Computer Networking

Assignment 3

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Problem 1: Switching Fabrics (10 points)

(1) The minimal number of time slots needed is 3.

The scheduling is as follows.

Slot 1: send X in top input queue, send Y in middle input queue.

Slot 2: send X in middle input queue, send Y in bottom input queue

Slot 3: send Z in bottom input queue.

(2) The largest number of slots is still 3.

Actually, based on the assumption that a non-empty input queue is never idle, we see that the first time slot always consists of sending X in the top input queue and Y in either middle or bottom input queue, and in the second time slot, we can always send two more datagram, and the last datagram can be sent in third time slot.

（3）Actually, if the first datagram in the bottom input queue is X, then the worst case would require 4 time slots.

Problem 2: Packet Scheduling (10 points)

(1) 112311231123…

Because 1 account for 50%,it should be twice as frequent as any other

(2) 112112112…

Problem 3: IP Addressing (15 points)

(1)

|  |  |
| --- | --- |
| Prefix Match | Link Interface |
| 11100000 00 | 0 |
| 11100000 01000000 | 1 |
| 1110000 | 2 |
| 11100001 1 | 3 |
| otherwise | 3 |

(2)

The first address :Link Interface 3. Because its prefix match 11001000 10010001 is belong to otherwise.

The second address :Link Interface 2. Because its prefix match 11100001 is belong to 1110000.

The third address :Link Interface 3. Because its prefix match 11100001 1 is belong to Link interface 3.

(3)

|  |  |
| --- | --- |
| Prefix Match | Link Interface |
| 11100000 00 (224.0/10) | 0 |
| 11100000 01000000 (224.64/16) | 1 |
| 1110000 (224/8) | 2 |
| 11100001 1 (225.128/9) | 3 |
| otherwise | 3 |

Problem 4: Subnet (10 points)

(1)

Subnet A: 214.97.255/24 (256 addresses)

Subnet B: 214.97.254.0/25 - 214.97.254.0/29 (128-8 = 120 addresses)

Subnet C: 214.97.254.128/25 (128 addresses)

Subnet D: 214.97.254.0/31 (2 addresses)

Subnet E: 214.97.254.2/31 (2 addresses)

Subnet F: 214.97.254.4/30 (4 addresses)

(2)

Router 1

Longest Prefix Match Outgoing Interface

11010110 01100001 11111111 Subnet A

11010110 01100001 11111110 0000000 Subnet D

11010110 01100001 11111110 000001 Subnet F

Router 2

Longest Prefix Match Outgoing Interface

11010110 01100001 11111111 0000000 Subnet D

11010110 01100001 11111110 0 Subnet B

11010110 01100001 11111110 0000001 Subnet E

Router 3

Longest Prefix Match Outgoing Interface

11010110 01100001 11111111 000001 Subnet F

11010110 01100001 11111110 0000001 Subnet E

11010110 01100001 11111110 1 Subnet C

Problem 5: SDN (15 points)

|  |  |  |
| --- | --- | --- |
| **S2 Flow Table** | | |
| **Match** | **Action** |
| Ingress Port = 1; IP Src = 10.3.\*.\*; IP Dst = 10.1.\*.\* | Forward (2) |
| Ingress Port = 2; IP Src = 10.1.\*.\*; IP Dst = 10.3.\*.\* | Forward (1) |
| Ingress Port = 1; IP Dst = 10.2.0.3  Ingress Port = 2; IP Dst = 10.2.0.3  Ingress Port = 1; IP Dst = 10.2.0.4  Ingress Port = 2; IP Dst = 10.2.0.4 | Forward (3)  Forward (3)  Forward (4)  Forward (4) |
| Ingress Port = 4  Ingress Port = 3 | Forward (3)  Forward (4) |

Problem 6: Link State Routing (10 points)

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| *Step* | *N’* | *D(t),p(t)* | *D(u),p(u)* | *D(v),p(v)* | *D(w),p(w)* | *D(y),p(y)* | *D(z),p(z)* |
| 0 | x | ∞ | ∞ | 3,x | 6,x | 6,x | 8,x |
| 1 | xv | 7,v | 6,v | 3,x | 6,x | 6,x | 8,x |
| 2 | xvu | 7,v | 6,v | 3,x | 6,x | 6,x | 8,x |
| 3 | xvuw | 7,v | 6,v | 3,x | 6,x | 6,x | 8,x |
| 4 | xvuwy | 7,v | 6,v | 3,x | 6,x | 6,x | 8,x |
| 5 | xvuwyt | 7,v | 6,v | 3,x | 6,x | 6,x | 8,x |
| 6 | xvuwytz | 7,v | 6,v | 3,x | 6,x | 6,x | 8,x |

Problem 7: Distance Vector Routing (10 points)

(1) Dx(w) = 2, Dx(y) = 4, Dx(u) = 7

(2)

First consider what happens if c(x,y) changes. If c(x,y) becomes larger or smaller (as

long as c(x,y) >=1) , the least cost path from x to u will still have cost at least 7. Thus

a change in c(x,y) (if c(x,y)>=1) will not cause x to inform its neighbors of any

changes.

If c(x,y)= δ<1, then the least cost path now passes through y and has cost δ+6.

Now consider if c(x,w) changes. If c(x,w) = ε ≤ 1, then the least-cost path to u continues to pass through w and its cost changes to 5 + ε; x will inform its neighbors of this new cost. If c(x,w) = δ > 6, then the least cost path now passes through y and has cost 11; again x will inform its neighbors of this new cost.

(3) Any change in link cost c(x,y) (and as long as c(x,y) >=1) will not cause x to inform

its neighbors of a new minimum-cost path to u .

Problem 8: Border Gateway Protocol (20 points)

(1) eBGP

(2) iBGP

(3) eBGP

(4) iBGP

(5) I1, Because the interface runs the cheapest path from 1D to 1C gateway routers.

(6) I2, According to the hotpotato protocol, Both routes have equal AS-PATH length but I2 begins the path that has the closest NEXT-HOP router

(7) I1, I1 begins the path that has the shortest AS-PATH