



Delphi in Depth: FireDAC

Cary Jensen

Delphi in Depth: FireDAC, Copyright © 2017 Cary Jensen

<http://www.JensenDataSystems.com/FireDACbook>

ISBN: ISBN-10: 1546391274, ISBN-13: 978-1546391272, Ebook edition available

Chapter Titles

Chapter Titles	v
Table of Contents	vii
About the Author	xvii
About the Technical Reviewers	xix
Acknowledgements	xxi
Introduction	1
Chapter 1 Overview of FireDAC	5
Chapter 2 Connecting to Data	15
Chapter 3 Configuring FireDAC	47
Chapter 4 Basic Data Access	81
Chapter 5 More Data Access	109
Chapter 6 Navigating and Editing Data	145
Chapter 7 Creating Indexes	165
Chapter 8 Searching Data	197
Chapter 9 Filtering Data	217
Chapter 10 Creating and Using Virtual Fields	259
Chapter 11 Persisting Data	297
Chapter 12 Understanding FDMemTables	329
Chapter 13 More FDMemTables: Cloned Cursors and Nested DataSets	369
Chapter 14 The SQL Command Preprocessor	397
Chapter 15 Array DML	425
Chapter 16 Using Cached Updates	439
Chapter 17 Understanding Local SQL	487
Appendix A Code Download, Database Preparation, and Errata	507
Index	519

Table of Contents

Dedication.....	3
Chapter Titles.....	v
Table of Contents	vii
About the Author	xvii
Cary Jensen.....	xvii
About the Technical Reviewers.....	xix
Dmitry Arefiev.....	xix
Holger Flick.....	xix
Jens Fudge	xx
Bruce McGee	xx
Acknowledgements	xxi
Introduction.....	1
Who Is This Book For	2
Conventions	2
Chapter 1 Overview of FireDAC.....	5
FireDAC Features	6
<i>Cross-Platform Support</i>	7
<i>Exceptional Support for Databases</i>	7
<i>Flexible Queries Using the SQL Command Preprocessor</i>	8
<i>Blazing Performance with Array DML</i>	8
<i>Support for a Variety of Query Execution Modes</i>	9
<i>Powerful Monitoring Capabilities</i>	9
<i>Cached Updates</i>	10
<i>Result Set Persistence</i>	10
<i>Data Type Mapping</i>	11
<i>Local SQL</i>	11
<i>Additional Features</i>	12
Connection Recovery	12
Advanced Transaction Support.....	12
Built-In Dialog Support.....	12
Support for Database-Specific Services.....	12
Customizable Data Access	13
Batch Move Support.....	13

Written in Object Pascal	13
Chapter 2 Connecting to Data.....	15
Creating Unnamed Connections	15
<i>Creating Temporary Connections</i>	<i>16</i>
<i>Defining a Temporary Connection Using FDConnection.Params.....</i>	<i>26</i>
<i>Defining a Temporary Connection at Runtime.....</i>	<i>27</i>
Creating Named Connections	28
<i>Creating Named Connections Definition Using the Database Explorer.....</i>	<i>29</i>
<i>Creating a Named Connection Definition Using the FireDAC Explorer.....</i>	<i>33</i>
<i>Creating a Persistent Connection.....</i>	<i>36</i>
<i>Creating a Private Connection.....</i>	<i>39</i>
Connecting to Any Database Using ODBC.....	41
Chapter 3 Configuring FireDAC	47
Share Configuration Properties.....	48
<i>Configuration Property Inheritance</i>	<i>48</i>
<i>Overriding Individual Configuration Properties.....</i>	<i>50</i>
<i>Restoring Configuration Property Inheritance.....</i>	<i>50</i>
Configuring the Shared Properties.....	51
<i>Fetch Options.....</i>	<i>54</i>
General Fetching.....	56
Items to Fetch	57
Items to Cache	57
Master-Detail	57
Live Data Window.....	58
<i>Format Options.....</i>	<i>58</i>
Data Mapping Rules	60
Handling BCD/FmtBCD Type and DataSnap Compatibility.....	62
Handling String Type.....	62
Parameters Default Type.....	63
Value Preprocessing	63
Dataset Sorting.....	64
Quotation Identifier.....	64
Default Field Formats	65
<i>Resource Options.....</i>	<i>65</i>
Command Text Processing	67
Persistence Mode.....	68
Command Execution.....	69
Connection Resources.....	69
<i>Update Options.....</i>	<i>70</i>

