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Cross platform mobile application development: Lessons learned

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Agenda

- QuickRTAN The app we are talking about
- Overview
- Communication
- Mobile Development
- UI
- Project Management / Coordination
- App Stores



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The app we are talking about: QuickRTAN



QuickRTAN

- App + Server component for secure TAN transfer
 - Public/Private key encryption for TANs
 - QR-Codes for information transfer









QuickRTAN



DEMO



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Overview

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Overview

- Mobile target platforms
 - Android
 - iOS
 - Blackberry
 - Windows Phone 7
- Requirements
 - QR-Code scanning (and generating)
 - Network communication between Client and Server
 - Cross platform crypto











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Communication

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QR-Codes

- QR-Codes designed for text
 - Various settings
 - Encoding
 - Error correction level
 - Reliable scanning dependencies
 - Code Size
 - Screen
 - Smartphone Camera (Moiré pattern)
 - ZXing to the rescue
 - http://code.google.com/p/zxing/







Data Format

- Various data exchange formats available
 - XML
 - JSON
 - CSV
 - Binary formats
 - BSON
 - Google Protocol Buffers
 - Proprietary format
 - Choice: JSON
 - Good support in all languages
 - Less verbose than XML
 - Good readability

Communication

- Various mechanisms available
 - Web Services
 - SOAP
 - RPC
- Choice: JSON-RPC
 - Benefits from already existing JSON stack
 - Simple protocol (simple to implement manually if no library for platform available)
 - Cross platform (compared to e.g. RMI)



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Mobile Development



Programming languages

- Native applications result in multiple programming languages
 - Java (Server, Android)
 - Java-ME (Blackberry)
 - Objective-C (iOS)
 - C# .NET (Windows Phone 7)
- Different ...
 - development tools
 - workflow
 - setups
- ... for every platform



Android

- Good Android Development Support
 - Idea IntelliJ
 - Eclipse
- Android SDK
- Android Debug Bridge (adb)
- Emulator (delivered by Android SDK)





Android - Development

- Different Java default behavior
 - Cipher.getInstance("RSA") => Problematic
 - Cipher.getInstance("RSA/None/PKCS1") => OK
- Unit-Tests => use the right SDK ;-)
- Android compiles into .class and then into Dalvik .dex
- Easy Code Sharing => Java Libraries
- Hard to cover all Versions and Devices

Android - Simple App Deployment

- Set Phone into Development-Mode
- Connect to USB
- Compile App
- Sign App (automatically by Build Tools)
- Deploy App to Phone/Emulator
- Debug like in "normal" Java





Android - Activity

- No void main()
- Define Permissions (Internet, Camera, ...)
- Activity Lifecycle

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Android Activity Stack



iOS - Objective C

- Apples programming language of choice
- Seems exotic [syntax uses:a lotOf:[square brackets]]
- Object Oriented dialect of C
 - Can be mixed with C and C++ code (an libraries)
- Modernized by Apple over time
 - ARC (Automatic Reference Counting instead of manual memory management)
 - Syntax shortcuts (dot accessors, literals)
- Fully fledged OO programming language => object structure can be kept similar
- Conventions
 - Different programming language conventions lead to subtle differences
- Unique features
 - Categories (add methods to existing classes without inheritance)
 - Makes some helper classes unnecessary

iOS - Code Sample

ExampleObject.h

@interface ExampleObject : NSObject {

@property(nonatomic) NSNumber *numberData; @property(nonatomic, retain) NSString *stringData;

- (id)initWithNumberData: (NSNumber*)numberData stringData: (NSString*)stringData;

@end

ExampleObject.m

@implementation Barcode

@synthesize numberData; @synthesize stringData;

- (id) initWithNumberData:(NSNumber*)numberData stringData:(NSString*)stringData {
 ...
}

call

@end

[myExampleObject initWithNumberData:@42 stringData:@"Hello, World"];



iOS - Development Tools

- Apple IDE: Xcode
 - Unavoidable for some Tasks
 - Device Management
 - Interface Designer
 - Project/Compiler Settings
- iOS Simulator
 - Careful: No Emulator
- On-Device Debugging and Profiling
- Alternative IDEs:
 - JetBrains AppCode



iOS - Obstacles

- Complicated device management
 - Developer creates a certificate
 - Development device registration with Apple (limited)
 - Complicated Code Signing (also for development)
 - Developer certificate gets sent to Apple
 - Signed by Apple for certain Developer Profile
 - Different Profiles for different App-IDs (and use cases)
 - Certificate has to be installed on device

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Blackberry

• Michi bitte



Windows Phone

Bernhard bitte



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UI



Native UI

- Different OS have different native looks
- Different philosophies
- Our approach: An iPhone app should look like an iPhone app



Native UI





UI similarities

- Of course the apps should share a common identity on all platforms
 - Similar ...
 - colors
 - wording
 - assets (icons, graphics, logo)
 - buttons (where to find what button)
 - workflow



