Assignment 11

Due Date: 16 October 2011

Workshop 11

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11.1.1.1 The problem is to find the minimum cost and maximum utility of a network design. The network consists of a set of data centers that are connected by a set of links. Each link has a cost and a utility associated with it. The goal is to design a network that maximizes the utility while minimizing the cost. The problem can be formulated as an integer linear program as follows:

\[ \min \sum \text{cost}(e) \cdot x(e) \]
\[ \text{subject to} \]
\[ \sum x(e) \geq 1 \text{ for all data centers} \]
\[ x(e) \in \{0, 1\} \text{ for all links} \]

where \( x(e) \) is a decision variable that indicates whether link \( e \) is included in the network. The cost of link \( e \) is denoted by \( \text{cost}(e) \). The objective is to minimize the total cost of the network, subject to the constraint that at least one link must be chosen for each data center.

11.1.1.2 The problem can be solved using the simplex method. The simplex method is an algorithm for solving linear programs. It starts by finding a basic feasible solution and then iteratively improves it until an optimal solution is found. The steps of the algorithm are as follows:

1. Find a basic feasible solution.
2. Check if the current solution is optimal.
3. If not, choose a pivot column and a pivot row and update the solution.
4. Repeat steps 2 and 3 until an optimal solution is found.

The optimal solution is the minimum cost and maximum utility of the network design.