

A Case Study for the Use of Randomized Rounding

A company has a large network with n nodes (n is a very large integer). Within the network there are m subnetworks, where m is a constant. The subnetworks are also large, each contains at least a fraction a of all nodes, where a is a constant with $0 < a < 1$. We know the values of n, m , and for each subnetwork we also know which nodes are included in it. (See an illustration on the next page.)

To improve the network performance, the management decides to upgrade the network, such that some of the nodes (but possibly not all) will be replaced with more powerful ones.

The following information is available:

- If node i is upgraded, then this upgrade will cost c_i , where the c_i are given positive numbers for $i = 1, \dots, n$.
- To provide each subnetwork with appropriate performance, it is required that at least half of the nodes are upgraded within *each* subnetwork.

Goal: Design an upgrade plan that satisfies the given conditions with minimum cost.

Solution: discussed in class.

