RSAConference2015

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CHANGE

Challenge today's security thinking

SESSION ID: MBS-R08

Mobile Malware: How Phones Get Hacked and How To Analyze the Malware…Live!

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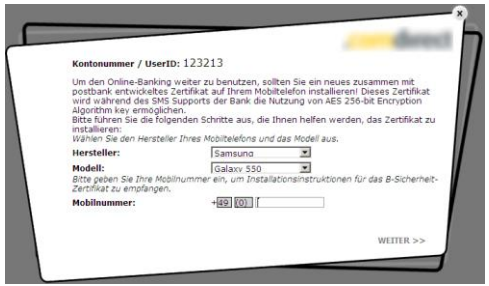
Agenda

- Introduction
- Brief History
- Demo: Fraudster builds his iBanking bot
- Demo: From the Victim's Perspective
- Demo: From the Attacker's Perspective
- Malware Analyst's Perspective: Tools of the Trade
- Demo: From the Malware Analyst's Perspective
- Demo: Mobile Ransomware…The Reality!
- Final Demo: Finding vulnerabilities in the malware
- Summary

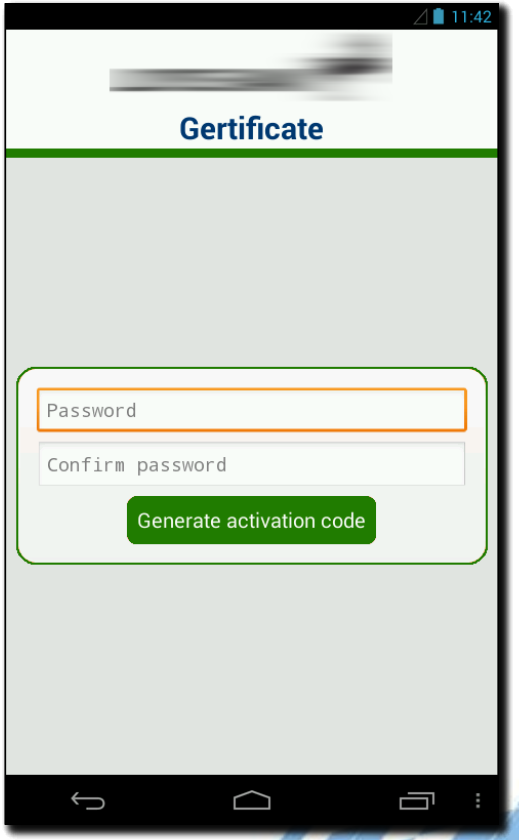
Demo:
Fraudster tries to log in to bank's website with stolen credentials



Infecting the victim's mobile - Social Engineering

iBanking

- Actively sold for over a year. During this time, price raised from $4,000 to $5,000
- Most notably used by Neverquest (aka Vawtrak) cyber gang
- Communicates over SMS and/or HTTP
- Commands supported:
  - Capture all in/out SMS & call-list
  - Send SMS / perform a call
  - Redirect incoming calls
  - Record ambient noise of the surroundings
  - Wipe all data from the device

