

# 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	Large Object Support.....	47
Issues with Inheritance.....	18	Managing Large Objects.....	50
Exercises.....	20	Exercises.....	52
Using Table Constraints & Constraint Exclusion.....	22	Creating & Managing	
Using Constraints to Manage Data.....	23	PostgreSQL Tablespaces & Databases.....	53
Exercises.....	26	PostgreSQL Tablespaces.....	54
Using Update Rules.....	27	Using CREATE TABLESPACE.....	55
Insert, Update, and Delete Rules.....	28	Where Objects Go.....	57
Specifying Rule Constraints.....	30	Using CREATE DATABASE.....	59
Using Multiple Statements Within a Rule.....	31	Exercises.....	63
Exercises.....	33	Monitoring Server Activity.....	64
Implementing Table Partitioning.....	34	OS Activity Monitoring Tools.....	65
Creating Insert Rules.....	35	The Statistics Collector.....	66
Table Partitioning.....	37	pg_stat Views.....	68
Table Partitioning Caveats.....	39	The pg_statio_ Views.....	71
Exercises.....	41	Viewing System Locks.....	74



Determining Space Usage.....	77	The Subquery Scan and Subplan Operators.....	115
Useful Monitoring Queries.....	78	The Function Scan.....	117
Server Monitoring & Performance Tuning.....	79	The TID Scan Operator.....	118
Understanding BGWRITER & Shared Buffers.....	80	The Materialize Operator.....	120
Server Configuration Variables.....	84	Setop Operators.....	121
Tuning the Sort Memory.....	87	Improving Query Performance.....	122
The Hash Join and work_mem.....	88	Exercises.....	129
Checkpoints & Performance.....	89	Query Optimizer Tips & Tricks.....	130
PostgreSQL Spread Checkpoints.....	93	Query Optimizer Parameters.....	131
Recap!.....	94	Planner Management.....	135
Using the PostgreSQL Query Optimizer.....	95	The Query Optimization Methods.....	138
Analyzing and Optimizing Queries.....	96	Viewing Alternate Query Plans.....	140
Using EXPLAIN to View Execution Plans.....	98	Gathering Performance Statistics.....	141
Understanding PostgreSQL's Query Operators.....	101	Disk Performance Tuning.....	142
The "Seq Scan" operator.....	102	Character Set Optimizations.....	143
The Index Scan Operator.....	104	Understanding Locales and Encodings.....	144
The Sort Operator.....	105	Clusters With Multiple Character Sets.....	147
The Unique Operator.....	107	Understanding Character Set Conversions.....	148
The Limit Operator.....	108	Performance Issues Regarding Character Set Conversions.....	149
The Aggregate Operator.....	109	Understanding Heap Only Tuple.....	150
The Append Operator.....	110	Understanding HOT.....	151
The Result Operator.....	111	Tuning the Query Planner.....	153
The Join Operators.....	112	Understanding the Query Planner.....	154
The Group and HashAggregate Operators.....	114	Exercises.....	159

Tuning the Free Space Map.....	160	Application Scaling through Caching.....	209
Basic VACUUM Information.....	161	Caching Hurdles.....	210
What is the Free Space Map (FSM)?.....	164	PostgreSQL Data Caching.....	211
FSM Tuning Parameters.....	165	Configuring the Cache Server.....	213
Limiting FSM Needs.....	166	How the Cache Works.....	215
VACUUM FULL Notes.....	167	Exercises.....	216
Exercises.....	169	PostgreSQL Caching.....	217
Tuning the Auto-Vacuum Daemon.....	170	Installing PostgreSQL Cache Components.....	219
About Auto-Vacuum.....	171	Updating PostgreSQL.conf.....	220
Optimizing the Operating System for PostgreSQL.....	178	PostgreSQL Cache Functions.....	221
File System Optimizations.....	179	Configuring PostgreSQL to Update Cache.....	224
Benchmarking with pgbench.....	182	Exercises.....	226
Configuring pgbench.....	183	Using Listen/Notify for Event Triggering.....	227
Exercises.....	186	Implementing Listen/Notify.....	229
Deploying Warm Standby/Log Shipping.....	187	Exercises.....	230
What is Warm Standby?.....	188	Improving Network Performance with PgBouncer.....	231
Configuring Log Shipping.....	195	About PgBouncer.....	232
Using pg_standby.....	196	Pooling Modes.....	233
Example archive_command Script.....	200	Downloading & Installing PgBouncer.....	234
SSH Key Based Authentication.....	202	Configuring PgBouncer.....	235
Log Shipping Notes.....	204	Configuration Database Parameters.....	236
Implementing PostgreSQL Query & Data Caching.....	206	Configuring PgBouncer General Parameters.....	239
Why Cache Data?.....	207	Setting Logging Parameters.....	242



Other Configuration Parameters.....	243	Installing Slony.....	253
Creating an Authorization File.....	245	Creating The Slonik Script.....	255
Launching & Managing PgBouncer.....	246	Starting Replication.....	257
Exercises.....	247	The Subscription Slonik Script.....	259
Replication with Slony-I.....	248	Exercises.....	260
Slony Architecture.....	249		