To my parents, John and Carole Garmany
John Garmany

For Janet, the love of my life
Don Burleson
About the Authors

John Garmany is a graduate of West Point and a retired Lt. Colonel with more than 20 years of IT experience. John is an OCP-certified Oracle DBA with a Masters degree in Information Systems, a Graduate Certificate in Software Engineering, and a B.S. degree in electrical engineering from West Point. A Senior Consultant with Burleson Enterprise, Inc. and author of Oracle Replication: Snapshot, Multi-master & Materialized Views Scripts (Rampant TechPress, 2003), John can be reached at john.garmany@computer.org.

Don Burleson is one of the world’s top Oracle Database experts, with more than 20 years of full-time DBA experience. He specializes in creating architectures for very large online databases, and he has worked with some of the world’s most powerful and complex systems.

A former Adjunct Professor, Don Burleson has written 32 books, published more than 100 articles in national magazines, and serves as Editor-in-Chief of Oracle Internals, Senior Consulting Editor for DBAZine, and Series Editor for Rampant TechPress. Don is a popular lecturer and teacher and is a frequent speaker at OracleWorld and other international database conferences.

As a leading corporate database consultant, Don has worked with numerous Fortune 500 corporations, creating robust database architectures for mission-critical systems. Don is also a noted expert on e-commerce systems and has been instrumental in the development of numerous web-based systems that support thousands of concurrent users.

Don’s professional web sites include www.dba-oracle.com and www.remote-dba.net.
## Contents at a Glance

1. Oracle Application Server 10g Architecture and Administration ................. 1
2. The Oracle Application Server 10g Infrastructure ........................................ 35
3. Installing Oracle Application Server 10g ................................................... 77
4. Using the Oracle HTTP Server (OHS) .......................................................... 117
5. Web Cache Administration ......................................................................... 155
6. Using J2EE in the Application Server 10g .................................................. 193
7. Oracle Containers for J2EE ......................................................................... 215
8. Database Connections and TopLink ............................................................. 235
9. High Availability ......................................................................................... 253
10. Performance Tuning ................................................................................. 265
11. Backup and Recovery ................................................................................. 325
12. Oracle Application Server 10g Security ..................................................... 343

Index ............................................................................................................. 363
Contents

ACKNOWLEDGMENTS .................................................. xv
INTRODUCTION ......................................................... xvii

1 Oracle Application Server 10g Architecture and Administration ........ 1
Architectural Overview ................................................. 2
   The Multitiered Model ........................................... 2
   Hardware Architecture of Application Server 10g ....................... 5
   Functional Architecture of Application Server 10g ....................... 6
Client Tier ............................................................. 7
Web Tier ............................................................... 7
App Server Tier ......................................................... 8
Database Tier .......................................................... 10
Component Overview .................................................. 11
   Application Server Portal .......................................... 11
   Application Server Discoverer ..................................... 12
   Oracle Forms Server .............................................. 13
   Application Server Personalization ................................ 13
   Oracle Application Server Wireless ................................ 15
   Oracle Reports Server ........................................... 16
   Single Sign-On (SSO) ............................................. 17
   Oracle Internet Directory ......................................... 17
   Metadata Repository (Infrastructure) ................................ 17
   Oracle Management Server (OMS) ............................... 18
   TopLink ............................................................. 18
Oracle Application Server 10g Administration ................................. 18
   Administrative Component Overview ................................ 19
   Command-Line Interfaces or OEM? ................................ 20
# Oracle Application Server 10g Administration Handbook

Managing Application Server 10g with Enterprise Manager ........................................ 21
Managing Application Server 10g with Command-Line Interfaces .................................. 22
Summary ............................................................................................................................ 34

