

Homework 2

CS530 Advanced Networks

Exercise 1

Suppose the following synthetic TCP traffic exchange between the two hosts 174.23.87.24 and 193.20.65.86 and captured on the host 174.23.87.24.

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1. 174.23.87.24/21->193.20.65.86/56534 seq(34) ACK(45) data(300)
2. 174.23.87.24/56534->193.20.65.86/21 seq(45) ACK(334) data(0)
3. 174.23.87.24/21->193.20.65.86/56534 seq(334) ACK(45) data(300)
4. 174.23.87.24/21->193.20.65.86/56534 seq(634) ACK(45) data(300)
5. 174.23.87.24/56534->193.20.65.86/21 seq(45) ACK(634) data(0)
6. 174.23.87.24/56534->193.20.65.86/21 seq(45) ACK(934) data(0)
7. 174.23.87.24/21->193.20.65.86/56534 seq(934) ACK(45) data(300)
8. 174.23.87.24/21->193.20.65.86/56534 seq(1234) ACK(45) data(300)
9. 174.23.87.24/21->193.20.65.86/56534 seq(1534) ACK(45) data(300)
10. 174.23.87.24/21->193.20.65.86/56534 seq(1834) ACK(45) data(300)
12. 174.23.87.24/56534->193.20.65.86/21 seq(45) ACK(1234) data(0)
13. 174.23.87.24/56534->193.20.65.86/21 seq(45) ACK(1534) data(0)
14. 174.23.87.24/56534->193.20.65.86/21 seq(45) ACK(1834) data(0)
15. 174.23.87.24/56534->193.20.65.86/21 seq(45) ACK(2134) data(0)
16. 174.23.87.24/21->193.20.65.86/56534 seq(2134) ACK(45) data(300)
17. 174.23.87.24/21->193.20.65.86/56534 seq(2434) ACK(45) data(300)
18. 174.23.87.24/21->193.20.65.86/56534 seq(2734) ACK(45) data(300)
19. 174.23.87.24/21->193.20.65.86/56534 seq(3034) ACK(45) data(300)
20. 174.23.87.24/21->193.20.65.86/56534 seq(3334) ACK(45) data(300)
21. 174.23.87.24/21->193.20.65.86/56534 seq(3634) ACK(45) data(300)
22. 174.23.87.24/21->193.20.65.86/56534 seq(3934) ACK(45) data(300)
23. 174.23.87.24/21->193.20.65.86/56534 seq(4234) ACK(45) data(300)
24. 174.23.87.24/56534->193.20.65.86/21 seq(45) ACK(2434) data(0)
25. 174.23.87.24/56534->193.20.65.86/21 seq(45) ACK(2734) data(0)
26. 174.23.87.24/56534->193.20.65.86/21 seq(45) ACK(3034) data(0)
27. 174.23.87.24/56534->193.20.65.86/21 seq(45) ACK(3334) data(0)
28. 174.23.87.24/56534->193.20.65.86/21 seq(45) ACK(3334) data(0)
29. 174.23.87.24/56534->193.20.65.86/21 seq(45) ACK(3334) data(0)
30. 174.23.87.24/56534->193.20.65.86/21 seq(45) ACK(3334) data(0)
20. 174.23.87.24/21->193.20.65.86/56534 seq(3334) ACK(45) data(300)
21. 174.23.87.24/21->193.20.65.86/56534 seq(3634) ACK(45) data(300)
22. 174.23.87.24/21->193.20.65.86/56534 seq(3934) ACK(45) data(300)
23. 174.23.87.24/21->193.20.65.86/56534 seq(4234) ACK(45) data(300)
24. 174.23.87.24/21->193.20.65.86/56534 seq(4534) ACK(45) data(300)
25. 174.23.87.24/21->193.20.65.86/56534 seq(4834) ACK(45) data(300)
26. 174.23.87.24/56534->193.20.65.86/21 seq(45) ACK(3634) data(0)
27. 174.23.87.24/56534->193.20.65.86/21 seq(45) ACK(3934) data(0)
28. 174.23.87.24/56534->193.20.65.86/21 seq(45) ACK(4234) data(0)
29. 174.23.87.24/56534->193.20.65.86/21 seq(45) ACK(4534) data(0)
30. 174.23.87.24/56534->193.20.65.86/21 seq(45) ACK(4834) data(0)
31. 174.23.87.24/56534->193.20.65.86/21 seq(45) ACK(5134) data(0)
32. 174.23.87.24/21->193.20.65.86/56534 seq(5134) ACK(45) data(300)
33. 174.23.87.24/21->193.20.65.86/56534 seq(5434) ACK(45) data(300)
34. 174.23.87.24/21->193.20.65.86/56534 seq(5734) ACK(45) data(300)
35. 174.23.87.24/21->193.20.65.86/56534 seq(6034) ACK(45) data(300)
36. 174.23.87.24/21->193.20.65.86/56534 seq(6334) ACK(45) data(300)
37. 174.23.87.24/21->193.20.65.86/56534 seq(6634) ACK(45) data(300)
38. 174.23.87.24/21->193.20.65.86/56534 seq(6934) ACK(45) data(300)
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1) What are the different values of the congestion window **cwind**?

