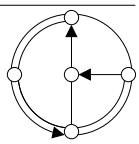
ETH
Eidgenössische Technische Hochschule Zürich
Swiss Federal Institute of Technology Zurich



SS 2007 Prof. R. Wattenhofer / Prof. P. Widmayer / Prof. S. Suri / T. Locher / Y. A. Oswald

Principles of Distributed Computing
Exercise 10

1 Minimum Cut with Fewest Arcs

Among all minimum s–t cuts in G, we want to find one with a fewest number of arcs. Show that if we set the capacity of each arc (u, v) to be

$$c'(u, v) \;=\; m \times c(u, v) + 1, \qquad \text{where } m = |E|,$$

then a minimum cut with respect to capacities $c'(u, v)$ is a *minimum cut with fewest arcs* with respect to the original capacities.

2 Maximum Flow Reduction Algorithm

Consider a flow network with unit capacity edges. That is, the network $G = (V, E)$ has a source s, a sink t, and the capacity $c_e = 1$ for each edge $e \in E$.

Given an integer parameter k, your goal is to delete k edges so as to reduce as much as possible the maximum s-t flow in the remaining graph. In other words, you should find a set F of k edges so that the maxflow in the graph $G' = (V, E - F)$ is as small as possible. Give a polynomial time algorithm for this problem.