## 2 The Oracle Application Server 10g Infrastructure ....................................................... 35
The Infrastructure Repository ................................................................................................. 36
Immutable iasdb Schemas ...................................................................................................... 37
Workflow iasdb Schemas ....................................................................................................... 39
Schemas Registered in the OID ............................................................................................ 39
Viewing the Whole iasdb Instance ....................................................................................... 39
The Infrastructure Log Tables .............................................................................................. 45
Writing Your Own Infrastructure Repository Log Scripts .................................................... 47
Viewing the Repository Log Tables ..................................................................................... 49
Infrastructure Log Reports .................................................................................................. 51
Portal Repository Log Audit Reports ................................................................................... 53
Repository Administration and Management ....................................................................... 58
Starting and Stopping the Infrastructure ............................................................................. 58
Single Sign-On (SSO) .......................................................................................................... 64
Roles of the SSO Administrator ......................................................................................... 65
Configuring the SSO Server ............................................................................................... 65
Enabling SSO ...................................................................................................................... 66
Using the SSO Audit Log Tables ........................................................................................ 67
SSO Administration Using the mod_osso Utility ................................................................. 73
Summary ............................................................................................................................ 74

## 3 Installing Oracle Application Server 10g ................................................................. 77
Planning for the Application Server Installation ................................................................ 78
Installation Types .............................................................................................................. 78
Server Configuration .......................................................................................................... 79
Server Requirements ......................................................................................................... 80
Other Planning Considerations .......................................................................................... 81
Operating System Setup ..................................................................................................... 82
Operating System Installation and Configuration .............................................................. 85
Install RedHat 2.1 AS/ES .................................................................................................... 85
Configure RedHat 2.1 AS/ES ............................................................................................. 86
Installation of Application Server 10g ................................................................................ 92
Environmental Variables ................................................................................................... 92
Installing the Infrastructure ............................................................................................... 93
Installing the Portal and Forms Middle Tier ....................................................................... 103
Post-Installation Tasks ....................................................................................................... 112
Starting and Stopping Application Server 10g ................................................................. 113
Summary ............................................................................................................................ 114

## 4 Using the Oracle HTTP Server (OHS) ..................................................................... 117
Managing the Oracle HTTP Server ................................................................................... 118
Oracle HTTP Server Modules ........................................................................................... 119
Configuring OHS and Using Server Logs ......................................................................... 120
Contents

Global Parameters .................................................. 121
Default Server Parameters ........................................... 122
Virtual Host .......................................................... 132
Dynamic Content ...................................................... 134
Oracle HTTP Server Performance Tuning .............................. 135
Monitoring the Oracle HTTP Server with Enterprise Manager .......... 135
   OHS System Usage Metrics ...................................... 138
   OHS Error Metrics ............................................... 139
   HTTP Server Response and Load Metrics ...................... 140
   HTTP Server Module Metrics .................................. 142
   HTTP Server Virtual Host Page ................................ 143
Summary ............................................................. 154

5 Web Cache Administration ........................................... 155
   Caching: Basic Concepts ......................................... 156
      Advantages and Disadvantages of Using Caches ............ 156
      Types of Caches .............................................. 157
   The Oracle Application Server 10g Web Cache ................. 159
      Locating the Web Cache ...................................... 159
      Load Balancing ............................................... 160
      Cache Invalidation ........................................... 163
   Managing the Oracle Web Cache ................................ 165
      Operations ....................................................... 166
      Monitoring ....................................................... 173
      Properties ....................................................... 179
      Logging and Diagnostics ..................................... 181
      Ports ............................................................ 181
      Origin Servers, Sites, and Load Balancing .................. 182
      Rules for Caching, Personalization, and Compression ...... 185
      Rule Association .............................................. 187
      Webcachectl Utility ........................................... 190
   Summary .......................................................... 191

6 Using J2EE in the Application Server 10g .......................... 193
   J2EE Introduction ................................................. 194
      Applets ........................................................ 195
      Client Applications .......................................... 195
      Servlets ......................................................... 196
      Java Server Pages ........................................... 196
      JavaBeans ....................................................... 196
      Enterprise JavaBeans ........................................ 196
      J2EE Containers ............................................... 196
      JAR Files, WAR Files, and EAR Files ......................... 197
   J2EE Components ............................................... 197
      Java Database Connectivity .................................. 197
      Java Message Service ........................................ 198
      Java Naming and Directory Interface ........................ 198
Oracle Application Server 10g Administration Handbook