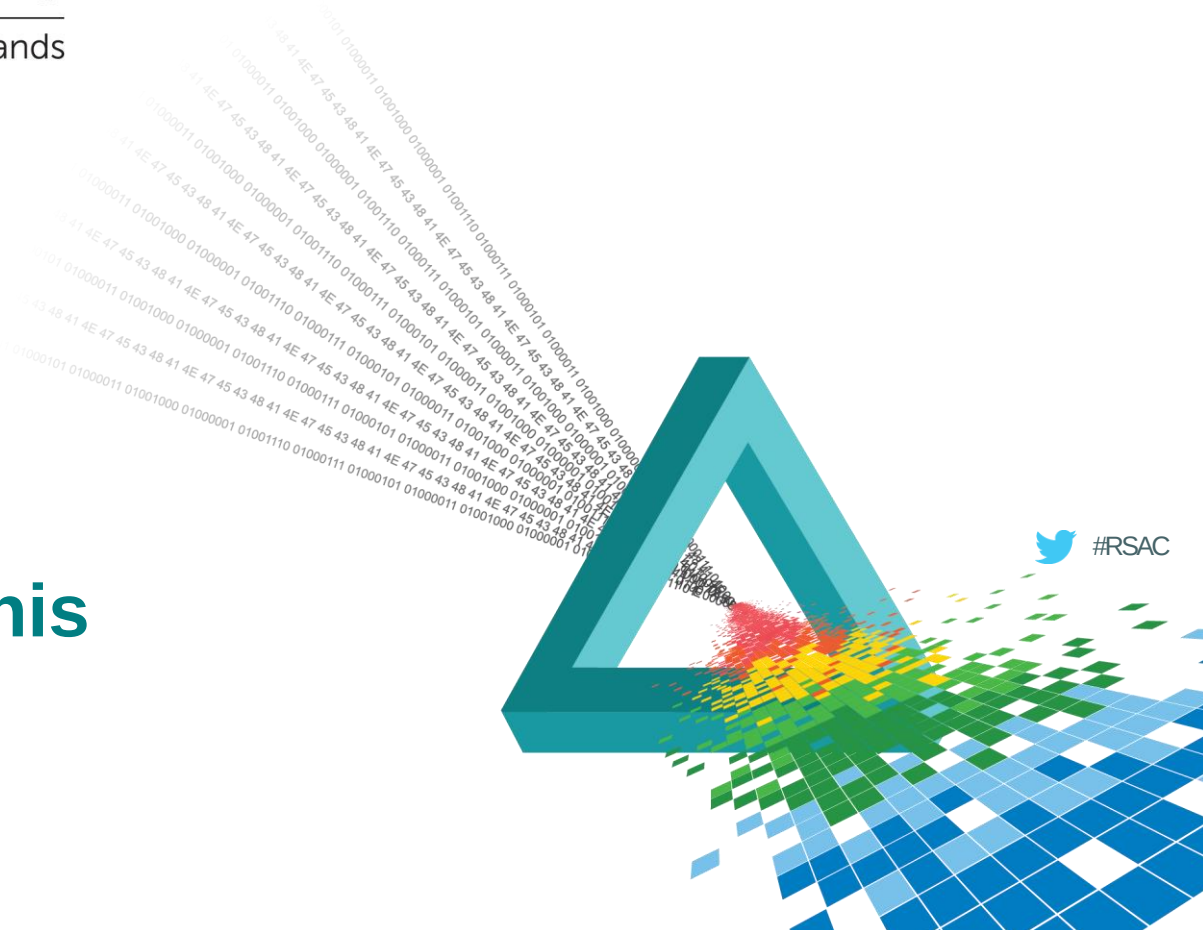


The iBanking Leak

- In February, 2014 the iBanking source code was leaked on several underground forums
- Following that, few modifications were observed:
  - AES algorithm was added to encrypt all of the app's resources
  - Security fixes to the web-panel
  - Code obfuscation (Spaghetti code)
  - Anti-SDK mechanism

```
<resources>
    <string-array name="adm_domens">
        <item>4338aa1dc5facbdd4ec0b8be27e4ccb4</item>
        <item>6388995b4c309de03aa68ac12c9b4ff5</item>
        <item>942a7d4f210ad5e1db0c015a4726771e</item>
        <item>11412065eb093a3ade1c4825b64e6d16</item>
        <item>22a5ed85e999ace9c23a870822fda2a3</item>
        <item>9e2d6f1bd13eec8af0c19ef85e16ae55</item>
        <item>0d4a2ebf7fd4b5659a83e951d1aea77b</item>
        <item>4af46d70be43642f4a2bb74c44913ae2</item>
        <item>30679f21a7676ec32650a119b8bb5180</item>
    </string-array>
</resources>
```

