CSC358 Tutorial 7

Question 1: Concept Review

(a) What is the difference between the data plane and the control plane of the network layer?

(b) Does a router have an IP address? If so, how many?

(c) We know that the complexity of Dijkstra's algorithm is $\mathcal{O}(N^2)$ where N is the number of nodes in the graph. We also know that the Internet has (at least) billions of nodes. N^2 with N being billions is HUGE. How come the Dijkstra's algorithm is still being widely used and is, in fact, quite effective in the Internet?

Question 2: Forwarding Table

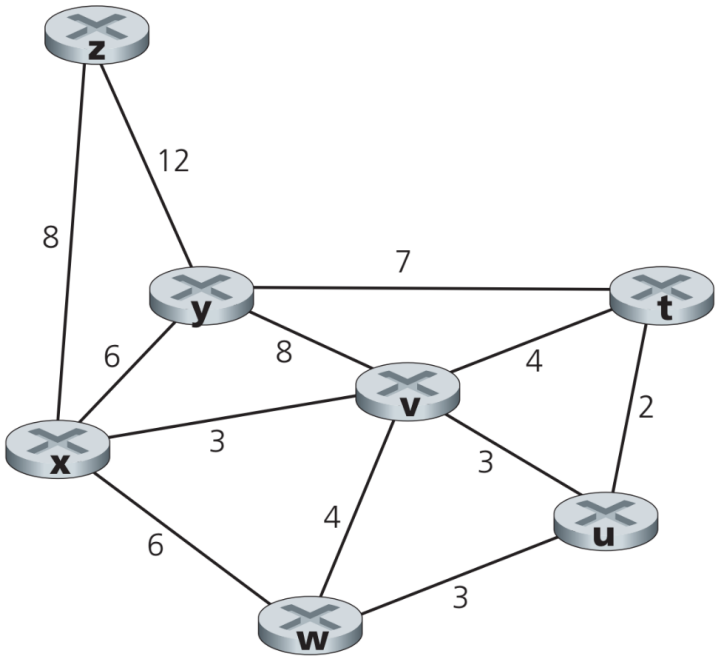
Consider a datagram network using 32-bit host addresses. Suppose a router has four link interfaces, numbered 0 through 3, and packets are to be forwarded to the link interfaces as follows:

Destination Address Range	Link Interface
11100000 00000000 00000000 00000000 through 11100000 00111111 11111111 11111111	0
11100000 01000000 00000000 00000000 through 11100000 01000000 11111111 11111111	1
11100000 01000001 00000000 00000000 through 11100001 01111111 11111111 11111111	2
otherwise	3

Provide a forwarding table that uses longest prefix matching, and forwards packets to the correct link interface. Your table should have as few entries as possible.

Question 3: Link-State Routing Algorithm

Consider the following network. With the indicated link costs, use Dijkstra's algorithm to compute the shortest path from x to all network nodes. Show your work.



Question 4: Distance-Vector Routing Algorithm

Consider the network shown below, and assume that each node initially knows the cost to each of its neighbours. Consider the distance-vector algorithm and show the change of the distance table entries at node z.