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CS 118
DIS 1A

Homework 6

1.

a. Represent in compressed representation and with IPv4-dot notation of last 32 bits

```
i. 2001:4860:4860:0000:0000:0000:0000:8888
= 2001:4860:4860::8888
= 2001:4860:4860:0::0.0.136.136

ii. 2a03:2880:2040:7f21:face:b00c:0000:25de
= 2a03:2880:2040:7f21:face:b00c::25de
= 2a03:2880:2040:7f21:face:b00c:0.0.37.222

iii. 2620:0000:0ccc:0000:0000:0000:0000:0002
= 2620:0:ccc::2
= 2620:0:ccc::0.0.0.2

iv. 0000:0000:0000:0000:0000:0000:0000:0001
= ::1
= ::0.0.0.1

v. 2605:e000:1521:0073:f4f0:6edb:fa4e:ed6f
= 2605:e000:1521:73:f4f0:6edb:fa4e:ed6f
= 2605:e000:1521:73:f4f0:6edb:250.78.237.111
```

b. Show the expanded representation of

```
i. 2607:f010:bfc:e009::2/64
= 2607:f010:0bfc:e009:0000:0000:0000:0002

ii. ::ffff:131.179.196.70
= 0000:0000:0000:0000:0000:ffff:83b3:c446
```

c. Calculate the number of addresses in the network, the first address, and the last address of

```
i. 2607:f010:bfc:e009::2/64
  number of addresses: 18446744073709551616
  first address: 2607:f010:bfc:e009:0000:0000:0000:0000
  last address: 2607:f010:bfc:e009:ffff:ffff:ffff:ffff

ii. 2620:0:1c00::/40
  number of addresses: 309485009821345068724781056
  first address: 2620:0:1c00:0000:0000:0000:0000:0000
  last address: 2620:0:1cff:ffff:ffff:ffff:ffff:ffff
```

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```
iii. 2620:107:3000::/44
  number of addresses: 19342813113834066795298816
  first address: 2620:107:3000:0000:0000:0000:0000:0000
  last address: 2620:107:300f:ffff:ffff:ffff:ffff:ffff


iv. 2600:1406:32::/48
  number of addresses: 1208925819614629174706176
  first address: 2600:1406:32:0000:0000:0000:0000:0000
  last address: 2600:1406:32:ffff:ffff:ffff:ffff:ffff
```

2. Considering calculations from the perspective of node z:

a. Show a table showing iterations of the Link State routing algorithm.

Iteration	Visited (length)	Dz	Dy	Dx	Dw	Dv	Du	Dt	Ds
0	Z (0)	0	14	-	-	-	-	2	-
1	Z,T (2)	0	6	-	-	11	4	2	3
2	Z,Y (14)	0	6	12	-	7	4	2	3
3	Z,T,S (3)	0	6	12	-	7	4	2	3
4	Z,T,U (4)	0	6	12	7	5	4	2	3
5	Z,T,U,V (5)	0	6	8	6	5	4	2	3
6	Z,T,U,V,W (6)	0	6	7	6	5	4	2	3

b. Show a resulting routing table (next hop for each destination).

Destination	Next Hop
Y	T
X	T
W	T
V	T
U	T
T	T
S	T

c. Assume the link between y and t is broken at time T. Estimate the amount of time needed to recalculate routing tables (in absolute time and/or link propagation delays L).

$$Z \rightarrow Y = L$$
$$Z \rightarrow Y \rightarrow V = 2L$$
$$Z \rightarrow Y \rightarrow V \rightarrow W = 3L$$
$$Z \rightarrow Y \rightarrow V \rightarrow U = 3L$$
$$Z \rightarrow Y \rightarrow V \rightarrow U \rightarrow T = 4L$$
$$round\ trip = 2 * (1 + 2 + 3 + 3 + 4)L = 26L$$

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3. Considering calculations from the perspective of node z:

a. Show a table showing iterations of the DV algorithm with split horizon and poison reverse.

Iteration	Z receives data from	Dz	Dy	Dt	Dv	Ds	Du	Dx	Dw
0	Z	0	14	2	-	-	-	-	-
1	T	∞	6	2	11	3	4	-	-
2	Y	∞	6	2	7	-	-	12	-
3	S	-	-	2	7	3	4	-	-
4	U	-	-	2	5	3	4	-	7
5	V	-	6	2	5	-	4	10	7
6	W	-	-	-	5	-	4	7	6

b. Show a resulting routing table (next hop for each destination).

Destination	Next Hop
Y	T
X	T
W	T
V	T
U	T
T	T
S	T

c. Assume the link between y and t is broken at time T. Estimate the amount of time needed to recalculate routing tables (in absolute time and/or link propagation delays L).

$$Z \rightarrow Y = L$$
$$Y \rightarrow X, V, T = L$$
$$V \rightarrow Y, T, U, W, X = L$$
$$W \rightarrow X, V, U = L$$
$$U \rightarrow W, V, T, S = L$$
$$T \rightarrow Y, V, U, S = L$$
$$(1 + 1 + 1 + 1 + 1 + 1)L = 6L$$

4. Suppose AS3 and AS2 are running OSPF for their intra-AS routing protocol. Suppose AS1 and AS4 are running RIP for their intra-AS routing protocol. Suppose eBGP and iBGP are used for the inter-AS routing protocol. Initially suppose there is no physical link between AS2 and AS4.

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At some time T, the prefix x appears in AS4, adjacent to the router 4a. From which routing protocol (OSPF, RIP, eBGP, or iBGP):

a. Router 3c learns about prefix x?
eBGP

b. Router 3a learns about prefix x?
iBGP

c. Router 1c learns about prefix x?
eBGP

d. Router 1d learns about prefix x?
iBGP