

## COMP 2322 Computer Networking

### Homework 4

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#### Questions:

1.

Interface number	Address range	Number of addresses in address range
Interface 0	00 000000 through 00 111111	$2^6 = 64$
Interface 1	010 00000 through 010 11111	$2^5 = 32$
Interface 2	011 00000 through 011 11111 10 000000 through 10 111111	$2^5 + 2^6 = 64 + 32 = 96$
Interface 3	10 000000 through 10 111111	$2^6 = 64$
Interface 4	11 000000 through 11 111111	$2^6 = 64$

2.

Length of MP3 file =  $3 \times 10^6$  bytes

Length of MP3 file in a datagram =  $1500 - 20 - 20 = 1460$  bytes

Number of datagrams =  $\frac{3 \times 10^6}{1460} = 2054.79 = 2055$

3.

Step	N'	D(a), p(a)	D(b), p(b)	D(c), p(c)	D(d), p(d)	D(e), p(e)	D(f), p(f)	D(g), p(g)
0	h	$\infty$	$\infty$	$\infty$	$\infty$	$\infty$	2, h	5, h
1	hf	$\infty$	10, f	$\infty$	$\infty$	$\infty$		5, h
2	hfg	$\infty$	10, f	$\infty$	9, g	13, g		
3	hfgb	12, b		16, b	9, g	13, g		
4	hfgbd	12, b		15, d		13, g		
5	hfgbde	12, b		14, a				
6	hfgbdea			14, a				
7	hfgbdeac							

Shortest path of h-a: h-f-b-a

Shortest path of h-b: h-f-b

Shortest path of h-c: h-f-b-a-c

Shortest path of h-d: h-g-d

Shortest path of h-e: h-g-e

Shortest path of h-f: h-f

Shortest path of h-g: h-g

### 3.

Find shortest path from  $h$  to all network nodes using Dijkstra's algorithm.

[Initialization] Distance = ( $h$ : 0), ( $f$ :  $\infty$ ), ( $g$ :  $\infty$ ), ( $b$ :  $\infty$ ), ( $d$ :  $\infty$ ), ( $e$ :  $\infty$ ), ( $d$ :  $\infty$ ), ( $a$ :  $\infty$ ), ( $c$ :  $\infty$ )

[Iteration 1] Extract vertex  $h$ , update vertices  $f, g$

$$h: d = 0$$

$$D = (f: \underline{2}), (g: \underline{5}), (b: \underline{\infty}), (d: \underline{\infty}), (e: \underline{\infty}), (a: \underline{\infty}), (c: \underline{\infty})$$

[Iteration 2] Extract vertex  $f$ , update vertex  $b$

$$h: d = 0, f: d = 2$$

$$D = (g: \underline{5}), (b: \underline{10}), (d: \underline{\infty}), (e: \underline{\infty}), (a: \underline{\infty}), (c: \underline{\infty})$$

[Iteration 3] Extract vertex  $g$ , update vertices  $d, e$

$$h: d = 0, f: d = 2, g: d = 5$$

$$D = (b: \underline{10}), (d: \underline{9}), (e: \underline{8}), (a: \underline{\infty}), (c: \underline{\infty})$$

[Iteration 4] Extract vertex  $b$ , update vertices  $a, c$

$$h: d = 0, f: d = 2, g: d = 5, b: d = 10$$

$$D = (d: \underline{9}), (e: \underline{8}), (a: \underline{12}), (c: \underline{16})$$

[Iteration 5] Extract vertex  $d$ , update vertex  $c$

$$h: d = 0, f: d = 2, g: d = 5, b: d = 10, d: d = 9$$

$$D = (e: \underline{8}), (a: \underline{12}), (c: \underline{15})$$

[Iteration 6] Extract vertex  $e$ , no update vertex

$$h: d = 0, f: d = 2, g: d = 5, b: d = 10, d: d = 9, e: d = 8$$

$$D = (a: \underline{12}), (c: \underline{15})$$

[Iteration 7] Extract vertex  $a$ , update vertex  $c$

$$h: d = 0, f: d = 2, g: d = 5, b: d = 10, d: d = 9, e: d = 8, a: d = 12$$

$$D = (c: \underline{14})$$

[Iteration 8] Extract vertex  $c$ , no update vertex

$$h: d = 0, f: d = 2, g: d = 5, b: d = 10, d: d = 9, e: d = 8, a: d = 12,$$

$$c: d = 14$$

$$D = \emptyset$$