Defending Mobile Applications

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Overview

- Layered Security
- iOS vs. Android
- An Attacker's Perspective
- Best Practices
- Resources

Layered Security

Philosophy

"A Jedi uses to force for knowledge and defense…never for attack."

- Master Yoda

"It is said that if you know your enemies and know yourself, you will not be imperiled in a hundred battles."

- Also Master Yoda
(or maybe Sun Tzu)

Layered Security

- Four (4) Key Areas
  - Application
  - Sandbox
  - Operating System
  - Network

- Three (3) Types of Mobile Apps
  - Web (browser-based)
  - Native
  - Wrapper

- Document the data flow
  - Data at rest
  - Data in motion
  - Integration points

iOS vs. Android

Application Security Models

iOS

- Sandboxing (One Folder per App)
  - Files
  - Preferences
  - Network Resources

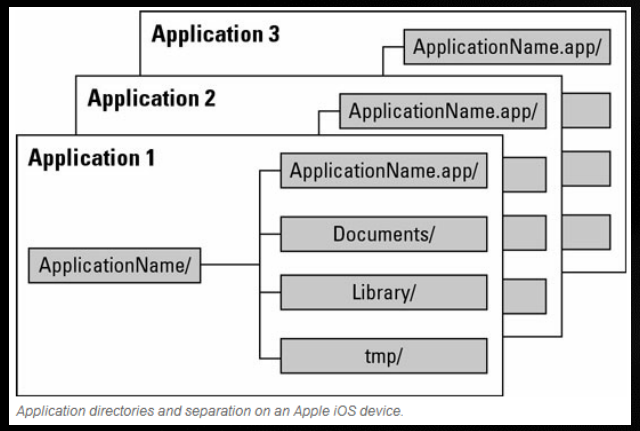


Image from Dummies.com

Android

- Sandboxing (One ID per Package)
- Apps start with no permissions
  - <uses-permission> tags in AndroidManifest.xml (for protected features)
  - Declare and enforce permissions with <permission> tags

App Stores

- **iTunes**
  - Annual developer fee ($99)
  - Developer must provide Apple with your SSN
  - Apps must be approved by Apple
- **Google Play**
  - $25 fee per app you submit
  - Developer must provide email, website, and phone number
    - No one *ever* abuses this system *wink, wink, nudge, nudge*
  - Apps do not require Google's approval
- **Amazon App Store**
  - Annual developer fee ($99)
    - First year waived
  - Developer must provide name, email, mailing address, and phone number
  - Apps must be approved by Amazon
- **Cydia (also, HackStore)**
  - App store installed on jailbroken iPhones / iPads / iPods
  - Cydia = package manager (installs apps from repos)
  - App security is linked to repo trustworthiness

