

## CS305 Computer Networks Homework 3

1. For 8-bit host addresses with longest prefix matching router, prefix 110 and 111 are matched first. Give a formulation to calculate number, assume prefix length is  $n$ : *number* =  $2^{8-n}$ .

Prefix	Dst Range	Number
00	0000 0000 – 0011 1111	64
01	0100 0000 – 0111 1111	64
10	1000 0000 – 1011 1111	64
110	1100 0000 – 1101 1111	32
111	1110 0000 – 1111 1111	32

2. For each subnet, the minimal bits length is:  $2^6 = 64, 2^7 = 128, 2^4 = 16$ . Then use those length to identify the host part length for each subnet: *length* =  $32 - n$ .

Subnet 1	Subnet 2	Subnet 3
222.1.16.64/26	222.1.16.128/25	222.1.16.16/28

In fact, all  $d \geq 2^n$  is fine for IP addresses.

3. Local network can support up to 128 interfaces.
- a) For simplification, assign IP address as follow:

Interface 1	Interface 2	Interface 3
192.168.2.1	192.168.2.2	192.168.2.3

- b) In the assumption in (a), randomly pick ports that TCP uses. Then, the 6 entries in NAT table are:

WAN side addr	LAN side addr
24.34.112.232, 5001	192.168.2.1, 3001
24.34.112.232, 5002	192.168.2.1, 3002
24.34.112.232, 5003	192.168.2.2, 3001
24.34.112.232, 5004	192.168.2.2, 3002
24.34.112.232, 5005	192.168.2.3, 3001
24.34.112.232, 5006	192.168.2.3, 3003

4. Destination-based forwarding: only has destination range and link interface (for longest-prefix matching example).

OpenFlow: containing rule, action, and even stats.

5. First, the iteration steps are:

Iteration	Current	Distance	Visited Set
1	x	z8, y6, v2, w6	(x)
2	v	y6, t6, u5, w6	(x, v)
3	u	w6, t6	(x, v, u)
4	y	z8, t6	(x, v, u, y)
5	w		(x, v, u, y, w)
6	t		(x, v, u, y, w, t)
7	z		(x, v, u, y, w, t, z)

The final forwarding table is:

Destination	Next step
z	z
y	y
v	v
w	w
t	v
u	v

6. Use Dijkstra's algorithm to find solution.

- a) Distance vectors:  $dis(x, w) = 2, dis(x, y) = 4, dis(x, u) = 7$ .
- b) Example:  $c(x, w) = 5$ , but no matter how link-cost  $c(x, y)$  changes, as long as the distance is a positive number, x won't inform a new minimum-cost path to u.
- c) Example:  $c(x, w) = 3, c(x, y) = -3$ .