

# CONTENTS

**INTRODUCTION**

**XXIX**

**CHAPTER 1: TECHNIQUES EVERY EXPERT PROGRAMMER  
NEEDS TO KNOW**

---

**1**

<b>Object-Oriented PHP</b>	<b>2</b>
Instantiation and Polymorphism	2
Interfaces	7
Magic Methods and Constants	8
Design Patterns	11
<b>Using MySQL Joins</b>	<b>20</b>
INNER JOIN	22
OUTER JOIN	24
Other JOIN Syntax	26
Complex Joins	27
<b>MySQL Unions</b>	<b>28</b>
<b>GROUP BY in MySQL Queries</b>	<b>30</b>
WITH ROLLUP	31
HAVING	32
<b>Logical Operations and Flow Control in MySQL</b>	<b>33</b>
Logic Operators	33
Flow Control	34
<b>Maintaining Relational Integrity</b>	<b>35</b>
Constraints	36
NOT NULL	36
UNSIGNED	36
ENUM and SET	37
UNIQUE KEY	37
FOREIGN KEY	38
Using Server SQL Modes	41
Storage Engine Integrity	45
What MySQL Does Not Tell You	45
What's Missing?	46
<b>Subqueries in MySQL</b>	<b>46</b>
Subquery	46
Correlated Subquery	46
Derived Table	47

<b>Using Regular Expressions</b>	<b>49</b>
General Patterns	50
Expert Regular Expressions	52
Putting It All Together in PHP	55
Regular Expressions in MySQL	60
<b>Summary</b>	<b>63</b>
<b>CHAPTER 2: ADVANCED PHP CONCEPTS</b>	<b>65</b>
<b>A Problem That Needs Solving</b>	<b>65</b>
<b>Iterators and the SPL</b>	<b>67</b>
A Sample View for the Application	67
The Iterator Interface	69
The Countable Interface	73
The SeekableIterator Interface and Pagination	75
The ArrayAccess Interface	77
<b>Lambda Functions and Closures</b>	<b>78</b>
The Old Way: Lambda-Style Functions	78
Understanding Closures	81
Using the Query Builder for Prototyping	83
<b>Summary</b>	<b>85</b>
<b>CHAPTER 3: MYSQL DRIVERS AND STORAGE ENGINES</b>	<b>87</b>
<b>MySQL Drivers</b>	<b>88</b>
<b>About MySQL Storage Engines</b>	<b>89</b>
Obtaining Storage Engine Information	89
<b>Default Storage Engines</b>	<b>93</b>
MyISAM	93
InnoDB	97
Memory	103
Blackhole	108
Archive	109
Merge	110
CSV	112
Federated	112
<b>Other MySQL Supplied Engines</b>	<b>118</b>
Falcon	118
Maria	120
<b>Pluggable Engines</b>	<b>121</b>
InnoDB Plugin	121
PBXT	122
XtraDB	123

<b>Engines as Standalone Products</b>	<b>124</b>
InfiniDB	124
TokuDB	124
Infobright	125
<b>Other MySQL Offerings</b>	<b>125</b>
Storage Engine Patch Products	125
MySQL-Related Products	126
Other Engines	127
Integrated Hardware Engines	128
Other Solutions	128
Wafflegrid	129
<b>Summary</b>	<b>129</b>
<b>CHAPTER 4: IMPROVING PERFORMANCE THROUGH CACHING</b>	<b>131</b>
<b>eAccelerator and APC</b>	<b>132</b>
Installing and Configuring APC	132
Installing and Configuring eAccelerator	133
User Cache	134
Checking the Cache Status	135
When to Use APC and eAccelerator	138
<b>memcached</b>	<b>138</b>
What Is memcached?	139
What memcached Does for You	139
How Does memcached Work?	139
How to Use memcached	141
What Is Gearman?	144
Caching Strategies	144
<b>Installing memcached</b>	<b>145</b>
<b>Starting memcached</b>	<b>148</b>
Startup Scripts	149
Testing Your memcached Installation	151
memcached Clients	153
<b>Libmemcached</b>	<b>153</b>
Libmemcached Features	154
Libmemcached Utility Programs	154
Installing libmemcached	155
<b>Libmemcached Utility Programs</b>	<b>155</b>
memcat	155
memflush	156
memcp	156
memstat	157
memrm	157