An Attacker's Perspective

Mobile Malware

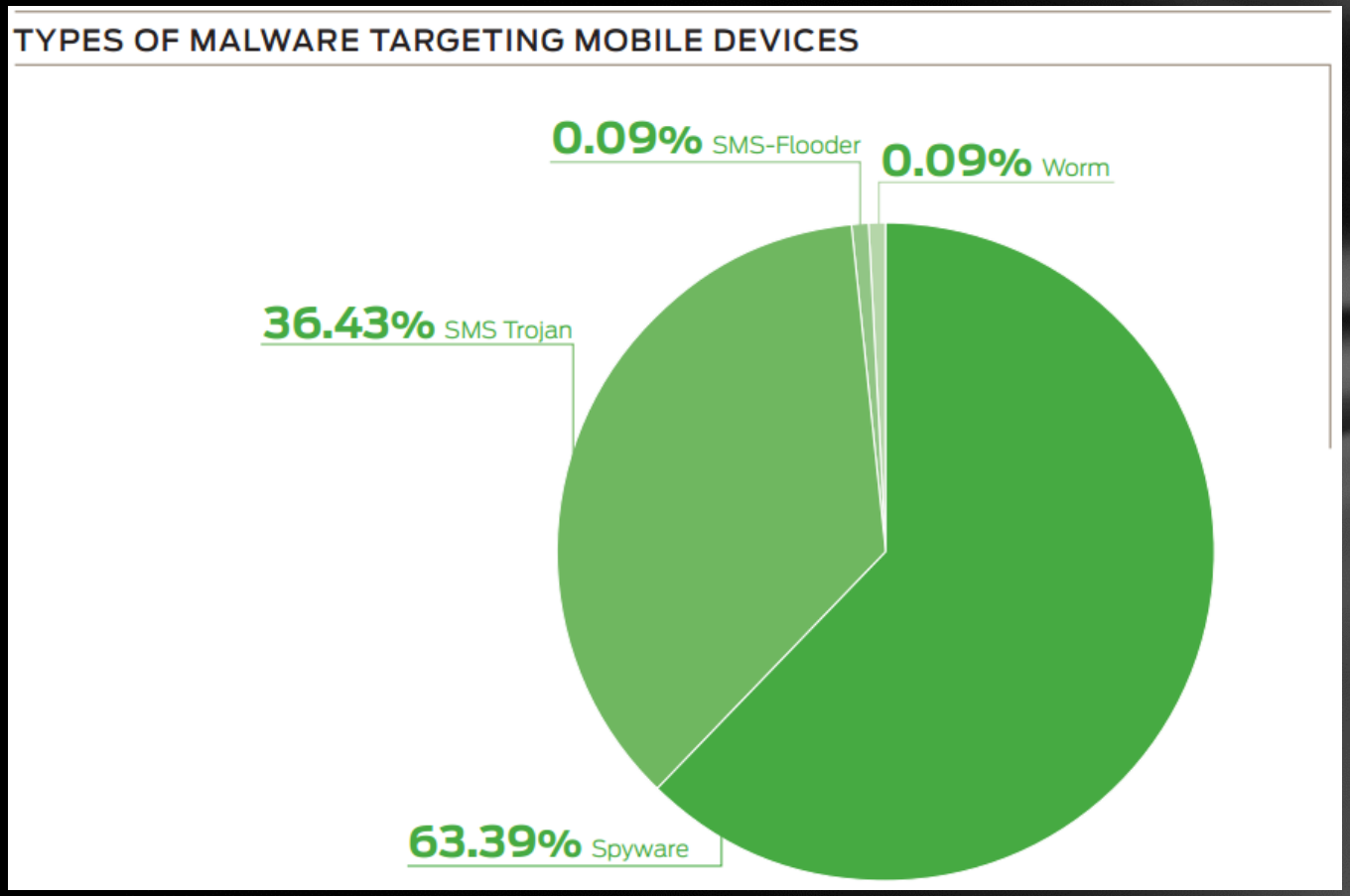


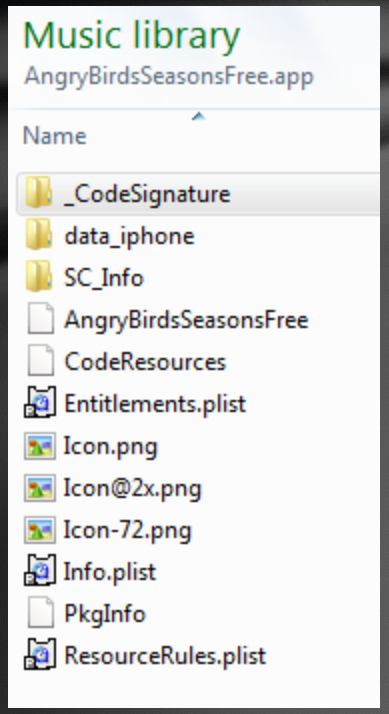
Image from 'Juniper Networks 2011 Mobile Threats Report'

Online Attacks

- Rogue Apps
  - Andoid.Pjapps (hijacked Steamy Windows app, sent premium texts)
  - DroidDream (sent user info to remote server)
  - DroidKungFu (installed back door , complete device compromise)
  - Plankton (Angry Birds 'supplementary' program, installed other files post-install)
- Man in the Middle
  - Mallory Proxy (Intrepidus Group)
  - Rogue Wireless AP
- Social Engineering
  - Phishing
  - Smishing
  - Serve malicious content via in-app ads

Offline Attack – App Deconstruction

- Download from app store
  - C:\Users\<username>\Music\iTunes\iTunes Media\Mobile Applications
- Extract app to folder using *7-zip*
- Manually examine the files using *Notepad++* or *prgrep*
- Look for sensitive info (integration points)
  - Connection strings
  - Calls to Internet-facing web services
  - Calls to other local resources



Offline Attack – iOS Forensics (Windows)

- Stand up a Windows 7 virtual machine
- Install *iTunes*
- Connect the device to the vm and backup via iTunes
- Open backup files with *Sqlite3Explorer*
  - C:\Users\<*User_ID*>\AppData\Roaming\Apple Computer\MobileSync\Backup\
  - SMS: 3d0d7e5fb2ce288813306e4d4636395e047a3d28
  - Call Log: 2b2b0084a1bc3a5ac8c27afdf14afb42c61a19ca
- Use *Query Builder* to extract evidence
- Alternately, manually examine the files using *Notepad++* or *prgrep*

Offline Attack – iOS Forensics (*nix)

- *iPhone Backup Analyzer* (iPBA)
- Stand up an Ubuntu virtual machine
  - I'm a fan of BackTrack 5 (release candidate 2)
- Download .tar of iPBA
- Command Line: *easy_install pyttk*
- Copy iPhone backup folder to the vm
- Run the iPBA Python script
  - *./main.py -d <backup_directory>*
- Examine additional info
  - Call history, thumbnails, contacts, network ID's, SMS data, cell location data, safari history, notes