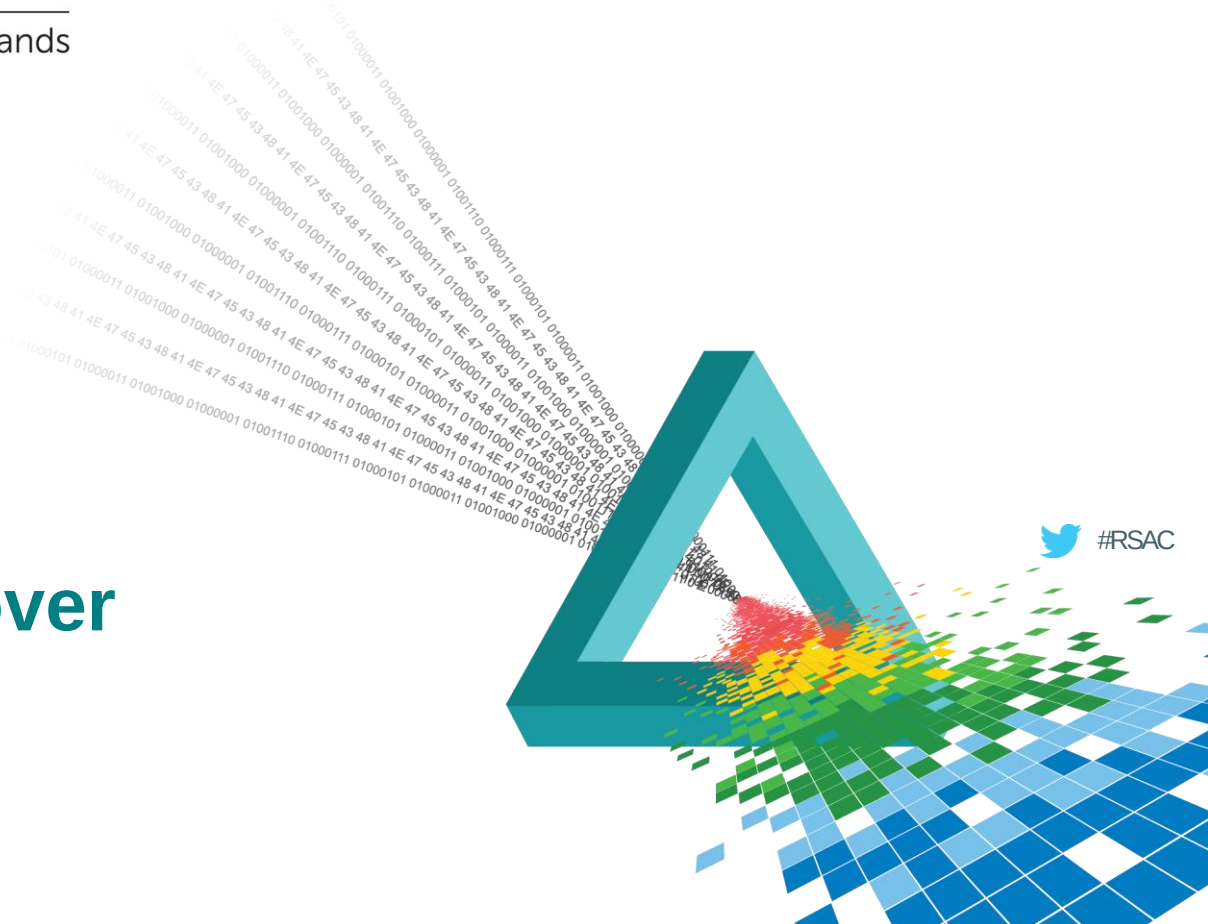
Demo: Fraudster builds his iBanking bot



Web Injections – Under Maintenance Page

Demo:
Victim installs malicious app on his phone through bank's website

Demo:
Fraudster takes over victim's phone



Demo: Fraudster makes transactions in victim's bank account by using the stolen credentials and the OTP