memslap	157
memerror	158
<b>PECL/Memcached</b>	<b>158</b>
Connecting, Instantiation	160
Setting Client Behavior	162
Putting and Retrieving Data	163
Append and Prepend	166
Delete	168
Increment and Decrement	168
Multi-get	169
Multi-set	170
Cache Locality Using byKey Methods and Multi get/set	171
getDelayed	173
CAS	174
Statistics	176
Server List	178
Error Handling	178
<b>Practical Caching</b>	<b>180</b>
memcached Proxy: moxi	185
Other “memcapable” Key-Value Stores	186
Tokyo Tyrant	187
<b>Summary</b>	<b>188</b>
<b>CHAPTER 5: MEMCACHED AND MYSQL</b>	<b>191</b>
<hr/>	
<b>The Memcached Functions for MySQL</b>	<b>191</b>
<b>How the Memcached Functions for MySQL Work</b>	<b>192</b>
<b>Installing the Memcached Functions for MySQL</b>	<b>193</b>
Prerequisites	193
Configure the Source	194
Build the Source	194
Install the UDF	195
Checking Installation	196
<b>Using the Memcached Functions for MySQL</b>	<b>196</b>
Establishing a Connection to the memcached Server	197
Data Setting Functions	198
Data Fetching Functions	204
Increment and Decrement	204
Behavioral Functions	206
Statistical Functions	209
Version Functions	211
Fun with Triggers (and UDFs)	212

---

Read-Through Caching with Simple Select Statements	216
Updates	219
<b>Summary</b>	<b>220</b>
<b>CHAPTER 6: ADVANCED MYSQL</b>	<b>221</b>
<hr/>	
<b>Views</b>	<b>221</b>
Access Permissions	223
Additional Information about Views	225
<b>Stored Procedures and Functions</b>	<b>226</b>
General Attributes	226
Stored Routine Logic	228
Using Stored Routines Privileges and Meta Data	230
Extending Stored Routines	231
Stored Routine Disadvantages	231
User Defined Functions	231
<b>Triggers</b>	<b>232</b>
No Triggers	233
Trigger Syntax	233
Insert Triggers	233
Update Triggers	234
Delete Triggers	235
Replace Triggers	236
Trigger Permissions	237
<b>Transactions</b>	<b>237</b>
Atomicity	238
Consistency	240
Isolation	242
Durability	247
Implied Commit	250
<b>Replication</b>	<b>250</b>
Replication Purposes	250
Replication Setup	251
Testing MySQL Replication	254
How Does MySQL Replication Work?	255
Testing MySQL Replication	259
Important Configuration Options	260
Important Replication Commands	261
Breaking Replication	261
Using Replication Selectively	262
The Issues with MySQL Replication	263
The Benefits of MySQL Replication	264

