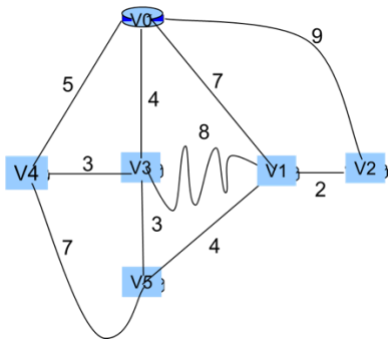
Homework 10 & Solutions (highlighted in yellow): Part of the review materials for the Final Exam, NO Submission.

Problem A: The Dijkstra's algorithm is implemented at router V_0 to build up the shortest-path tree rooted at source router V_0. The topology is given in the figure on the right.



(a) Fill in all the elements in the Link Cost matrix (2D Array), **C**, used by router V0 to record this topology. (Hint: in this example, **C** is a 6 x 6 matrix.)

(b) After the **Initialization** step in the Dijkstra's algorithm, what are the following values:

The set N' {v0}

The set Y' ∅

D(i) for each i between 1 and ***n* -1** D[1] ~ D[5]: 7, 9, 4, 5, ∞

p(i) for each i between 1 and ***n* -1** P[1] ~ P[5]: v0, v0, v0, v0, –

(c) After the 1st iteration in the Dijkstra's algorithm, what are the following values:

The set N' {v0, v3}

The set Y' {(v0, v3)}

D(i) for each i between 1 and ***n* – 1** D[1] ~ D[5]: 7, 9, 4, 5, 7

p(i) for each i between 1 and ***n* – 1** P[1] ~ P[5]: v0, v0, v0, v0, v3

(d) After the last iteration in the Dijkstra's algorithm, what are the following values:

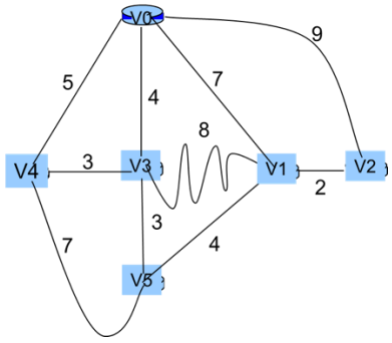
The set N' {v0, v3, v4, v1, v5, v2}

The set Y' {(v0, v3), (v0, v4), (v0, v1), (v3, v5), (v0, v2)}

D(i) for each i between 1 and ***n* – 1** D[1] ~ D[5]: 7, 9, 4, 5, 7

p(i) for each i between 1 and ***n* – 1** P[1] ~ P[5]: v0, v0, v0, v0, v3

Problem B: The Distance Vector algorithm is implemented at router V_0 to build up the forwarding table at source router V_0. The topology is given in the figure on the right.



(a) Assuming that the Distance Vector algorithm running on router V_0 has stabilized for the given topology, fill in all the elements for each one of the following vectors maintained at router V0. (Hint: the size of each vector is 6)

Distance Vector D0 = [0 7 9 4 5 7]

Link Vector L0 = [- v1 v2 v3 v4 v3]

Distance Vector D1 = [7 0 2 7 10 4]

Distance Vector D2 = [9 2 0 9 12 6]

Distance Vector D3 = [4 7 9 0 3 3]

Distance Vector D4 = [5 10 12 3 0 6]

(b) when router V0 detects that the cost of link (V0, V3) changes from 4 to 10, what are the new values of the elements in D0 and L0 re-computed by router V0 using the Distance Vector algorithm? Should router V0 notify its neighbors?

Distance Vector D0 = [0 7 9 8 5 11] yes, notify all its neighbors.

Link Vector L0 = [v0 v1 v1 or v2 v4 v4 v1 or v4]

Re-computation details: D0 = [0, min(7+0,9 + 2, 10+ 7, 5+ 10), min(7+ 2, 9+ 0, 10+ 9, 5+ 12), min(7+ 7, 9+ 9, 10+ 0, 5+ 3), min(7+ 10, 9+ 12, 10+ 3, 5+ 0), min(7+ 4, 9+ 6, 10+ 3, 5+ 6]

(c) if event b didn't occur, when router V0 receives a new D3 = [4 8 10 0 3 10] from V3, what are the new values of the elements in D0 and L0 re-computed by router V0 using the Distance Vector algorithm? Should router V0 notify its neighbors?

