

**CSE 550 - Computer Network Design  
Spring 2007 (Term 062)**

**Homework 3**

Date: Wednesday, April 18<sup>th</sup>, 2007

**Q1.** Consider the terminal assignment problem defined in the following table showing the cost matrix:

	A	B	C
a	3	6	5
b	5	7	2
c	1	3	4
d	2	8	5
e	7	1	9
f	10	2	3

The problem consists of 3 concentrators A, B, C, and 6 terminals, a, b, c, d, e, and f. Assume that each terminal has a weight of 1 and each concentrator has a capacity of 2.

Use the *Augmenting Path Algorithm* to find an optimal solution to this terminal assignment problem.

**Q2.** Consider the concentrator location problem defined in the following table showing the cost matrix:

	C <sub>1</sub>	C <sub>2</sub>	C <sub>3</sub>	C <sub>4</sub>
T <sub>1</sub>	5	9	2	6
T <sub>2</sub>	3	1	4	1
T <sub>3</sub>	5	8	9	7
T <sub>4</sub>	9	3	2	4

The problem consists of 4 concentrators C<sub>1</sub>, C<sub>2</sub>, C<sub>3</sub>, and C<sub>4</sub>; and 4 terminals, T<sub>1</sub>, T<sub>2</sub>, T<sub>3</sub>, and T<sub>4</sub>.

Assume that each terminal has a weight of 1 and each concentrator has a capacity of 2, and the cost of adding any of the 4 concentrators is 5.

Use the *Add Algorithm* to find a solution to this concentrator location problem. Solve the problem for 4 cases, each time using one of the 4 concentrators as the centre.

What conclusions can you draw from the solutions obtained?

**Q3.** A company has 6 divisions, each serviced by a 100 Mbps Ethernet workgroup switch, labelled  $S_1$  to  $S_6$ . The company has acquired three backbone switches  $B_1$ ,  $B_2$ , and  $B_3$ , each with four interfaces. Two of these interfaces are 100 Mbps Ethernet interfaces, and the two others are 1Gbps Fast Ethernet interfaces.

The cost of connecting each of the workgroup switches to each of the backbone switches is as specified in the following cost matrix:

	$B_1$	$B_2$	$B_3$
$S_1$	6	3	8
$S_2$	2	9	4
$S_3$	3	1	4
$S_4$	2	5	9
$S_5$	1	6	3
$S_6$	2	7	9

Find a minimum cost feasible assignment of the workgroup switches to the Backbone switches, and give the cost of such assignment.

**You must show all the steps.**

**Q4.** A company has 6 divisions, each serviced by a 1Gbps Ethernet switch, labelled  $S_1$  to  $S_6$ . The company has one router ( $R_1$ ) available, and need to decide on how many other routers to acquire, if any, among three possible routers:  $R_2$ ,  $R_3$ , and  $R_4$ . Each one of the four routers has five 1Gbps interfaces. The routers that will be used by the company will be connected to each other in a ring topology.

The cost of acquiring a new router is 2, and the cost of connecting switches to routers is specified in the following cost matrix:

	$R_1$	$R_2$	$R_3$	$R_4$
$S_1$	4	2	2	1
$S_2$	1	2	0	1
$S_3$	2	1	0	2
$S_4$	2	2	1	2
$S_5$	0	2	2	3
$S_6$	4	3	0	2

Find a minimum cost feasible assignment of switches to routers, list the new routers that have to be acquired, and give the cost of such assignment.

**You must show all the steps.**