



Danysoft®



iOS/Android Application Development with Delphi

Francisco Charle

Francisco Charte

**iOS/Android
Application
Development with
Delphi**

2 -

ALL RIGHTS RESERVED

The contents of this publication are all rights reserved. They may not be reproduced, transcribed, transmitted, stored in a retrieval system, or translated to another language in any form or by any means, mechanical, manual, electronic, magnetic, chemical, optical, or otherwise. The prosecution of unauthorized reproduction will result in jail and/or fines.

LIMITED RESPONSIBILITY

Both the author and Danysoft have revised the text to avoid errors of any kind, but we cannot promise you that the book is completely free of errors. Please send us your suggestions and comments about the book to attcliente@danysoft.com.

DISCOUNTS

Danysoft offers special discounts to training centers and for volume acquisitions. For more details, please contact Danysoft.

REGISTERED TRADEMARKS

All products and trademarks are mentioned only for identification purposes and are registered by their respective companies.

Author: Francisco Charte
Published in English by Danysoft
Avda. de la Industria, 4 Edif. 1
28108 Alcobendas, Madrid. Spain.
+34 902 123146 | www.danysoft.com | info@danysoft.com

PRINTED IN SPAIN

© [Danysoft](http://www.danysoft.com) | Madrid, 2015 | English version.

ISBN 978-84-939910-8-1 | Depósito Legal M-1648-2015

iOS/Android Application Development with Delphi - Francisco Charte

Preface

To the person who makes my life meaningful: María Jesús

Until the end of the last century, most software was developed to be used almost exclusively on personal computers. These had homogeneous characteristics in terms of hardware, and there were three major operating systems: Windows, OS X, and GNU/Linux. Input devices (keyboard and mouse), screen resolutions, and the access to the file system were fairly standardized aspects, and thus developers did not have to worry too much about these details.

Over the last 10-15 years, two new platforms for running applications have been gaining ground: the Web and mobile devices. The latter can also be considered as a computer, but with a heterogeneity of settings in hardware and software that the field of computing has not known since the microcomputers birth, in the 70-80s decades.

It is the heterogeneous hardware and software what promotes competition, and eventually offers the end user a wide range of devices to choose from. However, this advantage for the end user becomes broadly an obstacle for developers, which have to design their applications for different operating

4 - Preface

systems which are not always converging in terms of user interaction guidelines.

Delphi has become in recent years one of the most powerful cross-platform development tools, thanks to the incorporation of new compilers specific to each system, as well as a component library common to all of them. Starting with version XE5, it is possible to build applications for Windows, OS X, iOS and Android from the same code base. This ability has been extended in further versions, such as XE6 and specially XE7. This allows to expand the number of potential users from a single project, thus reducing the developer's workload.

The aim of this book is to give the reader all the information required to start developing mobile applications with Delphi, specifically for devices running iOS and Android operating systems. The author does not assume any specific knowledge by the reader about the Delphi language, its user interface or the development tools for iOS/Android. Nonetheless, it is assumed that the reader is a programmer and, therefore, has the appropriate background to understand the text and knows the fundamental aspects of the software development lifecycle.

Acknowledgments

Writing a book is a demanding task, one which requires so much dedication that usually abstracts the author from everything which surrounds him. I can never be grateful enough for the support that my family always provides me. Thank you María Jesús, David and Alejandro, you are the pillars that keep me where I am.

I also want to convey my thanks to all those who, in one way or another, have made this book a reality, so that it has reached the reader. Thanks to José Luis Castaño for trusting me with this project, and to the staff of Danysoft involved in the creation of the cover, production, distribution, etc.

Contents

Preface.....	3
Acknowledgments.....	4
Contents.....	5
List of Figures.....	17
Introduction.....	23
History of Delphi.....	24
Delphi for mobile platforms.....	27
About this book.....	27
About the author.....	29
Part I:	
The mobile ecosystem.....	31
Chapter 1:	
Mobile devices hardware.....	33
Core components.....	34
Processors and graphics units.....	35
Mobile SoCs.....	36
Mobile CPU cores.....	38
Graphics Processing Units.....	39
Memory.....	39

