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Nota di contenuto	TASK SCHEDULING FOR PARALLEL SYSTEMS; CONTENTS; Preface; Acknowledgments; 1. Introduction; 1.1 Overview; 1.2 Organization; 2. Parallel Systems and Programming; 2.1 Parallel Architectures; 2.1.1 Flynn's Taxonomy; 2.1.2 Memory Architectures; 2.1.3 Programming Paradigms and Models; 2.2 Communication Networks; 2.2.1 Static Networks; 2.2.2 Dynamic Networks; 2.3 Parallelization; 2.4 Subtask Decomposition; 2.4.1 Concurrency and Granularity; 2.4.2 Decomposition Techniques; 2.4.3 Computation Type and Program Formulation; 2.4.4 Parallelization Techniques; 2.4.5 Target Parallel System 2.5 Dependence Analysis2.5.1 Data Dependence; 2.5.2 Data Dependence in Loops; 2.5.3 Control Dependence; 2.6 Concluding Remarks; 2.7 Exercises; 3. Graph Representations; 3.1 Basic Graph Concepts; 3.1.1 Computer Representation of Graphs; 3.1.2 Elementary Graph Algorithms; 3.2 Graph as a Program Model; 3.2.1 Computation and Communication Costs; 3.2.2 Comparison Criteria; 3.3 Dependence

Graph (DG); 3.3.1 Iteration Dependence Graph; 3.3.2 Summary; 3.4 Flow Graph (FG); 3.4.1 Data-Driven Execution Model; 3.4.2 Summary; 3.5 Task Graph (DAG); 3.5.1 Graph Transformations and Conversions 3.5.2 Motivations and Limitations 3.5.3 Summary; 3.6 Concluding Remarks; 3.7 Exercises; 4. Task Scheduling; 4.1 Fundamentals; 4.2 With Communication Costs; 4.2.1 Schedule Example; 4.2.2 Scheduling Complexity; 4.3 Without Communication Costs; 4.3.1 Schedule Example; 4.3.2 Scheduling Complexity; 4.4 Task Graph Properties; 4.4.1 Critical Path; 4.4.2 Node Levels; 4.4.3 Granularity; 4.5 Concluding Remarks; 4.6 Exercises; 5. Fundamental Heuristics; 5.1 List Scheduling; 5.1.1 Start Time Minimization; 5.1.2 With Dynamic Priorities; 5.1.3 Node Priorities; 5.2 Scheduling with Given Processor Allocation 5.2.1 Phase Two 5.3 Clustering; 5.3.1 Clustering Algorithms; 5.3.2 Linear Clustering; 5.3.3 Single Edge Clustering; 5.3.4 List Scheduling as Clustering; 5.3.5 Other Algorithms; 5.4 From Clustering to Scheduling; 5.4.1 Assigning Clusters to Processors; 5.4.2 Scheduling on Processors; 5.5 Concluding Remarks; 5.6 Exercises; 6. Advanced Task Scheduling; 6.1 Insertion Technique; 6.1.1 List Scheduling with Node Insertion; 6.2 Node Duplication; 6.2.1 Node Duplication Heuristics; 6.3 Heterogeneous Processors; 6.3.1 Scheduling; 6.4 Complexity Results; 6.4.1 || Classification 6.4.2 Without Communication Costs 6.4.3 With Communication Costs; 6.4.4 With Node Duplication; 6.4.5 Heterogeneous Processors; 6.5 Genetic Algorithms; 6.5.1 Basics; 6.5.2 Chromosomes; 6.5.3 Reproduction; 6.5.4 Selection, Complexity, and Flexibility; 6.6 Concluding Remarks; 6.7 Exercises; 7. Communication Contention in Scheduling; 7.1 Contention Awareness; 7.1.1 End-Point Contention; 7.1.2 Network Contention; 7.1.3 Integrating End-Point and Network Contention; 7.2 Network Model; 7.2.1 Topology Graph; 7.2.2 Routing; 7.2.3 Scheduling Network Model; 7.3 Edge Scheduling 7.3.1 Scheduling Edge on Route

## Sommario/riassunto

A new model for task scheduling that dramatically improves the efficiency of parallel systems Task scheduling for parallel systems can become a quagmire of heuristics, models, and methods that have been developed over the past decades. The author of this innovative text cuts through the confusion and complexity by presenting a consistent and comprehensive theoretical framework along with realistic parallel system models. These new models, based on an investigation of the concepts and principles underlying task scheduling, take into account heterogeneity, contention for communication r