Comp 2322 Computer Networking

Homework Four

Due time: 11:59pm, April 6, 2024, Saturday

Total marks: 10 points

Submission Requirements:

You need to submit the homework to the blackboard via Learn@PolyU on or before the due time. Late submission will cause the marks to be deducted 25% per day.

Questions:

1) (4 points) Consider a network using 8-bit host addresses. Suppose a router uses the longest prefix matching and has the following forwarding table:

Prefix Match	Interface
00	0
010	1
011	2
10	2
11	3

For each of the four interfaces, give the associated range of destination host addresses and the number of addresses in the range.

Question 1 answer:

Interface 0:

The prefix match is "00". .Which corresponds to the range of addresses from 00.000000 to 00.111111 in binary, or 0 to 63 in decimal. The number of addresses in this range is 63-0+1=64.

Interface 1:

The prefix match is "010". Which corresponds to the range of addresses from 010.000000 to 010.111111 in binary, or 64 to 95 in decimal. The number of addresses in this range is 95-64+1=32.

Interface 2:

There are two prefix matches for this interface: "011" and "10".

First "011": This corresponds to the range of addresses from 011.000000 to 011.111111 in binary, or 96 to 127 in decimal. The number of addresses in this range is 127-96+1=32.

Second "10": This corresponds to the range of addresses from 10.000000 to 10.111111 in binary, or 128 to 191 in decimal. The number of addresses in this range is 191-128+1=64.

So, total number of addresses for interface 2 =64+32=96

Interface 3:

The prefix match is "11". Which corresponds to the range of addresses from 11.000000 to 11.111111 in binary, or 192 to 255 in decimal. The number of addresses in this range is 255-192+1=64.

So for all the interfaces the associated range of destination host addresses and the number of addresses in the range is as follows:

Interface 0: Range 0-63 (00000000 – 00111111)

Number of addresses in the range:64

Interface 1: Range 64-95 (01000000 – 01011111)

Number of addresses in the range:32

Interface 2: Range 96-127 (01100000 – 01111111)

Number of addresses in the range:32

Range128-191 (10000000 – 10111111)

Number of addresses in the range:64

Total number of addresses for interface 2: 96

Interface 3: Range 192-255 (11000000 – 11111111)

Number of addresses in the range:64

2) (1 point) Suppose datagrams are limited to 1,000 bytes (including header) between source Host A and destination Host B due to the link has an MTU of 1000 bytes. Assuming a 20-byte IP header, how many datagrams would be required to send an MP3 file that consists of 5M bytes when using TCP? Explain how you computed your answer.

Question 2 Answer:

Maximum payload size per datagram = MTU - IP header size*2

= 1000 - 40

= 960 bytes

5M bytes= 5000000 bytes

Number of datagrams

= MP3 file size / maximum payload size per datagram

= 5M bytes / 960 bytes

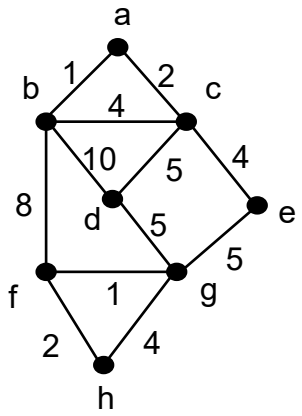
= 5000000 bytes / 960 bytes

= 5108.33

= 5109 (Round to whole)

Therefore, 5109 datagrams would be required to send the MP3 file using TCP.

3) (5 points) Consider the network below. Please use Dijkstra's shortest-path algorithm to compute the shortest path from node *a* to all network nodes.



Question 3 Answer:

Step	N'	P(b)	P(c)	P(d)	P(e)	P(f)	P(g)	P(h)

0	a	1,a	2,a	∞	∞	∞	∞	∞
1	ab		2,a	11,a	∞	9,a	∞	∞
2	abc			7,a	6,a	9,a	∞	∞
3	abce			7,a		9,a	11,a	∞
4	abced					9,a	11,a	∞
5	abcedf						10,a	11,a
6	abcedfg							11,a
7	abcedfgh							

So the shortest path from a to all network nodes is abcedfgh