6 - Contents

Storage.....	40
Battery.....	42
User interaction components.....	44
Touch screen.....	44
Display.....	44
Other layers.....	46
Keyboard.....	47
Mic/Speaker.....	48
Other interaction components.....	49
Sensors and other components.....	50
Accelerometer and gyroscope.....	50
Magnetometer (Compass).....	51
Positioning components.....	52
Communication components.....	53
Miscellaneous.....	54
Conclusions.....	55
What's next.....	56
Chapter 2:	
Software platforms for mobile devices.....	58
Smartphones' software platform structure.....	59
A low-level RTOS.....	60
A high-level OS.....	61
Mobile operating systems history.....	62
The early days.....	62
Today's major platforms.....	65
iOS.....	65
Android.....	67
Windows Phone.....	68
Other mobile operating systems.....	70
Conclusions.....	72
What's next.....	72
Chapter 3:	
Development solutions overview.....	73
The three main development strategies.....	74
Mobile Web applications.....	75
Advantages.....	76
Disadvantages.....	77
Languages and tools.....	78
Design languages.....	78
Programming languages.....	80
API and libraries.....	81
Development tools.....	82
Hybrid mobile applications.....	84

Advantages.....	85
Disadvantages.....	86
Languages and tools.....	86
Native mobile applications.....	88
Advantages.....	89
Disadvantages.....	89
Languages and tools.....	90
Where does Delphi fit?.....	93
Conclusions.....	95
What's next.....	95

Part II:
Mobile development with Delphi.....96

Chapter 4:
Delphi, SDKs and tools installation.....98

Delphi installation.....	99
Product editions and characteristics.....	99
System requirements.....	100
Hardware requirements.....	100
Software requirements.....	101
Installation process.....	102
Updating the Delphi installation.....	105
Installation maintenance.....	107
Android development tools configuration.....	109
Managing Android SDK versions.....	109
Managing Android virtual devices.....	113
Physical devices configuration.....	116
iOS development tools configuration.....	119
Installing Xcode.....	120
Folder sharing configuration.....	122
PAServer installation.....	124
PAServer Manager (Delphi XE7).....	125
Conclusions.....	128
What's next.....	128

Chapter 5:
Introducing the Delphi working environment.....131

MyMunchies sample application.....	132
Main IDE components.....	132
IDE layout customization.....	135
IDE Insight.....	136
Starting a new project.....	137
Delphi XE7 multi-device projects.....	139
Selecting a template for MyMunchies.....	140

8 - Contents

User interface design fundamentals.....	143
Choosing among designer views.....	143
Styles and views in Delphi XE7.....	145
Interface style while designing.....	145
Master view and specific views for each platform.....	146
Working methodology using XE7 views.....	146
Editing the components properties.....	149
Adding new components to the interface.....	152
Removing components.....	154
MyMunchies user interface.....	155
A title for each page.....	155
Configuring the lists of products.....	158
Adding the list of selected items.....	162
Writing some code.....	163
Code, components and events.....	163
Managing events through the Object Inspector.....	163
Code editing.....	165
Code provided by the project template.....	167
Managing the targets.....	168
Platform properties and configuration.....	169
Adding a new platform.....	170
Managing platforms in Delphi XE7.....	172
Running and debugging the application.....	173
Debugging tools.....	175
Breakpoints.....	176
Process state.....	177
Watching variables contents.....	178
Stepping through the code.....	181
Project deployment to mobile devices.....	182
Deployment to an Android device.....	182
Deployment to an iOS device.....	183
Connection configuration.....	184
How to change a connection.....	186
Conclusions.....	188
What's next.....	188

Chapter 6:

Mobile project templates.....	190
Starting from scratch.....	191
A form with header and footer.....	192
Navigation elements.....	193
A form with several pages.....	196
A master/detail form.....	199
An interface optimized for tablets.....	201
The Delphi XE7 Master-Detail application template.....	203

The TMultiView component.....206
 A form for 3D applications.....207
 Conclusions.....209
 What's next.....209

Chapter 7:

