

# Contents

|   |           |
|---|-----------|
| ACKNOWLEDGMENTS .....                                   | xi        |
| INTRODUCTION .....                                      | xiii      |
| <b>1 The Database Administrator .....</b>               | <b>1</b>  |
| General DBA Skills .....                                | 2         |
| Where Do DBAs Belong in an Organization? .....          | 4         |
| Database Installation Planning .....                    | 5         |
| Leveraging Skills .....                                 | 5         |
| Database Migrations .....                               | 9         |
| Summary .....   | 13        |
| <b>2 Oracle Internals .....</b>                         | <b>15</b> |
| Memory Structures .....                                 | 16        |
| Oracle Memory Parameters .....                          | 17        |
| Sizing the SGA and PGA .....                            | 20        |
| Where Are the master, msdb, and tempdb Databases? ..... | 22        |
| System-level Information .....                          | 23        |
| Data Dictionary Views .....                             | 26        |
| Jobs and Schedules .....                                | 28        |
| Templates and Temporary Tables .....                    | 28        |
| Services and Processes .....                            | 29        |
| sp_configure Options and Parameters .....               | 32        |
| Viewing and Setting Parameters .....                    | 33        |
| Getting Started with Some Parameters .....              | 34        |
| Undo, Redo, and Logs .....                              | 38        |
| Transaction Logs Versus Redo Logs .....                 | 38        |
| Undo and Beyond .....                                   | 39        |
| Summary .....   | 42        |

|  |            |
|--|------------|
| <b>3 Oracle Installation</b>                     | <b>43</b>  |
| Operating Systems                                | 44         |
| Windows Setup                                    | 46         |
| Useful Linux/Unix Commands                       | 48         |
| Linux Setup                                      | 50         |
| Storage Requirements                             | 55         |
| Disk Storage                                     | 56         |
| Storage Management with ASM                      | 57         |
| Oracle Files                                     | 61         |
| Oracle Database Components                       | 63         |
| Oracle Software Installation                     | 64         |
| Using a Response File                            | 67         |
| Removing Software                                | 68         |
| Upgrading the Database                           | 68         |
| Applying Patches                                 | 70         |
| Summary  | 71         |
| <b>4 Database Definitions and Setup</b>          | <b>73</b>  |
| Servers, Databases, Instances, and Schemas       | 74         |
| SQL Server Setup Versus Oracle Setup             | 77         |
| Creating Databases                               | 79         |
| Using the DBCA                                   | 79         |
| Duplicating Databases with Templates and Scripts | 83         |
| Creating the Listener                            | 85         |
| Choosing a Character Set                         | 89         |
| Security   | 94         |
| Permissions for the Server                       | 95         |
| Permissions for Schemas                          | 98         |
| DBA Roles and Responsibilities Revisited         | 101        |
| Summary  | 102        |
| <b>5 DBA Tools</b>                               | <b>103</b> |
| Overview of Tools for Typical Database Tasks     | 104        |
| Oracle Enterprise Manager                        | 105        |
| OEM Navigation                                   | 105        |
| Storage Management                               | 107        |
| Database Configuration                           | 108        |
| Oracle Scheduler                                 | 109        |
| Statistics and Resource Management               | 109        |

|   |            |
|---|------------|
| Security .....  | 109        |
| Enterprise Manager Configuration .....                | 111        |
| SQL*Plus .....  | 112        |
| SQL Developer .....                                   | 117        |
| Client Connections .....                              | 119        |
| Client Connection Configuration .....                 | 120        |
| JDBC Connections .....                                | 123        |
| Aliases .....   | 123        |
| My Oracle Support .....                               | 124        |
| Summary .....   | 125        |
| <b>6 Database Backup, Restore, and Recovery .....</b> | <b>127</b> |
| Backing Up Databases .....                            | 128        |
| Backup Strategies .....                               | 128        |
| Backup and Restore Commands .....                     | 129        |
| RMAN Configuration for Backups .....                  | 131        |
| Backup Options .....                                  | 135        |
| Backup Examples .....                                 | 137        |
| OEM Backup Jobs .....                                 | 137        |
| Restoring and Recovering Databases .....              | 141        |
| What Can Go Wrong? .....                              | 141        |
| Restore and Recover Options .....                     | 143        |
| Data Recovery Advisor .....                           | 147        |
| Copying the Database .....                            | 149        |
| Managing Backups .....                                | 152        |
| Viewing Backups .....                                 | 152        |
| Purging Obsolete Files .....                          | 155        |
| Backing Up and Restoring Objects .....                | 156        |
| Copying Objects at the Table and Schema Level .....   | 156        |
| Using Data Pump .....                                 | 157        |
| Protecting Users from Users .....                     | 161        |
| Recycle Bin .....                                     | 161        |
| Flashback .....                                       | 164        |
| Summary .....   | 169        |
| <b>7 Database Maintenance .....</b>                   | <b>171</b> |
| Maintenance Tasks .....                               | 172        |
| Consistency Checks .....                              | 173        |
| Health Checks .....                                   | 174        |

