



Table of Contents

Introduction.....	6	Managing Large Objects.....	42
What this course is about.....	7	The Oversized-Attribute Storage Technique.....	43
General PostgreSQL Best Practices.....	8	When to TOAST?.....	44
PostgreSQL Best Practices.....	9	How to TOAST?.....	45
Table Inheritance.....	13	Why TOAST?.....	46
PostgreSQL Table Inheritance.....	14	Creating & Managing	
Issues with Inheritance.....	18	PostgreSQL Tablespaces & Databases.....	47
Exercises.....	20	PostgreSQL Tablespaces.....	48
Using Table Constraints & Constraint Exclusion.....	22	Using CREATE TABLESPACE.....	49
Using Constraints to Manage Data.....	23	Where Objects Go.....	51
Exercises.....	26	Using CREATE DATABASE.....	53
Using Update Rules.....	27	Exercises.....	57
Insert, Update, and Delete Rules.....	28	Monitoring Server Activity.....	58
Specifying Rule Constraints.....	30	OS Activity Monitoring Tools.....	59
Using Multiple Statements Within a Rule.....	31	The Statistics Collector.....	60
Exercises.....	33	pg_stat Views.....	62
Implementing Table Partitioning.....	34	The pg_statio_ Views.....	65
Creating Insert Rules.....	35	Viewing System Locks.....	68
Table Partitioning.....	37	Determining Space Usage.....	71
Table Partitioning Caveats.....	39	Useful Monitoring Queries.....	72
Exercises.....	41	Server Monitoring & Performance Tuning.....	73

Understanding BGWRITER & Shared Buffers.....	74	The Materialize Operator.....	115
Server Configuration Variables.....	78	Setop Operators.....	116
Tuning the Sort Memory.....	82	Improving Query Performance.....	117
The Hash Join and work_mem.....	83	Exercises.....	124
Checkpoints & Performance.....	84	Query Optimizer Tips & Tricks.....	125
PostgreSQL Spread Checkpoints.....	88	Query Optimizer Parameters.....	126
Recap!.....	89	Planner Management.....	130
Using the PostgreSQL Query Optimizer.....	90	The Query Optimization Methods.....	133
Analyzing and Optimizing Queries.....	91	Viewing Alternate Query Plans.....	135
Using EXPLAIN to View Execution Plans.....	93	Gathering Performance Statistics.....	136
Understanding PostgreSQL's Query Operators.....	96	Disk Performance Tuning.....	138
The "Seq Scan" operator.....	97	Diagnosis Tools.....	139
The Index Scan Operator.....	99	Using pg_top.....	142
The Sort Operator.....	100	Using pg_stat_statements.....	145
The Unique Operator.....	102	Installing pg_stat_statements.....	146
The Limit Operator.....	103	pg_stat_statements Notes.....	149
The Aggregate Operator.....	104	Exercises.....	150
The Append Operator.....	105	Using auto_explain.....	151
The Result Operator.....	106	Installing auto_explain Server Wide.....	152
The Join Operators.....	107	Exercises.....	154
The Group and HashAggregate Operators.....	109	Understanding Heap Only Tuple.....	155
The Subquery Scan and Subplan Operators.....	110	Understanding HOT.....	156
The Function Scan.....	112	Tuning the Query Planner.....	158
The TID Scan Operator.....	113	Understanding the Query Planner.....	159

Exercises.....	164	Other Hot Standby Notes.....	213
Tuning the Auto-Vacuum Daemon.....	165	Implementing PostgreSQL Query & Data Caching.....	214
About Auto-Vacuum.....	166	Why Cache Data?.....	215
Optimizing the Operating System for PostgreSQL.....	173	Application Scaling through Caching.....	217
File System Optimizations.....	174	Caching Hurdles.....	218
Benchmarking with pgbench.....	177	PostgreSQL Data Caching.....	219
Configuring pgbench.....	178	Configuring the Cache Server.....	221
Exercises.....	181	How the Cache Works.....	223
Deploying Warm Standby/Log Shipping.....	182	Exercises.....	224
What is Warm Standby?.....	183	PostgreSQL Caching.....	225
Configuring Log Shipping.....	190	Installing PostgreSQL Cache Components.....	227
Using pg_standby.....	191	Updating PostgreSQL.conf.....	228
Example archive_command Script.....	195	PostgreSQL Cache Functions.....	229
SSH Key Based Authentication.....	197	Configuring PostgreSQL to Update Cache.....	232
Log Shipping Notes.....	199	Exercises.....	234
Enabling Hot Standby.....	201	Using Listen/Notify for Event Triggering.....	235
About Hot Standby.....	202	Implementing Listen/Notify.....	237
Set up WAL Archiving.....	203	Exercises.....	238
SSH Key Based Authentication.....	204	Improving Network Performance with PgBouncer.....	239
Configuring Recovery.conf for Hot Standby.....	206	About PgBouncer.....	240
Starting the Secondary Node.....	209	Pooling Modes.....	241
Configuring Standby Limits.....	210	Downloading & Installing PgBouncer.....	242
About the WAL Sender.....	211	Configuring PgBouncer.....	243