Java Transaction API .................................................. 198
JavaMail API .......................................................... 198
Java API for XML Processing ............................................. 198
Java Authentication and Authorization Service ....................... 199
Java Virtual Machines .................................................. 199
Enterprise JavaBeans ................................................... 200
Introduction to Oracle Containers for J2EE .......................... 201
Servlets, JSPs, and Apache Jserv ...................................... 202
Deploying Applications Using Enterprise Manager .................... 208
Summary .................................................................. 213

7 Oracle Containers for J2EE .............................................. 215
Management of OC4J ..................................................... 216
Managing OC4J Using the dcmctl/opmnctl Utilities ................ 217
Managing Configuration Management ..................................... 218
Managing OC4J Using Enterprise Manager ......................... 221
OC4J—Instance or Container .......................................... 222
Creating an OC4J Container .......................................... 222
Deleting an OC4J Container .......................................... 222
Starting an OC4J Container .......................................... 223
OC4J Home Page ..................................................... 224
Summary .................................................................. 233

8 Database Connections and TopLink .................................. 235
Persistence .................................................................. 236
Java Database Connectivity (JDBC) .................................... 237
Thin Driver ............................................................... 237
OCI Driver ............................................................... 238
Server-Side Driver ...................................................... 238
Dynamic SQL ............................................................ 238
Dynamic SQL ............................................................ 238
Java Naming and Directory Interface (JNDI) ....................... 239
Data Sources and OC4J ............................................... 239
Bean Managed Persistence ........................................... 244
Container Managed Persistence ....................................... 244
Oracle Application Server TopLink 10g ............................ 244
TopLink Mapping Workbench 10g ..................................... 245
Summary .................................................................. 251

9 High Availability .......................................................... 253
Why Are Systems Unavailable? .......................................... 254
Eliminating Single Points of Failure .................................... 255
Web Cache Tier .......................................................... 256
Midtier .................................................................... 256
Infrastructure Tier ........................................................ 259
Back-End Database ...................................................... 259
Contents

Disaster Recovery .......................................................... 260
Backup and Recovery ..................................................... 260
Rolling Upgrades ............................................................. 261
OC4J High Availability Features ......................................... 261
Hot Deployments and Redeployments .................................. 261
OC4J Islands ................................................................. 261
Transparent Application Failover ....................................... 262
High Availability of Applications ....................................... 263
Summary ................................................................. 263

10 Performance Tuning ..................................................... 265
Proactive Tuning: An Overview .......................................... 266
Setting Up the Monitoring Environment .............................. 267
Establishing a Standard User Environment ......................... 268
Forms Server Monitoring .................................................. 271
  Summarizing Forms Server Log Information .................... 274
  Transaction-Level Response Time Monitoring .................. 276
  Component Response Time Breakdown ............................ 277
Monitoring and Load-Balancing the Oracle HTTP Server(OHS) 
  Using dmstool ............................................................ 279
  Monitoring with aggrespy ............................................. 294
Monitoring the Oracle Database Instances .......................... 294
Web Cache Tuning .......................................................... 297
  Cacheability Rules ...................................................... 297
  Monitoring the Web Cache ............................................ 297
  Oracle HTTP Server and Web Cache ............................... 299
Load Balancing Oracle Application Server 10g ..................... 301
  Oracle Application Server 10g Monitoring ...................... 302
  Monitoring and Load-Balancing the UNIX Server ............. 308
  UNIX Monitoring Goals .............................................. 308
  Overview of the vmstat Utility .................................... 310
  Generating Reports on UNIX Server Overload ................... 313
  Server Exception Reports ........................................... 314
  Daily Server Alert Report .......................................... 320
Summary ............................................................... 323