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2) What are the different congestion control phases that appear in the previous exchange?

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3) What are the different values of **ssthresh**?

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4) What is the impact of the loss of the segment at the step 13?

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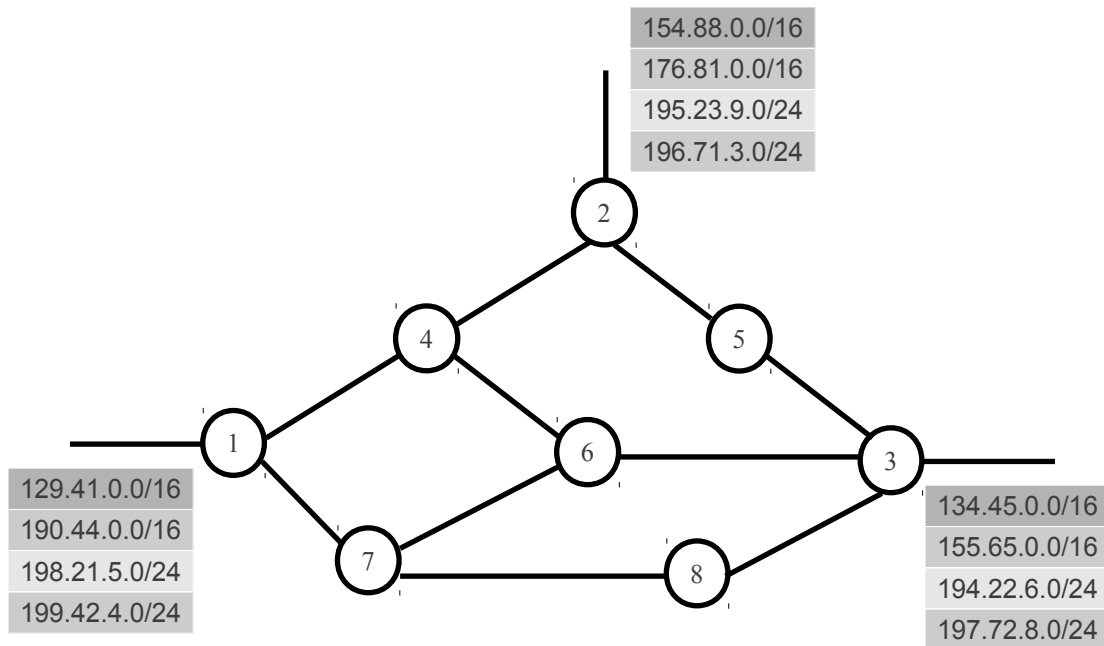
5) What is the impact of the loss of the segment at the step 14?

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Exercise 3

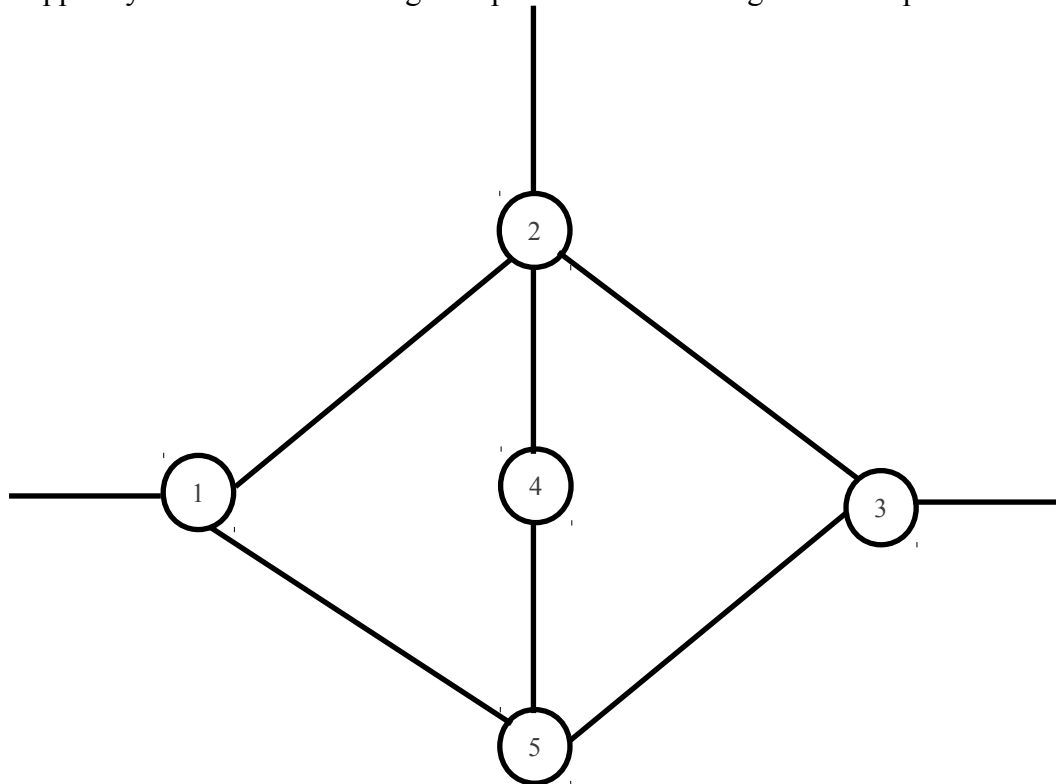
Suppose you have the following MPLS-enabled transit network where each ASBR (1, 2, and 3) router is advertising a list of prefixes inside the network. The transit network is running the OSPF protocol as an IGP. Give the different routing table of different routers (We will focus only on external routes learned from BGP). Give the different switching tables of the different LSRs.