<b>Events</b>	<b>264</b>
Creating Events	265
Enabling the Events Scheduler	267
Altering Events	267
Event Privileges	268
Event Meta Data	269
<b>Summary</b>	<b>270</b>
<b>CHAPTER 7: EXTENDING MYSQL WITH USER-DEFINED FUNCTIONS</b>	<b>271</b>
<b>Introduction to UDFs</b>	<b>272</b>
<b>Developing a UDF</b>	<b>273</b>
UDF Development Requirements	273
UDF Required Functions	274
<b>A Practical UDF Example</b>	<b>274</b>
UDF High-Level Design	275
Designing an Algorithm to Use for Your UDF	277
Implementing the Program	277
Building the UDF	292
Installing the UDF	294
Running Your New UDF	295
<b>Using a UDF with PHP</b>	<b>296</b>
Connecting and Disconnecting to MySQL	296
Returning the Result Set Array	297
<b>Other UDF SQL Statements</b>	<b>300</b>
<b>Debugging a UDF</b>	<b>300</b>
Attaching gdb to an Already Running Process	301
Setting a BreakPoint and Stepping through Code	302
Dealing with Literal Values	304
Debugging Summary	304
<b>Summary</b>	<b>305</b>
<b>CHAPTER 8: WRITING PHP EXTENSIONS</b>	<b>307</b>
<b>Setting Up the Build Environment</b>	<b>308</b>
<b>Creating an Extension with ext_skel</b>	<b>309</b>
Creating and Compiling Skeleton Code	309
Using a Function Definitions File	312
Generating Help Files	313
<b>Creating an Extension with CodeGen_PECL</b>	<b>314</b>
Creating the Basic XML File	314
Defining Functions	316
Defining Constants, INI Directives, and Globals	318
Defining Objects, Methods, and Properties	319

---

<b>Variables in PHP Extensions</b>	<b>321</b>
Setting and Testing zvals	323
Reading and Comparing zvals	324
Dealing with Strings as zvals	326
Advanced Memory Management	328
<b>Using Functions in Extensions</b>	<b>329</b>
Basic Definitions	329
Using Arguments	331
Defining Argument Information	334
Returning Values	334
Built-In Functions	335
Creating and Consuming PHP API Functions	336
More Notes and Creating Helper Functions	339
<b>Input/Output</b>	<b>340</b>
Standard Out	340
Files and Streams	341
Networking	344
Errors and Warnings	346
<b>Arrays and Hash Tables</b>	<b>347</b>
Building and Accessing Arrays	347
Accessing and Modifying Hash Tables	349
<b>Objects and Interfaces</b>	<b>349</b>
Creating a Class	350
Interacting with Objects	355
<b>Constants, INI Directives, and Globals</b>	<b>357</b>
Constants	357
Globals and INI Directives	358
<b>Describing an Extension</b>	<b>361</b>
Printing a Description	361
Building a Table	362
Specifying a Logo	362
<b>Summary</b>	<b>364</b>
<b>CHAPTER 9: FULL-TEXT SEARCHING</b>	<b>365</b>
<hr/>	
<b>MySQL FULLTEXT Indexes</b>	<b>365</b>
Using MySQL FULLTEXT Indexes	367
MySQL FULLTEXT Index Issues	368
<b>A Better Solution: The Sphinx Full-Text Search Engine</b>	<b>369</b>
Sphinx Configuration and Installation	370
Sphinx.conf Settings	371
Starting Sphinx	382
Searching Sphinx	383

Delta Indexes	389
Merging Indexes	394
<b>Developing Applications That Use SPHINX</b>	<b>395</b>
Sphinx and PHP	395
<b>Summary</b>	<b>399</b>
<b>CHAPTER 10: MULTI-TASKING IN PHP AND MYSQL</b>	<b>401</b>
<hr/>	
<b>Gearman</b>	<b>401</b>
<b>What Is Gearman?</b>	<b>402</b>
Installing and Running Gearman	404
Using the Gearman MySQL UDFs	407
PHP and Gearman	409
<b>Narada: A Search Engine Application</b>	<b>412</b>
Obtaining Narada	413
Narada Components	413
Database Tables for the Search Engine Application	415
Sphinx Setup	416
Gearman Workers	429
Index Page	435
One Other Tidbit of Code	438
The Big Picture	439
Running Narada	439
To-Do List for Narada	441
Other Job Server Systems	442
<b>Summary</b>	<b>442</b>
<b>CHAPTER 11: REWRITE RULES</b>	<b>443</b>
<hr/>	
<b>Using Rewrite Rules</b>	<b>444</b>
Understanding the Purpose and Structure of Rewrite Rules	444
Understanding and Controlling Rewrite Rule Flow	445
Conditional Rules	447
Logging and Optimization	450
<b>Rewrite Maps</b>	<b>451</b>
Built-In Maps	451
Random and Text Lookups	452
Using PHP and MySQL	452
<b>Summary</b>	<b>456</b>
<b>CHAPTER 12: USER AUTHENTICATION</b>	<b>457</b>
<hr/>	
<b>Designing the Database</b>	<b>458</b>
<b>HTTP-Based Authentication</b>	<b>460</b>
Basic Authentication	461