Common tasks.....211
 User interface navigation.....212
 The TActionList component.....213
 The ActionList editor.....215
 Standard actions.....218
 How to implement a Tab navigation system.....219
 Devices with hardware back button.....222
 User-defined actions.....223
 Gesture-based navigation.....224
 Standard gestures vs interactive gestures.....225
 The TGestureManager component.....225
 Touch target expansion.....227
 Navigation through standard gestures.....227
 Managing interactive gestures.....228
 Interactive gesture identification.....229
 Interactive gestures in practice.....230
 Updating Content through gestures (pull-to-refresh).....232
 Application lifetime changes.....234
 Screen orientation changes.....234
 Configuring the project for specific screen orientations.....235
 Reacting to screen orientation changes.....236
 Application state changes.....239
 How to register for application state events.....239
 Life cycle events of mobile applications.....240
 Handling application state events in practice.....242
 Saving and loading data.....243
 Where to store application data.....244
 Saving and loading text data.....245
 Dealing with configuration parameters.....247
 Loading graphic files.....249
 Deploying additional files into the data directory.....251
 Saving and loading state information with Delphi XE7.....252
 The OnSaveState event.....253
 Transiently storing state data.....253
 Persistently storing state data.....255
 The TMultiView component (XE7).....255
 TMultiView as a generic container.....256
 Presentation mode.....258
 Configuring the static panel.....259

10 - Contents

Configuring the sliding panel.....	259
Configuring the floating panel.....	261
Linking the master and detail panels.....	262
Conclusions.....	263
What's next.....	264

Chapter 8:

Introducing the Delphi language.....	266
Basic syntax.....	267
Delphi code modules.....	268
Structure of the program code module.....	268
Structure of a standard code module.....	270
Module references.....	271
Comments.....	273
Essential data types.....	274
Integer and floating point numbers.....	274
Characters and character strings.....	276
Other basic data types.....	277
Notation for literals and identifier naming.....	278
Enumerations.....	279
Scoped enumerations.....	281
Subranges.....	282
Arrays.....	284
Static arrays declaration.....	285
Arrays with non-numeric indexes.....	286
Managing dynamic arrays.....	287
Records.....	288
Sets.....	291
Expressions.....	292
Arithmetic, relational, and logical expressions.....	293
Set expressions.....	294
Pointer expressions.....	294
Other expression types.....	295
Statements.....	296
Conditional statements.....	296
Iterative statements.....	298
Procedures and functions.....	299
Parameters by value and by reference.....	301
Parameters with default values.....	301
Arrays as parameters to methods.....	302
Structured exception handling.....	303
Other statements.....	305
Classes and their members.....	306
How to define a new class.....	306
Class members visibility.....	308

Object construction.....	309
The TCollectible class.....	310
Attributes declaration.....	311
Private methods declaration.....	313
Constructor declaration.....	314
Public properties' declaration.....	314
Implementation of methods.....	316
The TComputer class.....	318
Class members and the self object.....	321
The TCollection class.....	322
Anonymous methods.....	325
Anonymous method use scenario.....	325
Anonymous method type definition.....	326
How to pass anonymous methods as arguments.....	327
Generic types.....	328
How to define a generic type.....	329
Generic types instantiation and use.....	330
Code writing aids.....	331
Code templates.....	332
Code formatting.....	334
Code navigation.....	335
Code refactoring.....	336
Managing code versions.....	336
Conclusions.....	338
What's next.....	338

Chapter 9:

The FMX component library.....	340
Why FMX?.....	341
FMX and graphic hardware.....	341
FMX user interface styles.....	342
FMX controls common aspects.....	343
Placing controls.....	344
Control sizing and alignment.....	345
Padding and margins.....	346
User interface layout example.....	346
In FMX everything is a container.....	348
Nested components.....	349
Child coordinates and parent boundaries (clipping).....	351
Appearance properties.....	353
Visual styles.....	354
Predefined styles and tint properties.....	355
How a FMX style is built.....	357
Visual style files.....	359
Loading visual style files at design time.....	360

12 - Contents

The visual style designer.....	361
Changing the form's visual style at run time.....	363
Conclusions.....	369
What's next.....	370
Chapter 10:	
Animations, transformations and visual effects.....	371
Animations.....	373
Animation categories.....	373
Defining an animation.....	374
How to configure the animation.....	375
Managing the animation process.....	378
Rotating and scaling controls.....	379
Animations and transformations in practice.....	381
User interface composition.....	381
Configuring the watch hands animation.....	383
Configuring the button animation.....	385
Modifying the scale of the user interface.....	387
Rotating the whole user interface.....	388
Visual effects and filters.....	389
The TEffect class and its descendants.....	390
How to configure a visual effect.....	392
Visual effects in practice.....	392
Conclusions.....	394
What's next.....	395
Chapter 11:	
Introducing 3D user interfaces.....	397
How a 3D interface is structured.....	398
Three-dimensional objects.....	400
How to configure a 3D object.....	400
How to define new 3D objects.....	403
Materials.....	408
Lights.....	411
Cameras.....	413
2D objects in a 3D world.....	416
Conclusions.....	418
What's next.....	419
Part III:	
Mobile programming techniques.....	421
Chapter 12:	
Motion sensors.....	423
FMX components for accessing motion sensors.....	424