UI on Android

- XML Layout Design
- UI Designer DroidDraw
- Wide Range of Screen Sizes
 - XHDPI ~320dpi ... 7 11 inches
 - HDPI ~240dpi ... 4 7 inches
 - MDPI ~160dpi (Baseline) ... 3 5 inches
 - LDPI ~120dpi ... 2 3 inches
- Scaleable Graphics with 9-Patch
- Big Changes since Version 4.0 with Layout Guide
 - Tabs
 - Action Bar
- Localization
 - String files

UI on iOS

- Static layouts (320x480)
- Retina display still works with a logical 320x480 coordinate system just higher DPI
 - 640x960
 - @2x assets (icon.png and icon@2x.png)
- Interface Builder for basic UIs
 - Drag and Drop Editor for simple UI elements
- Programmatic UI creation enforced for complex UI
 - TableView
 - Typical Objective-C delegate structures
 - Off-Screen rows are reused programmatically (performance)
- Localization (L10n, I18n) support built in
 - String files
 - UI Files
 - Assets (images)



UI on iOS





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Project Management Coordination



Coordination

- The most important part: Precise interface definition
 - Data structure definition of every interface (in our case: JSON-RPC, Barcode)
 - Exact specifications (byte order, crypto algorithms)
- Master document which documents all interfaces
 - Living document
 - All team members need to know and understand this document by heart
 - Real time collaboration helps
 - Google Docs
 - Etherpad
 - Or our Services :P (Spaaze, Mind42, SimpleMeet.me)

Code-Organization

Real code sharing only possible between Server and Android app

• On other platforms:

- Use same naming conventions
 - Same class names help when talking to each other
 - Calling a BindingResponse BindingRequest on the mobile device (because from the view of the mobile device it's a request to the server) is not helpful
- Use same code structure
 - Having the same infrastructure of data objects helps when talking to each other
 - Given structure can be used as boilerplate for ports on other platforms



Prototyping

- Especially in the beginning
 - Simple prototyping tests
- Crypto
 - Are the crypto libraries compatible to each other (decrypt/encrypt/sign/verify)
- Data formats

- Are compressors compatible (zlib stream vs. gzip container)
- RPC
 - JSON-RPC interface working (serialization of libraries could differ Jabsorb by default e.g. adds and expects a Java class wrapping layer)

Version Management

- Protocol needs to be versioned
 - Server and clients need to talk the same version
 - Interface document version = protocol version
 - Protocol version also part of the protocol
 - Server can detect requests with older version
 - Mechanism to enforce updates
 - Additional versioning of certain components depending on the project (binding version)
- Update rollout
 - Server and clients should all be updated at the same time



Platforms

Lead platform

- Either planned (iPhone version = main version, all other ports)
- Or by incident (established itself)
 - e.g.: Android/iPhone client is always first implementing new UI and features
- Other platforms have to follow
- Lead platform implementation should be good
 - Guiding all other platforms

Testing

- Test device for every platform required
- All important/supported platform combinations (iPhone 3G with iOS 4, ...) should be tested regularly
- Update process should also be tested (ORM migration between versions, ...)

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App Stores



App Stores

- Different App Stores Different Policies
- Developer program fees
- App reviews
- Policies
 - App policies
 - Marketing policies



Android Play Store

- Registration USD 25,-
- Immediate Upload possible after Registration
- Only Signed-Apps (Self-Signed)
- Updates only with same Signing-Key possible
- Distribution Settings:
 - Country
 - Version



Apple AppStore

- iOS Developer Program
 - \$99 + paperwork (commercial register extract, phone verification, ...)
- App & Update Review
 - ~1 week
- Strict policies
 - Refusal due to use of deprecated or private API, ...
 - No mentioning of competing platform
- Marketing policies
 - More paperwork for marketing materials (HiRes device images, AppStore button)
 - Strict policies of material usage
- For selling apps (non free apps)
 - More paperwork



Encryption Registration

- US BIS (Bureau of Industry and Security) requires registration (or in worst case classification) for export of cryptography
- Apple servers located in the US
- Apple requires ERN (Encryption Registration Number)
- ERN usually enough for mass market standard cryptogrphy
 - Registration with SNAP-R (online document system of BIS)
 - Online submission of required forms
- BIS got flooded with requests after Smartphone/App revolution
 - Nowadays all online ...
 - ... and ERN is enough (self classification)
 - Still: Legal-speak paragraph hell

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Problems

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Problems

• TODO: Some more slides for lessons learned?

- Biggest problems we had
 - Getting crypto work?
 - JABSORB wrapper?
 - Exception Handling?
 - Security (sensitive data on devices, self signing, rooting, jailbreaking, ...)
 - Handling keys
 - Key handling (developer keys/certificates)?
 - ...?



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Summary



Summary

- Most important
 - Project Management
 - Precise documentation of interfaces
 - Versioning
 - Good communication during "hot phase" (integration)
 - Technical
 - Code Organization
 - Naming
 - Structure
 - Sharing
 - Shared repository (code, assets, documents, ...)

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Thanks for your attention



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Questions?