General Updating.....	72
Locking.....	72
Refreshing	73
Automatic Incrementing.....	73
Posting Changes	74
<i>Transaction Options</i>	75
Isolation Level.....	76
Update Ability	76
Automatic Committing.....	77
DBMS-Specific Parameters.....	77
Disconnection Action.....	78
Nesting	78
Understanding UpdateOptions.UpdateMode.....	78
Chapter 4 Basic Data Access	81
The User Interface and Data Binding	85
<i>Navigation and VCL Data Links</i>	86
The DBNavigator	86
Multi-Record VCL Controls and Navigation: DBGrid and DBCtrlGrid	89
<i>Navigation and LiveBindings</i>	91
<i>The BindNavigator</i>	92
<i>Position-Related LiveBindings</i>	94
Understanding FDTable.....	97
<i>Configuring an FDTable</i>	97
<i>Executing Datasets at Design Time</i>	99
<i>Executing DataSets at Runtime</i>	100
<i>When Should You Connect?</i>	100
<i>Live Data Window</i>	102
Executing Queries and Stored Procedures.....	103
<i>Executing Queries</i>	103
Executing Stored Procedures	105
Chapter 5 More Data Access	109
Parameterized Queries and Stored Procedures	109
<i>The Advantages of Parameters</i>	110
Greater Flexibility	110
Improved Performance	110
Prevention of SQL Injection.....	111
<i>Defining Parameters at Design Time</i>	112
<i>Parameterized FDQueries and the Query Editor.</i>	115

x Delphi in Depth: FireDAC

<i>Defining Parameters at Runtime</i>	118
Taking Control of Updates: FDUpdateSQL	121
<i>Defining the Query</i>	122
<i>Configuring the DataSet</i>	124
<i>Creating the Parameterized FDUpdateSQL Queries</i>	128
FDCommand, FDTAdapter, and FDMemTable	130
Managing Transactions	133
<i>Implicit and Explicit Transactions</i>	133
<i>Transaction Isolation</i>	138
Dirty Read Isolation	139
Read Committed Isolation	139
Repeatable Read Isolation	139
<i>Nested Transactions</i>	139
Asynchronous Queries	140
Monitoring FireDAC Queries	141
Chapter 6 Navigating and Editing Data	145
Understanding Fields	145
The Current Record	148
Detecting Changes to Record State	148
<i>Calculating Performance</i>	152
Navigating Programmatically	153
<i>Basic Navigation</i>	154
<i>Have I Gone Too Far? Bof and Eof</i>	154
<i>Using MoveBy</i>	155
<i>Navigating Using RecNo</i>	156
<i>Scanning a FireDAC DataSet</i>	157
<i>Disabling Controls While Navigating</i>	157
<i>Navigating Using Bookmarks</i>	160
<i>Editing a DataSet</i>	161
Chapter 7 Creating Indexes	165
Index Overview	166
Temporary Indexes	167
<i>An Example of Creating Temporary Indexes at Runtime</i>	168
<i>Temporary Indexes and FormatOptions.SortOptions</i>	171
Persistent Indexes	172
<i>Defining Persistent Indexes</i>	173
<i>Creating Field-Based Indexes</i>	178
Creating a Field-Based Index at Design Time	178
Selecting an Index at Design Time	179
Creating a Field-Based Index at Runtime	180

