Technische Universität München
Fakultät für Informatik
Lehrstuhl für Effiziente Algorithmen
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Winter Semester 2012/13
Problem Set 7
December 11, 2012

Parallel Algorithms

Due Date: December 18, 2012 **before** *class!*

Problem 1 (10 Points)

Prove that any bisection of the $n \times n$ mesh of trees contains at least n edges.
Hint: Use the same argument that was used in the lecture for the bisection width of an r-dimensional mesh.

Problem 2 (10 Points)

The $n \times n$ *reduced mesh of trees* consists of an $n \times n$ array with complete binary trees added to the $(i \log n + 1)$st row and column for each i, $0 \leq i < \frac{n}{\log n}$.
How many processors are contained in a reduced mesh of trees?

Problem 3 (10 Points)

Show that if an $n \times n$ mesh of trees is used to route packets to and from leaf processors, then it can take $\Omega(\sqrt{m})$ steps to route m packets even if no two packet destinations are the same.

Problem 4 (10 Points)

Show that the $n \times n$ mesh of trees can simulate any n-node network with an $O(\log n)$-factor delay.