Distance Vector D0 = [0 7 9 4 5 11] yes, notify all its neighbors

Link Vector L0 = [v0 v1 v1 or v2 v3 v4 v1 or v4]

Re-computation details: D0 = [0, min(7+0,9 + 2, 4+ 8, 5+ 10), min(7+ 2, 9+ 0, 4+ 10, 5+ 12), min(7+ 7, 9+ 9, 4+ 0, 5+ 3), min(7+ 10, 9+ 12, 4+ 3, 5+ 0), min(7+ 4, 9+ 6, 4+ 10, 5+ 6]

Problem C. Mobile travels to a visited network whose mobility agent is Foreign Agent 1 (FA1). A correspondent initiates a communication with this mobile while this mobile is in the visited network of FA1. In the middle of the communication, this mobile moves to a new visited network whose mobility agent is Foreign Agent 2 (FA2). SELECT all the **relevant** events from the following list and LIST them **in the order of occurrence** to complete the following two scenarios, respectively. **Hint**: the events for registration, the communication while this mobile is in FA1's network, and the communication while this mobile moves to FA2's network must be included in both scenarios; some events, such as **d** in both scenarios, **f** in scenario 1, and **e** in scenario 2, may be LISTED more than one times.

(**Review Tips for Final Exam**: Please also review the scenarios of the basic **direct routing in a data network**.)

(1) the scenario of supporting mobility via **indirect routing** in a data network

____a, n, h, f, i, o, d, b, r, k, f, l, s, d_____

(2) the scenario of supporting mobility via **direct routing with the use of anchor foreign agen**t in a data network

____ a, n, h, g, j, e, o, d, c, q, m, e, p, s, d_____

a. While entering the visited network of FA1, this mobile contacts FA1 and sends FA1 its permanent address.
b. While entering the visited network of FA2, this mobile contacts FA2 and sends FA2 its permanent address.
c. While entering the visited network of FA2, this mobile contacts FA2 and sends FA2 its care-of-address assigned by FA1.
d. This mobile replies directly to the correspondent.
e. The correspondent sends IP datagrams with this mobile's care-of-address assigned by FA1 as the destination ip address.
f. The correspondent sends IP datagrams with the permanent address of this mobile as the destination ip address.
g. The correspondent contacts the home agent to request the care-of-address of this mobile.
h. The home agent records a mapping between this mobile's permanent address and its care-of-address assigned by FA1.
i. The home agent intercepts IP datagrams destined to the permanent address of this mobile, encapsulates them in IP datagrams using this mobile's care-of-address assigned by FA1 as the destination ip address, and forwards them out.
j. The home agent sends this mobile's care-of-address assigned by FA1 to the correspondent.
k. The home agent records a mapping between this mobile's permanent address and its care-of-address assigned by FA2.
l. The home agent intercepts IP datagrams destined to this mobile's permanent address, encapsulates them in IP datagrams using this mobile's care-of-address assigned by FA2 as the destination ip address, and forwards them out.
m. FA1 records a mapping between this mobile's care-of-address assigned by FA1 and its care-of-address assigned by FA2.
n. FA1 assigns a care-of-address to this mobile, and sends both the permanent address and such care-of-address of this mobile to the home agent.
o. FA1 receives IP datagrams destined to this mobile's care-of-address assigned by FA1, and forwards them to this mobile.
p. FA1 receives IP datagrams destined to this mobile's care-of-address assigned by FA1, and forwards them to FA2 using this mobile's care-of-address assigned by FA2 as the destination ip address.
q. FA2 assigns a care-of-address to this mobile, and sends both this mobile's care-of-address assigned by FA1 and this new care-of-address to FA1.
r. FA2 assigns a care-of-address to this mobile, and sends both the permanent address and this new care-of-address of this mobile to the home agent.
s. FA2 receives IP datagrams destined to this mobile's care-of-address assigned by FA2, and forwards them to this mobile.