

# Homework Problem Set 3

(Due on April 9)

## I. Reading Assignment

*Required Reading:* [JK] Section 4.1, 4.3, 4.4 (except 4.4.5), 4.5, 4.6, 4.7, 4.8

## II. Homework Problems and Questions

1. (5 pts) The figure below shows a screen shot of IP traffic from Wireshark. Please answer the questions below based on the information from the figure.

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⊕ Frame 58: 62 bytes on wire (496 bits), 62 bytes captured (496 bits)
⊕ Ethernet II, Src: Wistron_86:9f:ff (00:1d:72:86:9f:ff), Dst: Ditech_2b:fc:00 (00:d0:02:2b:fc:00)
⊕ Internet Protocol, Src: 129.59.89.185 (129.59.89.185), Dst: 211.99.196.185 (211.99.196.185)
    Version: 4
    Header length: 20 bytes
⊕ Differentiated Services Field: 0x00 (DSCP 0x00: Default; ECN: 0x00)
    Total Length: 48
    Identification: 0x2818 (10264)
⊕ Flags: 0x02 (Don't Fragment)
    Fragment offset: 0
    Time to live: 128
    Protocol: TCP (6)
⊕ Header checksum: 0x5f9e [correct]
    Source: 129.59.89.185 (129.59.89.185)
    Destination: 211.99.196.185 (211.99.196.185)

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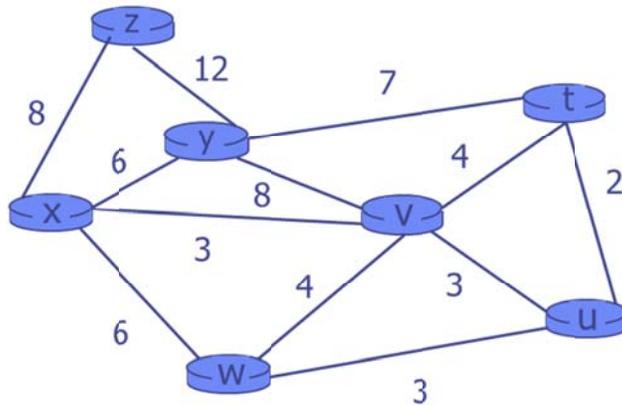
- Is this an IPv4 datagram or an IP v6 datagram?
- What are the source and destination addresses of this IP datagram?
- What is the transport layer protocol that is associated with this IP datagram? Why such information is needed in the datagram?
- What is the length of this datagram? what is the header length?
- What is the “Time to live” value of this datagram? What it means?

2. (5 pts) Consider sending a 2400-byte datagram into a link that has an MTU of 700 bytes. How many fragments are generated? What are their offset values?

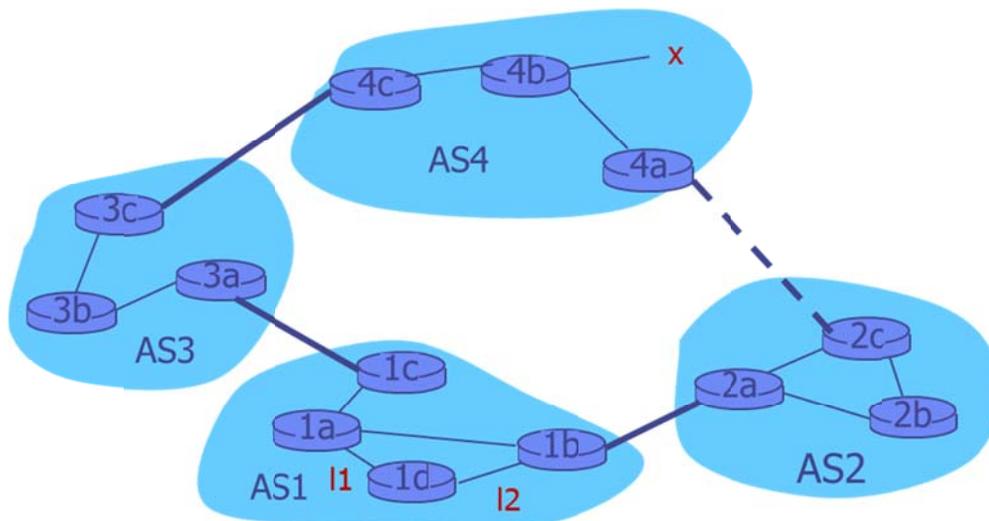
3. (5 pts) Consider a subnet with prefix 128.119.40.128/26. Give an example of one IP address (of form XXX.XXX.XXX.XXX) that can be assigned to this network. Suppose an ISP owns the block of addresses in form 128.119.40.64/26 and it wants to create four subnets from this block, with each block having the same number of IP addresses. What are the prefixes (of form a.b.c.d/x) for the four subnets?

4. (25 pts) Consider the following network with the indicated link cost.

- Use Dijkstra’s shortest-path algorithm to compute the shortest path from x to all network nodes. Please show the steps of your computation using a table similar to Table 4.3 in [JK].
- Now consider Bellman-ford distance-vector algorithm. Assume that each node only knows the costs to its direct neighbors initially. Please provide x’s distance vector to all other nodes in the network. Please show the steps of your computation using a table(s).



5. (10 pts) Consider the network shown below. 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.



- Router 3c learns about subnet with prefix x from which routing protocol: OSPF, RIP, eBGP, or iBGP?
- Router 1d learns about subnet with prefix x from which routing protocol?
- Once router 1d learns about x it will put an entry (x,I) in its forwarding table. Will I be I1 or I2 for this entry? Explain your answer briefly.
- Now suppose that there is a physical link between AS2 and AS4, shown by the dashed line. Suppose router 1d learns that x is accessible via AS2 as well as via AS3. Will I be set to I1 or I2? Explain your answer briefly.
- Now suppose that there is another AS, called AS5, which lies on the path between AS2 and AS4 (not shown in diagram). Suppose router 1d learns that x is accessible via AS2, AS5, AS4 as well as via AS3, AS4. Will I be set to I1 or I2? Explain your answer briefly.