---

Digest Authentication	463
<b>Pure PHP Authentication</b>	<b>466</b>
Using PHP Sessions	467
Building Secure Cookies	471
<b>Access Control Lists</b>	<b>473</b>
<b>Summary</b>	<b>475</b>
<b>CHAPTER 13: UNDERSTANDING THE INFORMATION_SCHEMA</b>	<b>477</b>
<hr/>	
<b>Using the INFORMATION_SCHEMA</b>	<b>478</b>
<b>Table Objects Tables</b>	<b>479</b>
<b>Other Database Objects Tables</b>	<b>481</b>
<b>MySQL Status Tables</b>	<b>482</b>
PROCESSLIST (5.1)	482
SESSION_STATUS/GLOBAL_STATUS (5.1)	484
SESSION_VARIABLES/GLOBAL_VARIABLES (5.1)	485
<b>MySQL Meta Data Tables</b>	<b>486</b>
CHARACTER_SETS	486
COLLATIONS	487
COLLATION_CHARACTER_SET_APPLICABILITY	488
<b>MySQL ACL Permissions Tables</b>	<b>488</b>
USER_PRIVILEGES	488
SCHEMA_PRIVILEGES	489
TABLE_PRIVILEGES	489
COLUMN_PRIVILEGES	490
<b>INFORMATION_SCHEMA Extensions</b>	<b>491</b>
<b>SHOW Cross Reference</b>	<b>491</b>
<b>Summary</b>	<b>492</b>
<b>CHAPTER 14: SECURITY</b>	<b>493</b>
<hr/>	
<b>Hardening Your MySQL Server</b>	<b>493</b>
Installation Defaults	494
Operating System Security	495
MySQL Security Permissions	495
Additional Database Security	500
Auditing	500
<b>Encoding Data</b>	<b>501</b>
Bi-directional Encoding	501
Single-Directional Encoding	505
<b>PHP Security Recipes</b>	<b>506</b>
Protecting against SQL Injection	506
Protecting against Replay Attacks	507

Protecting against XSS	509
Protecting against CSRF	511
Automation Attacks	514
<b>Summary</b>	<b>516</b>
<b>CHAPTER 15: COMMAND-LINE AND WEB SERVICES</b>	<b>517</b>
<hr/>	
<b>Creating Command-Line Scripts</b>	<b>517</b>
Reading Command-Line Input	518
Prompting for Input	520
Completed Classes	521
Setting Up Cron Jobs	522
Bonus: Output in Color	523
<b>Creating Web Services</b>	<b>524</b>
RESTful Web Services	524
SOAP Web Services	532
Getting Started with the SOAP Library	533
<b>Summary</b>	<b>541</b>
<b>CHAPTER 16: OPTIMIZATION AND DEBUGGING</b>	<b>543</b>
<hr/>	
<b>Debugging PHP</b>	<b>543</b>
Creating Stack Traces	544
<b>Optimizing Queries</b>	<b>545</b>
Reducing SQL	545
Identifying SQL Statements	545
Optimizing SELECT	546
Optimizing UPDATE	556
Optimizing DELETE	556
Optimizing INSERT	558
Optimizing REPLACE	558
INSERT ... ON DUPLICATE KEY UPDATE	558
<b>Debugging MySQL</b>	<b>560</b>
Error Log	560
Slow Query Log	561
Processlist	562
Other Commands	564
Using a Debugger with MySQL	564
<b>Summary</b>	<b>565</b>
<b>INDEX</b>	<b>567</b>