Reading for This Lecture

• Primary
  – Horowitz and Sahni, Chapter 4
  – Kozen, Lecture 3

• Secondary
  – Miller and Boxer, Chapter 12 (up to page 286)
Baruvka's Algorithm

- At each step, select all edges that connect some component of the graph to its nearest neighbor.
- Add all these edges to the tree simultaneously.
- Why does this work?

- Sequential Implementation
Component Labeling

- Given a graph $G = (V, E)$.
- Component labeling is numbering each vertex according to which component it belongs to.
- Sequential Component Labeling Algorithms
  - Breadth-first search
  - Union-find
- This is the equivalent to finding the equivalence classes in a set.
Parallel Component Labeling

- Algorithm
- Analysis
Parallelizing Baruvka's Algorithm

• Assume CRCW (minimum number written)
• Assume |E| + |V| processors
• Algorithm
  – Initialization
    • Find minimum edge adjacent to each node and mark them.
  – Iterate
    • Perform parallel component labeling.
    • Find minimum edge connecting each node to another component.
    • Find overall minimum edge connecting each component to another.
    • Add all these edges into the graph