Suppose each ASBR is advertising more than 160000 entries in the network, what is the solution that you propose in order to reduce the overhead introduced by the advertisement of different mappings between labels/prefixes?.



Exercise 4

Suppose you have the following transport network running the OSPF protocol.



Suppose also you have the following traffic matrix and that each link is a bidirectional with a bandwidth of 1Mbps in each direction.

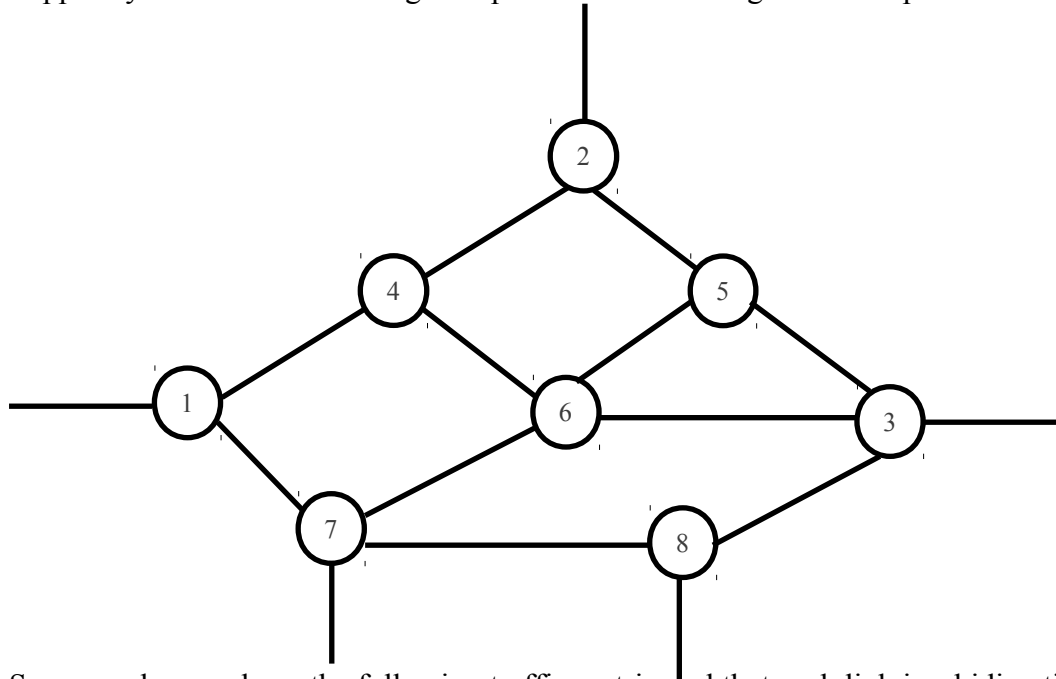
Traffic matrix

Source	Destination	Traffic (Mbps)
1	2	1
1	3	1
2	1	1
2	3	1
3	1	1
3	2	1

Give the optimal distribution of costs on links in order to forward the traffic without loss.

Exercise 5

Suppose you have the following transport network running the OSPF protocol.



Suppose also you have the following traffic matrix and that each link is a bidirectional with a bandwidth of 10Mbps in each direction.

Traffic matrix

Source	Destination	Traffic (Mbps)
1	2	6
1	3	3
1	7	2
1	8	2
2	1	6
2	3	3
2	7	2
2	8	2
7	1	5
7	2	3
7	3	4
7	8	5
8	1	5
8	2	2
8	3	2
8	7	4

Is it easy to determine the optimal distribution of costs on links in order to forward the traffic without loss?

What is the traffic engineering solution that you propose in order to satisfy the traffic demands without loss?

Implement the proposed solution.

Exercise 7

Analyze the content of the following frame.

Frame

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0024 ee23 22ba 00a9 3ebb ddf4 8847 00a4
0120 4510 003c 4c03 4000 3e06 eb08 c6ac
6247 c5a1 170b d228 0a6e 1dda 7308 0000
0000 5010 1008 81fa 0000 0001 0203 0405
0607 0809 0a0b 0c0d 0e0f 1011 1213
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