Distributed Information Processing

23rd Lecture

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Outline

- Performance Evaluation
  - Introduction
  - Performance Debugging for Distributed Systems of Black Boxes
- Q&A
Introduction

- Exploiting Parallelism with the Distributed System (Compiler or Library)
  - Autoparallelization
    - Heterogeneity
    - Variable latencies
  - Manual Computation Decomposition and Load Balancing (Distributed Memory)
    - Architecture independence
  - Data Allocation (Distributed Memory)
    - Maximizing locality
    - Minimizing communication

Data Parallelism
Introduction (Cont’d)

- Parallel Execution of Components
  - Load matching
  - Communication optimization

- Overlap of Communication with Computation (Distributed Memory)
  - Large and variable latencies

- Reuse of More Data in Local Memories (Distributed Memory)

- Spreading Computation Evenly across Processors (Distributed Memory)
  - Minimizing communication
Introduction (Cont’d)

Performance Tools

- **Goal**
  - User’s identifying and overcoming performance bottlenecks

- **Functionalities**
  - Measurement
  - Analysis
  - Visualization
  - Engineering/Tuning
  - Estimation/Prediction

Via Instrumentation

To Identify Bottlenecks
Introduction

- Critical Path
  - Longest Path through the DAG
    - Corresponding to the longest path
- Critical Path of a Program
  - Longest CPU or Communication Weighted Path of the PAG

Improving This Procedure May Not Improve the Program’s Execution Time

Program Activity Graph

a Graph Consisting of Nodes Representing Significant Events, and Arcs Indicating the Ordering of Events within a Process or Synch Dependencies between Events