Selecting an Index at Runtime.....	180
<i>Creating Expression Indexes</i>	182
<i>Creating Distinct Indexes</i>	184
<i>Creating a Filter-Based Index</i>	186
Two Runtime Index Examples: Sorting a DBGrid On-The-Fly.....	190
Chapter 8 Searching Data	197
Searching FireDAC DataSets	197
<i>Simple Record-by-Record Searches</i>	199
<i>Searching with Indexes</i>	200
Finding Data.....	201
Going to Data	204
<i>Searching with Variants</i>	207
Locating Data	208
Using Lookup.....	213
Chapter 9 Filtering Data	217
Filters	217
<i>Using a Range</i>	222
Setting Ranges.....	222
Using ApplyRange	228
Canceling a Range.....	231
A Comment About Ranges.....	231
Using Filters.....	232
<i>Basic Filters</i>	233
<i>Special Filter Expressions</i>	234
Null Comparisons.....	236
String Functions	238
Date/Time Functions	239
Miscellaneous Functions	241
Escaping Wildcard Characters.....	242
FireDAC Scalar Functions.....	243
<i>Other Filter-Related Properties</i>	243
<i>Using the OnFilterRecord Event Handler</i>	245
<i>Navigating Using a Filter</i>	246
<i>Using Ranges and Filters Together</i>	249
Master-Detail Views: Dynamically Filtered Detail Tables	250
<i>Defining a Range-Based Dynamic Master-Detail Relationship</i>	252
<i>Defining a Parameter-Based Dynamic Master-Detail Relationship</i>	254
<i>Detail Records and the FetchOptions.DetailDelay Property</i>	258

Chapter 10 Creating and Using Virtual Fields	259
Aggregate Fields	260
<i>Creating Aggregate Fields.....</i>	261
Adding the Aggregate Field.....	264
Defining the Aggregate Expression	266
Setting Aggregate Index and Grouping Level.....	268
Making the Aggregate Field Available	269
Turning Aggregates On and Off	272
<i>Creating Aggregate Collection Items</i>	272
Understanding Group State.....	274
Creating AggregateFields at Runtime.....	277
Calculated Fields.....	280
<i>InternalCalc Fields and FireDAC Scalar Functions.....</i>	283
Lookup Fields	285
Understanding FieldOptions	292
<i>The FieldOptions Property</i>	293
<i>Combine Options and PositionMode.....</i>	295
<i>The UpdatePersistent FieldOptions Property</i>	295
<i>Field and Fields Properties</i>	296
Chapter 11 Persisting Data.....	297
Persisting Data to Files	298
<i>Saving to Files</i>	299
File formats.....	301
Storing Human-Readable Data	303
What to persist	305
Persisted Version Information	308
<i>Loading from Files</i>	309
File Formats	312
Merging Data When Loading	312
<i>Automating Persistence</i>	316
<i>Maintaining Backups</i>	317
Persisting to Streams.....	321
<i>Saving to a Stream</i>	322
<i>Loading from a Stream</i>	324
Persistence and FDSCHEMAAdapters.....	326
Chapter 12 Understanding FDMemTables	329
The Role of FDMemTable in FireDAC Applications	330
Defining an FDMemTable's Structure	331

<i>Defining Structure Using FieldDefs</i>	332
Creating FieldDefs at Design Time	332
Creating FieldDefs at Runtime	336
<i>Defining an FDMemTable's Structure Using Fields</i>	339
Creating Fields at Design Time	339
Creating Fields at Runtime	345
Loading FDMemTables Directly From DataSets	347
<i>Loading an FDMemTable Using CopyDataSet</i>	348
Other FDDatasets and CopyDataSet	359
<i>Copying Data Using the FDDataset Data Property</i>	362
Editing Data at Design Time	364
Chapter 13 More FDMemTables: Cloned Cursors and Nested DataSets	369
Cloning and FDMemTables	369
<i>Master with Detail Clone</i>	371
<i>Editing with Cloned Cursors and Cached Updates</i>	375
Creating Nested DataSets	379
<i>Defining Nested DataSets at Design Time</i>	380
<i>Defining Nested DataSets at Runtime</i>	384
Using FieldDefs at Runtime	385
Using Fields at Runtime	389
<i>Final Thoughts About Nested DataSets</i>	393
Chapter 14 The SQL Command Preprocessor	397
Macro Substitution.....	400
Escape Sequences	406
<i>Constant Substitution</i>	407
<i>Identifier Substitution</i>	408
<i>Conditional Substitution</i>	409
<i>FireDAC Scalar Functions</i>	412
FireDAC String/Character Scalar Functions	415
Numeric Scalar Functions	417
Date/Time Scalar Functions	419
System Scalar Functions.....	421
The Convert Scalar Function.....	422
Special Character Processing.....	423
Chapter 15 Array DML	425
Using Array DML.....	426
Array DML Mode and Errors	434

