

EKON 21

How to Access the Android API

Brian Long

<http://blong.com>

<http://blog.blong.com>

Agenda

- Delphi and Android
 - What you can & can't easily do on Android with RAD Studio since XE5
 - Delphi's lifelines
- Android concepts
- The JNI Bridge
- Delphi Android helpers
- Android API usage examples:
 - System services
 - Launching activities via intents
 - Receiving intents in your own activity
 - Listeners

Delphi and Android

- What you can do easily
 - Create cross-platform apps
 - Build UIs
 - Build business/DB logic
- What you can't do so easily
 - Access OS features, such as alarms, contacts*, speech, network info, NFC
 - Access Android 'plug-n-play' app functionality
 - Access hardware, such as barcode scanners or USB peripherals
 - Create services** or broadcast receivers
 - Hook onto Android events
 - Access custom Android/Java libraries***

* Berlin

** Seattle

*** XE7

Delphi and Android

- Delphi generates native Android ARM code
- Android runs in a Java (Dalvik) Virtual Machine
- JNI exists to allow Java and native code to talk
- Delphi has JNI Bridge aka Java / Native Bridge (XE5) to ease the pain
- You can access the OS API
 - It's messier than with Win[32|64]
 - It's easier than with raw JNI!
- Delphi XE6+ Android improvements:
 - `Activity.onActivityResult` support in FMX msg manager system (XE6)
 - `Activity.onNewIntent` support in FMX msg manager system (10)
 - Java2OP.exe (XE7)
 - Support for including custom Java libraries (XE7)

Android concepts

- System services
- Activities
- Intents
- Manifests
- Permissions
- Listeners

JNI Bridge (or Java Bridge or Native Bridge)

- Based in the RTL unit `Androidapi.JNIBridge.pas`
- `IJavaClass` for class/static methods
- `IJavaInstance` for instance & listener methods
- `TJavaGenericImport` generic class to bind class and instance method declarations into one Delphi import/factory class to represent a Java class

JNI Bridge (or Java Bridge or Native Bridge)

- Use `TJavaGenericImport.Create` class method to invoke default Java constructor (parameterless `init`) and return the `IJavaInstance` descendant
- Use `JavaClass` class property to invoke class methods, including other constructors (`init` overloads)
- Use `Wrap` class method to get an `IJavaInstance` descendant from either:
 - an opaque Java object reference, i.e. a JNI reference
 - Another `IJavaInstance` descendant (= Java object typecasting)

JNI Bridge (or Java Bridge or Native Bridge)

- All Delphi Java wrappers implement `ILocalObject`, which has `GetObjectID` method to give opaque Java object reference (JNI reference)
- Implement listeners by inheriting from `TJavaLocal` and implementing the Java listener interface

Delphi Android helpers

- `Androidapi.Helpers.pas` (XE6+):
 - Delphi's Java activity: `SharedActivity`
 - Delphi's Java activity context: `SharedActivityContext`
 - Delphi and Java string conversions:
 - `JStringToString`, `StringToJString`
 - `JCharSequenceToStr`, `StrToJCharSequence`
- `FMX.Helpers.Android.pas` (XE5+):
 - Native vs Java thread management (not so vitally important as of 10.2):
 - `CallInUIThread` (XE5+)
 - `CallInUIThreadAndWaitFinishing` (XE5+)
 - `TUIThreadCaller.Call<>` (XE8+)

Delphi Android helpers

- `Androidapi.Helpers.pas` (XE6+):
 - Delphi's Java activity: `TAndroidHelper.Activity` (10+)
 - Delphi's Java activity context: `TAndroidHelper.Context` (10+)
 - Delphi and Java string conversions:
 - `JStringToString`, `StringToJString`
 - `JCharSequenceToStr`, `StrToJCharSequence`
- `FMX.Helpers.Android.pas` (XE5+):
 - Native vs Java thread management (not so vitally important as of 10.2):
 - `CallInUIThread` (XE5+)
 - `CallInUIThreadAndWaitFinishing` (XE5+)
 - `TUIThreadCaller.Call<>` (XE8+)

Android API usage examples

- Importing an API (or custom Java library):
 - By hand
 - Java2OP (XE7+), e.g.
 - `Java2OP -classes android.nfc.* -unit Androidapi.JNI.NFC`
 - <https://github.com/FMXExpress/android-object-pascal-wrapper>
- APIs:
 - Toast (academic as of Delphi 10)
 - Network information (academic as of Delphi XE8)
 - Speech classes (TTS & SR) (academic as of Delphi 10.1)
 - Object serialisation
 - NFC

Android API usage examples

- Using system services:
 - Vibration service
 - Network connectivity & wi-fi services

Android API usage examples

- Launching activities via intents:
 - Web page, map
 - Contact
 - SMS, email
- Launching activities and getting feedback:
 - ZXing barcode scanner – message subscription
- Receiving intents in your own activity:
 - NFC – another message subscription – full coverage at: <http://blong.com/Articles/Delphi10NFC/NFC.htm>
 - Speech recognition
- Falling back to JNI
 - NFC example: `NfcAdapter.enableForegroundDispatch`
- Listeners:
 - Text-to-speech

Questions/Consultancy?

- brian@blong.com
- <http://blong.com>
- <http://blog.blong.com>