Motion sensors.....	425
Motion sensor types and associated classes.....	426
Selection of the sensor to read.....	428
Sensor state.....	430
Reading data from the sensor.....	432
Properties holding motion data.....	433
Data reading process.....	434
Orientation sensors.....	434
Orientation sensor types and associated properties.....	435
Configuration and data retrieving from the sensor.....	436
How to use motion sensors in practice.....	437
User interface design.....	437
Retrieving the sensor list.....	440
How to select the sensor to use.....	444
Reading process activation.....	444
Reading data.....	445
Compilation and execution.....	449
Conclusions.....	453
What's next.....	453

Chapter 13:

Geolocation information.....	455
The TLocationSensor component.....	456
Location sensor availability.....	457
Sensor configuration.....	459
Reading location data.....	460
Retrieving other data from the GPS.....	461
Regions configuration (iOS).....	461
Location encoding and decoding.....	463
Geocoder object initialization.....	463
Retrieving an address coordinates	464
Obtaining an address from coordinates.....	465
Map visualization.....	466
The TWebBrowser component.....	466
How to put together a URL for accessing Google Maps and Bing Maps.....	467
Location information in practice.....	468
User interface design.....	468
Additional members declaration.....	470
Sensor activation and deactivation.....	471
Location changes.....	471
Descriptive location information.....	474
Conclusions.....	477
What's next.....	477

14 - Contents

Chapter 14:

Using the integrated cameras.....	479
Components for the use of audiovisual media.....	480
Retrieving pictures from the camera.....	481
Detecting the camera and its functionality.....	482
Selecting the camera to use.....	483
Setting the camera configuration.....	484
Capturing pictures.....	485
The TCameraComponent in practice.....	486
User interface design.....	486
Camera initialization.....	491
Changing the active camera.....	492
Configuration changes.....	492
Visualizing the captured pictures.....	494
Storing the pictures in files.....	495
Standard actions and the camera.....	496
Obtaining a picture from the camera.....	497
Obtaining a picture from the photo library.....	498
How to share data with other applications.....	498
Using actions in practice.....	499
Capturing audio and video sequences.....	502
Playing audio and video sequences.....	504
Conclusions.....	505
What's next.....	506

Chapter 15:

Linking mobile and desktop applications.....	508
Introducing the app tethering technique.....	509
How to connect applications.....	511
Automatic connection.....	511
Manual connection.....	512
Application discovery.....	512
Manual pairing.....	513
Application profiles discovery.....	514
Discovery and pairing in practice.....	514
Designing the managers application.....	515
Designing the customers application.....	518
Verifying connectivity.....	521
Sending and receiving data.....	522
Shared resources.....	523
Creating the shared resource.....	523
Setting the resource content.....	524
Accessing a shared resource.....	525
How to subscribe to changes in a shared resource.....	527
Temporary resources.....	529

Publishing and requesting actions.....	530
Remote actions definition.....	531
How to invoke a remote action.....	532
App tethering and Delphi XE7.....	535
Discovering applications outside the own subnet.....	535
Bluetooth connections.....	536
Bluetooth communication services.....	538
Classic Bluetooth and Bluetooth LE.....	538
Operation scheme.....	539
Permission configuration.....	539
The Bluetooth communication manager.....	541
Building a basic testing user interface.....	541
Making the application visible to other devices.....	543
Searching for other devices.....	544
Managing the pairing process.....	546
Connecting and transferring data.....	547
The TBluetoothLE component.....	548
Conclusions.....	549
What's next.....	549
Chapter 16:	
Notifications and advertising.....	551
Using notifications.....	552
How to define a notification.....	552
Immediate notifications.....	553
Scheduled notifications.....	555
Canceling notifications.....	556
Advertising.....	558
Advertising and mobile applications.....	558
The Google AdMob program.....	559
How to obtain an Ad ID for our application.....	561
The Apple iAd program.....	563
How to add advertising banners to our applications.....	565
Specific configuration for Android.....	566
Changing from AdMob API to Google Mobile Ads API.....	568
Specific configuration for iOS.....	569
Conclusions.....	570
Index.....	571

16 - Contents