|   |            |
|---|------------|
| Update Statistics                       | 176        |
| System Statistics                       | 177        |
| Object Statistics                       | 178        |
| Object Maintenance                      | 181        |
| Index Rebuild                           | 181        |
| Table Reorganization                    | 184        |
| Invalid Objects                         | 187        |
| Grants                                  | 189        |
| Synonyms                                | 190        |
| Job Scheduling                          | 191        |
| Creating a Job in Oracle Scheduler      | 191        |
| Using DBMS_SCHEDULER                    | 194        |
| Setting Up System and User Jobs         | 196        |
| File Maintenance                        | 197        |
| Shrinking and Resizing Files            | 197        |
| Tablespace Monitoring                   | 200        |
| Error Logs, Alert Logs, and Trace Files | 203        |
| Summary                                 | 204        |
| <b>8 Performance and Tuning</b>         | <b>207</b> |
| Better-Performing Systems               | 208        |
| Indexes                                 | 209        |
| Index Monitoring                        | 210        |
| Index Types                             | 210        |
| Locking                                 | 219        |
| Current Activity Views                  | 221        |
| Current Sessions                        | 222        |
| Activity Monitors                       | 223        |
| Waits                                   | 225        |
| SQL Plans                               | 226        |
| Viewing Explain Plans                   | 226        |
| Tuning Using Explain Plans              | 228        |
| Automatic Workload Repository           | 233        |
| AWR Reports                             | 233        |
| Active Session History View             | 236        |
| Library Cache for SQL Statements        | 236        |
| Summary                                 | 238        |
| <b>9 PL/SQL</b>                         | <b>239</b> |
| Database Coding Practices               | 240        |
| Packages and Package Bodies             | 243        |

|  |            |
|--|------------|
| Triggers .....                                 | 246        |
| Updates and Conditions .....                   | 249        |
| Transactions .....                             | 250        |
| Beginning a Transaction .....                  | 251        |
| Defining Commits .....                         | 253        |
| Cursor Processing .....                        | 254        |
| Processing with FORALL .....                   | 257        |
| Functions .....                                | 258        |
| Debugging Procedures and Unit Testing .....    | 262        |
| Error Handling .....                           | 264        |
| Error Handling Packages .....                  | 266        |
| Standard Error Messages .....                  | 268        |
| Using DBMS Packages .....                      | 270        |
| Summary .....                                  | 271        |
| <b>10 High-Availability Architecture .....</b> | <b>273</b> |
| Options for High Availability .....            | 274        |
| Clustering with RAC .....                      | 276        |
| Configuring RAC .....                          | 278        |
| Testing RAC .....                              | 282        |
| Setting Up Client Failover .....               | 283        |
| Setting Up RAC Listeners .....                 | 285        |
| Patching RAC .....                             | 286        |
| Deploying RAC .....                            | 286        |
| Configuring and Monitoring RAC Instances ..... | 287        |
| Primary and Standby Databases .....            | 289        |
| Using Active Standby Databases .....           | 290        |
| Setting Up a Standby Database .....            | 292        |
| ASM in an RAC Environment .....                | 297        |
| Managing ASM Disk Groups .....                 | 297        |
| Viewing ASM Information .....                  | 302        |
| Streams and Advanced Replication .....         | 304        |
| Oracle Streams .....                           | 304        |
| Advanced Replication .....                     | 307        |
| Summary .....                                  | 307        |
| <b>Appendix .....</b>                          | <b>309</b> |
| <b>Index .....</b>                             | <b>315</b> |