com to determine the locations of the Web servers at each of these universities.

Answer:

Geographic locations of where these IP addresses are not tracked and provided by arin's whois service since this service only give contact and registration information, autonomous system numbers (ASN), organizations or customers that are associated with these resources, and related Points of Contact (POC).

1. Arizona State University

Network Resources	
ASUHYPER (NET-192-67-165-0-1)	192.67.165.0 - 192.67.165.255
GILBERT1 (NET-204-228-4-0-1)	204.228.4.0 - 204.228.5.255
ASU-ISP (NET-207-246-32-0-1)	207.246.32.0 - 207.246.63.255
ASURD1 (NET-206-206-192-0-2)	206.206.192.0 - 206.206.223.255
ASU-ISP2 (NET-209-147-128-0-1)	209.147.128.0 - 209.147.191.255
ASU-NET (NET-129-219-0-0-1)	129.219.0.0 - 129.219.255.255
ASUV6-NET (NET6-2620-D8-8000-1)	2620:D8:8000:: - 2620:D8:8000:FFFF:FFFF:FFFF:FFFF:FFFF

2. University of Arizona

Network Resources	
UA-CS-NET (NET-192-12-69-0-1)	192.12.69.0 - 192.12.69.255
AZMATH (NET-192-12-196-0-1)	192.12.196.0 - 192.12.196.255
UA-X (NET-206-207-42-0-1)	206.207.42.0 - 206.207.42.255
UOFAZ (NET-206-207-224-0-1)	206.207.224.0 - 206.207.255.255
STEWARD-OBS (NET-192-31-28-0-1)	192.31.28.0 - 192.31.28.255
MAMACONTROL (NET-192-82-237-0-1)	192.82.237.0 - 192.82.237.255
UA-STU-NET (NET-150-135-0-0-1)	150.135.0.0 - 150.135.255.255
UNIV-ARIZ (NET-128-196-0-0-1)	128.196.0.0 - 128.196.255.255
UA-COLMED-PHX (NET-208-68-28-0-1)	208.68.28.0 - 208.68.31.255
COLMED-PHX-ABC-1 (NET-208-75-160-0-1)	208.75.160.0 - 208.75.167.255
ARIZONA-V6 (NET6-2607-F088-1)	2607:F088:: - 2607:F088:FFFF:FFFF:FFFF:FFFF:FFFF:FFFF

3. Franklin W. Olin College of Engineering

Network Resources	
FWOCE-AS42 (NET-208-91-52-0-1)	208.91.52.0 - 208.91.55.255
FOLINCOLLEGE2-173-26 (NET-4-21-173-0-1)	4.21.173.0 - 4.21.173.255
FOLINCOLLEGE2-174-26 (NET-4-21-174-0-1)	4.21.174.0 - 4.21.175.255
FOLINCOLLEGE-33-24 (NET-4-36-33-128-1)	4.36.33.128 - 4.36.33.255

Arizona State University server in Tempe, AZ

192.67.165.0	US	Tempe, Arizona, United States, North America	85287	33.4148, -111.9093	Arizona State University	Arizona State University		753

University of Arizona server in Tucson, AZ

IP Address	Country Code	Location	Postal Code	Coordinates	ISP	Organization	Domain	Metro Code
192.12.69.0	US	Tucson, Arizona, United States, North America	85721	32.2338, -110.95	University of Arizona	University of Arizona		789

Franklin W. Olin College of Engineering in Needham, MA

IP Address	Country Code	Location	Postal Code	Coordinates	ISP	Organization	Domain	Metro Code
208.91.52.1	US	Needham, Massachusetts, United States, North America	02492	42.2793, -71.245	Franklin W. Olin College Of Engineering	Franklin W. Olin College Of Engineering		506

Question: 19

Consider sending a 2400-byte datagram into a link that has an MTU of 700 bytes. Suppose the original datagram is stamped with the identification number 422. How many fragments are generated? What are the values in the various fields in the IP datagram(s) generated related to fragmentation?

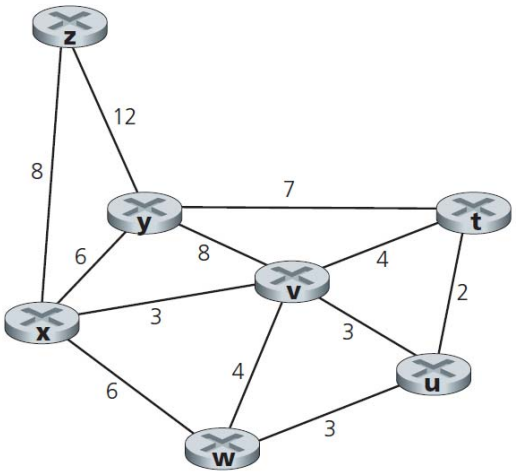
Answer:

$$\lceil (2400-20)/680 \rceil = 4$$

Note: max size of data field in fragment = 700 – 20 =680.

All fragments' identification number is 422. All fragments except the last one should be 700 bytes, the last datagram should be 360 bytes. The offset of 4 fragments should be 0, 85, 170, 255. The fragment bit flag of first 3 fragments will be 1, the last fragment bit flag will be 0.

Question: 27a



Consider the network shown in Problem P26. Using Dijkstra's algorithm, and showing your work using a table similar to Table 4.3, do the following:

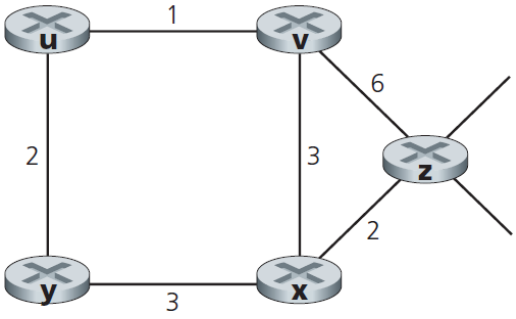
a. Compute the shortest path from t to all network nodes.

Answer:

Step	N'	D(x), p(x)	D(u),p(u)	D(v),p(v)	D(w),p(w)	D(y),p(y)	D(z),p(z)
0	t	∞	2,t	4,t	∞	7,t	∞
1	tu	∞	2,t	4,t	5,u	7,t	∞
2	tuv	7,v	2,t	4,t	5,u	7,t	∞
3	tuvw	7,v	2,t	4,t	5,u	7,t	∞
4	tuvwx	7,v	2,t	4,t	5,u	7,t	15,x
5	tuvwxy	7,v	2,t	4,t	5,u	7,t	15,x
6	tuvwxyz	7,v	2,t	4,t	5,u	7,t	15,x

Question: 28

Consider the network shown below, and assume that each node initially knows the costs to each of its neighbors. Consider the distance-vector algorithm and show the distance table entries at node z.



From \ To	U	V	X	Y	Z
V	1	0	3	3	5
X	4	3	0	3	2
Y	2	3	3	0	5
Z	6	5	2	5	0

Question: 35

Describe how loops in paths can be detected in BGP.

Answer:

BGP has built-in loop detection via the AS_PATH attribute. The loop can be detected if an AS appears more than one times.