Best Practices

viaForensics

- Digital forensics and security firm
- Multiple projects
  - appWatchdog
  - AFLogical
  - Santoku Linux
- 42+ Secure Mobile Development Best Practices
  - *https://viaforensics.com/resources/reports/best-practices-ios-android-secure-mobile-development/*

viaForensics Best Practices – General

- Avoid use of query string for sensitive data
- Institute local session timeout
- Implement code complexity and obfuscations
- Use address space layout randomization
- Avoid simple logic (if sessionIsTrusted == 1)
- Avoid simple logic variables (session.trusted = TRUE)
- Test third party libraries
- Use geolocation carefully
- Limitations of UUID (Universally Unique Identifier)
- Avoid use of MEID (Mobile Equipment Identifier) as user identifier
- Tamper checking
- Implement enhanced / two-factor authentication
- Protect application settings
- Validate input from client

From https://viaforensics.com/resources/reports/best-practices-ios-android-secure-mobile-development/

viaForensics Best Practices – Server

- Web server: check session settings
- Prevent framing and clickjacking
- Web server configuration
- Protect against CSRF with form tokens
- Protect and pen test web services
- Protect internal resources
- Fully validate SSL/TLS
- Protect against SSLStrip
- Certificate pinning
- SSL configuration

From https://viaforensics.com/resources/reports/best-practices-ios-android-secure-mobile-development/

viaForensics Best Practices – Data Storage

- Avoid storing sensitive data on the device
- Avoid caching app data on the device
- Limit caching of username
- Avoid crash logs
- Disable debug logs
- Hide account numbers and use tokens
- Use SECURE setting for cookies
- Implement secure data storage
- Be aware of copy/paste
- Be aware of the keyboard cache
- Securely store sensitive data in RAM
- Understand secure deletion of data

From https://viaforensics.com/resources/reports/best-practices-ios-android-secure-mobile-development/

viaForensics Best Practices – Android

- Implement file permissions carefully
- Implement *Intents* carefully
- Check activities
- Implement *Broadcasts* carefully
- Implement *PendingIntents* carefully
- Validate *Services*
- Avoid *Intent* sniffing
- Implement *ContentProviders* carefully
- WebView best practices
- Avoid storing cached camera images
- Avoid GUI objects caching

From https://viaforensics.com/resources/reports/best-practices-ios-android-secure-mobile-development/

viaForensics Best Practices – iOS

- Avoid cached application snapshots
- Use the Keychain carefully

From https://viaforensics.com/resources/reports/best-practices-ios-android-secure-mobile-development/

Resources

Resources

- What, me worry?
  - Pen Testing Mobile Applications
    - http://www.slideshare.net/clubhack/pentesting-mobile-applications-club-hack2011
  - OWASP Top Ten Mobile Risks
    - http://www.slideshare.net/JackMannino/owasp-top-10-mobile-risks

- Comparing Android to iOS
  - Android vs. iOS: Security Comparison
    - http://palizine.plynt.com/issues/2011Oct/android-vs-ios/
  - Android Application Security and Permissions
    - http://developer.android.com/guide/topics/security/security.html
  - iOS Application Security
    - http://www.dummies.com/how-to/content/application-security-on-apple-ios-mobile-devices.html
  - App Store Comparison
    - http://bjango.com/articles/appstores/

More Resources

- Mobile Antimalware
  - 10 Examples of Mobile Malware
    - http://www.boston.com/business/technology/gallery/smartphone_malware_examples/
  - Lookout
    - https://www.mylookout.com/
  - SMobile
    - http://www.smobilesystems.com/

- Mobile Security Reports & Recs
  - Juniper Networks 2011 Mobile Threats Report
    - http://www.juniper.net/us/en/local/pdf/additional-resources/jnpr-2011-mobile-threats-report.pdf
  - NSA Mobility Capability Package
    - http://www.nsa.gov/ia/_files/Mobility_Capability_Pkg_(Version_1.1U).pdf
  - viaForensics 42+ Best Practices [for mobile app development]
    - https://viaforensics.com/mobile-security/secure-mobile-development-42-practices-secure-ios-android-development.html

Tools

- 7-Zip
  - http://www.7-zip.org/
- BackTrack Linux
  - http://www.backtrack-linux.org/
- iPhone Backup Analyzer
  - http://www.ipbackupanalyzer.com/
- Mallory: Transparent TCP and UDP Proxy
  - http://intrepidusgroup.com/insight/mallory/
- Notepad++
  - http://notepad-plus-plus.org/
- PRGrep
  - http://www.prgrep.com/
- Santoku Linux
  - https://santoku-linux.com/
- Sqlite3Explorer
  - http://www.singular.gr/sqlite/
- viaForensics App Watchdog
  - https://viaforensics.com/appwatchdog/

Questions?

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