11 Backup and Recovery .................................................. 325
Why You Need a Backup Plan .......................................... 326
  External Problems ...................................................... 326
  Internal Problems ...................................................... 327
Backing Up Application Server 10g .................................. 327
  What to Back Up ........................................................ 328
Application Server Protection ........................................... 328
  Backing Up Application Server Instances ....................... 329
  Recovering the Application Server ................................. 329
Metadata Repository Database Protection ............................ 331
Undo Logs ................................................................. 331
<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Archive Logs</td>
<td>332</td>
</tr>
<tr>
<td>Control Files</td>
<td>333</td>
</tr>
<tr>
<td>Cold Backup</td>
<td>334</td>
</tr>
<tr>
<td>Hot Backup</td>
<td>335</td>
</tr>
<tr>
<td>Recovery Manager (RMAN)</td>
<td>339</td>
</tr>
<tr>
<td>Database Recovery</td>
<td>339</td>
</tr>
<tr>
<td>Complete Database Recovery</td>
<td>341</td>
</tr>
<tr>
<td>Database Recovery Issues</td>
<td>341</td>
</tr>
<tr>
<td>Application Server 10g Backup and Recovery Tool</td>
<td>341</td>
</tr>
<tr>
<td>Summary</td>
<td>342</td>
</tr>
<tr>
<td>12 Oracle Application Server 10g Security</td>
<td>343</td>
</tr>
<tr>
<td>Component Security Features</td>
<td>344</td>
</tr>
<tr>
<td>Web Cache</td>
<td>344</td>
</tr>
<tr>
<td>Oracle HTTP Server</td>
<td>344</td>
</tr>
<tr>
<td>Oracle Container for Java</td>
<td>346</td>
</tr>
<tr>
<td>Oracle Identity Management</td>
<td>346</td>
</tr>
<tr>
<td>Oracle Internet Directory</td>
<td>347</td>
</tr>
<tr>
<td>Delegated Administration Services</td>
<td>349</td>
</tr>
<tr>
<td>Single Sign-On</td>
<td>354</td>
</tr>
<tr>
<td>Summary</td>
<td>362</td>
</tr>
<tr>
<td>Index</td>
<td>363</td>
</tr>
</tbody>
</table>
Acknowledgments

Writing this book was a learning experience that allowed me to meet some of the real people that make the Oracle Application Server the great product that it is. Any time you work with beta software, you run into frustrating problems. I especially want to mention the help I received from Pete Farkas and Brian Conneen, who installed the original beta and were part of the team that provided the technical review of the chapters. I also want to thank Lisa Goldstein for her help during the entire process of writing the book. Oracle had members of the Application Server team on both coasts review the chapters of this book, and their comments and suggestions were invaluable. Most of the team I never got to meet, but they added immensely to the quality of this book. To the entire Oracle Application Server team, I thank you for your support and help, and for producing a great product.

Thanks also to the incredible McGraw-Hill/Osborne team. Special thanks to Lisa McClain and Athena Honore, who had to guide me through the production process and put up with all the missed deadlines. A special thanks to Emily Rader and Judith Brown, who did an incredible job editing my poor writing. You guys are great.

Finally, I want to thank the team at BEI who had to pick up the extra work and put up with me during the writing of this book. Thanks for all the support.

John Garmany
Introduction

The Oracle Application Server 10g is a large and complicated product that is hard to learn and sometimes confusing to use. With capability comes complexity. Many times we find clients that are improperly using their application server because they don’t understand what each component does. More importantly, we find that the administration and support for the application server fall on the shoulders of the company DBA because it is an Oracle product. Many DBAs know what Java is because it goes in the database (somewhere, somehow), but that is the extent of their knowledge. The Application Server documentation is thousands of pages long and must cover every possible configuration of a component. As such, it is a bit overwhelming when trying to find specific information. The goal of this book is to provide the bases for anyone, from a Java developer to an Oracle DBA, to install and administer the Oracle Application Server 10g. Key to meeting this goal, we cover some critical tasks such as installation, performance tuning, and backup and recovery. We also explain the capability of each component of the Application Server and how it is used.

Even though the focus is on administration, some development topics are briefly introduced in the discussion of some of the Application Server components. However, this book does not cover either J2EE or Portal development. Those tasks are covered in detail in other Oracle Press books.

We tried to cover each component in a single chapter so that you could refer directly to that chapter for a needed component. Some chapters refer you to other chapters for additional information on specific topics. If you are new to Java and J2EE, you will need to read Chapter 6 to understand how the Application Server 10g supports J2EE components and APIs.

Lastly, one of the most annoying habits of computer books is to tell you what to do, without explaining how to do it. We have made every effort to detail the “how” in Oracle Application Server 10g administration.