Contents

Preface

About the Author

CHAPTER 1  INTRODUCTION TO GRID COMPUTING  1

1.1 Grid Computing Concept  1
1.2 History of Distributed Computing  4
1.3 Computational Grid Applications  12
1.4 Grid Computing Infrastructure Development  14
   Large-Scale U.S. Grids 14
   National Grids 16
   Multi-National Grids 17
   Campus Grids 18
1.5 Grid Computing Courses  18
1.6 Grid Computing Software Interface  19
1.7 Summary  27
   Further Reading 28
   Bibliography 29
   Self-Assessment Questions 31
   Programming Assignments 32
CHAPTER 2  JOB SUBMISSION 35

2.1 Introduction 35
2.2 Globus Job Submission 38
   Components 38
   Job Specification 41
   Submitting a Job 48
2.3 Transferring Files 55
   Command-Line File Transfers 55
   Staging 57
2.4 Summary 59
   Further Reading 59
   Bibliography 59
   Self-Assessment Questions 60
   Programming Assignments 62

CHAPTER 3  SCHEDULERS 65

3.1 Scheduler Features 65
   Scheduling 65
   Monitoring Job Progress 69
   Additional Scheduler Features 70
3.2 Scheduler Examples 75
   Sun Grid Engine 75
   Condor 81
3.3 Grid Computing Meta-Schedulers 100
   Condor-G 100
   GridWay 102
3.4 Distributed Resource Management Application (DRMAA) 107
3.5 Summary 110
   Further Reading 111
   Bibliography 111
   Self-Assessment Questions 112
   Programming Assignments 114

CHAPTER 4  SECURITY CONCEPTS 117

4.1 Introduction 117
   Secure Connection 117
   Password Authentication 118
   Encryption and Decryption 119
## CONTENTS

- Bibliography 288
- Self-Assessment Questions 290
- Programming Assignments 291

**APPENDIX A**  INTERNET AND NETWORKING BASICS  293

**APPENDIX B**  LINUX AND WINDOWS COMMAND-LINE INTERFACES  303

**APPENDIX C**  XML MARKUP LANGUAGE  315

**APPENDIX D**  GLOBUS INSTALLATION TUTORIAL  331

Glossary  345

**ANSWERS TO SELF-ASSESSMENT QUESTIONS**  357

**INDEX**  359