<i>Handling Array DML Limits.....</i>	437
Chapter 16 Using Cached Updates.....	439
Cached Updates: The Basics.....	441
<i>Entering and Exiting Cached Updates</i>	441
<i>Detecting the Cache State.....</i>	442
<i>Record Status and Change Filters</i>	444
<i>What Has Changed?</i>	447
<i>Persisting the Cache.....</i>	448
Managing the Cache	449
<i>Cancelling the Last Change.....</i>	449
<i>Cancelling a Specific Change.....</i>	450
<i>Cancelling All Updates.....</i>	450
<i>Clearing the Cache Without Cancelling Changes</i>	451
<i>Using Save Points.....</i>	452
Applying Updates	453
<i>Apply Updates Using Brute Force.....</i>	453
<i>Calling the ApplyUpdates Method.....</i>	453
The ApplyUpdates Method in Automatic Mode	457
ApplyUpdates and OnUpdateRecord.....	463
<i>ApplyUpdates and Errors</i>	467
Managing Errors Following the Call to ApplyUpdates.....	467
Managing Errors Using Event Handlers	469
Understanding Centralized Cached Updates	477
<i>Managing Master-Detail Tables in the Centralized Cached Updates Model</i>	481
Chapter 17 Understanding Local SQL.....	487
Implementing Local SQL	488
<i>The Initial Setup.....</i>	488
<i>Configuring the SQLite Connection</i>	492
<i>Configuring the Datasets.....</i>	493
<i>Configuring FDLocalSQL</i>	495
Activating Local SQL Queries at Runtime.....	499
Some Comments on FDLocalSQL	504
Appendix A Code Download, Database Preparation, and Errata	507
Code Download	507
Database Preparation	509
<i>Installation.....</i>	509
<i>The DataPaths Unit</i>	509
<i>Using SharedDMVcl</i>	512
<i>The EMPLOYEE Named Connection</i>	513

<i>InterBase UDF Definitions</i>	515
Errata.....	517
Index	519

Delphi in Depth: FireDAC

- Learn how to connect to a wide variety of databases
 - Optimize your connection configurations
 - Explore the world of indexes, searches, and filters
 - Discover the power of persisted datasets
 - Create flexible queries using macros and FireDAC scalar functions
 - Achieve blazing performance with Array DML
 - Master the art of cached updates
 - Add sophisticated features using Local SQL
-
- Appropriate for novice to advanced Delphi database developers
 - Requires RAD Studio or Delphi XE6 Professional or higher
 - Source code and more at www.JensenDataSystems.com

About the Author

Cary Jensen is a best-selling author of more than twenty-five books on software development. He is an award-winning trainer and a popular speaker at software conferences throughout much of the world. An Embarcadero Delphi MVP, Cary has provided training to companies on every version of Delphi, starting with the original Delphi World Tour in 1995. He is the founder, and co-presenter for Delphi Developer Days (2001 to present).

Visit www.DelphiDeveloperDays.com for more information.

Dr. Jensen is Chief Technology Officer at Jensen Data Systems, Inc., a company that has been providing training, consulting, and software development services since 1988. An active developer, he assists clients in data modeling, software architecture, software development, team management, mentoring, training, and software migration. He has a Ph.D. in Engineering Psychology, from Rice University, specializing in human-computer interaction.