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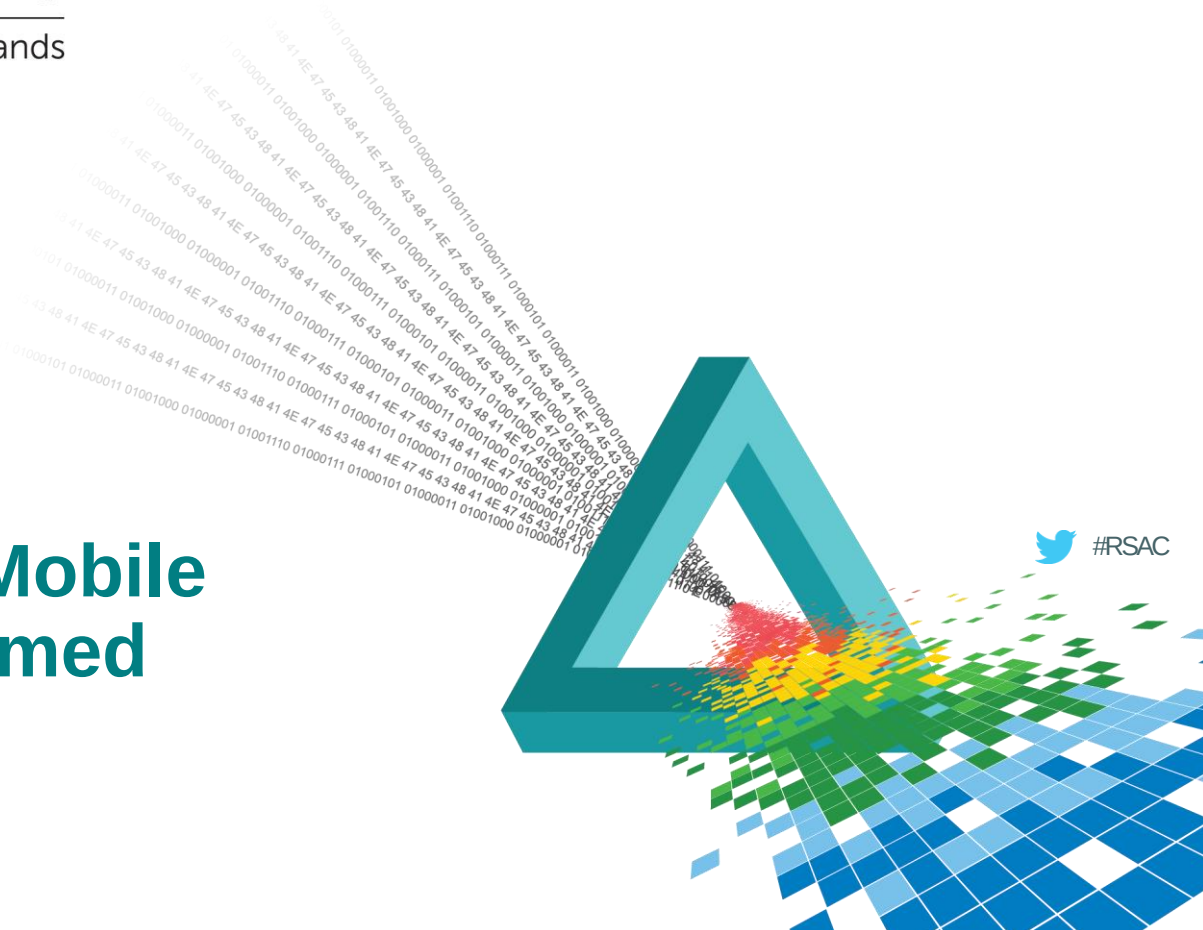
How Analysis of Mobile Malware is Performed

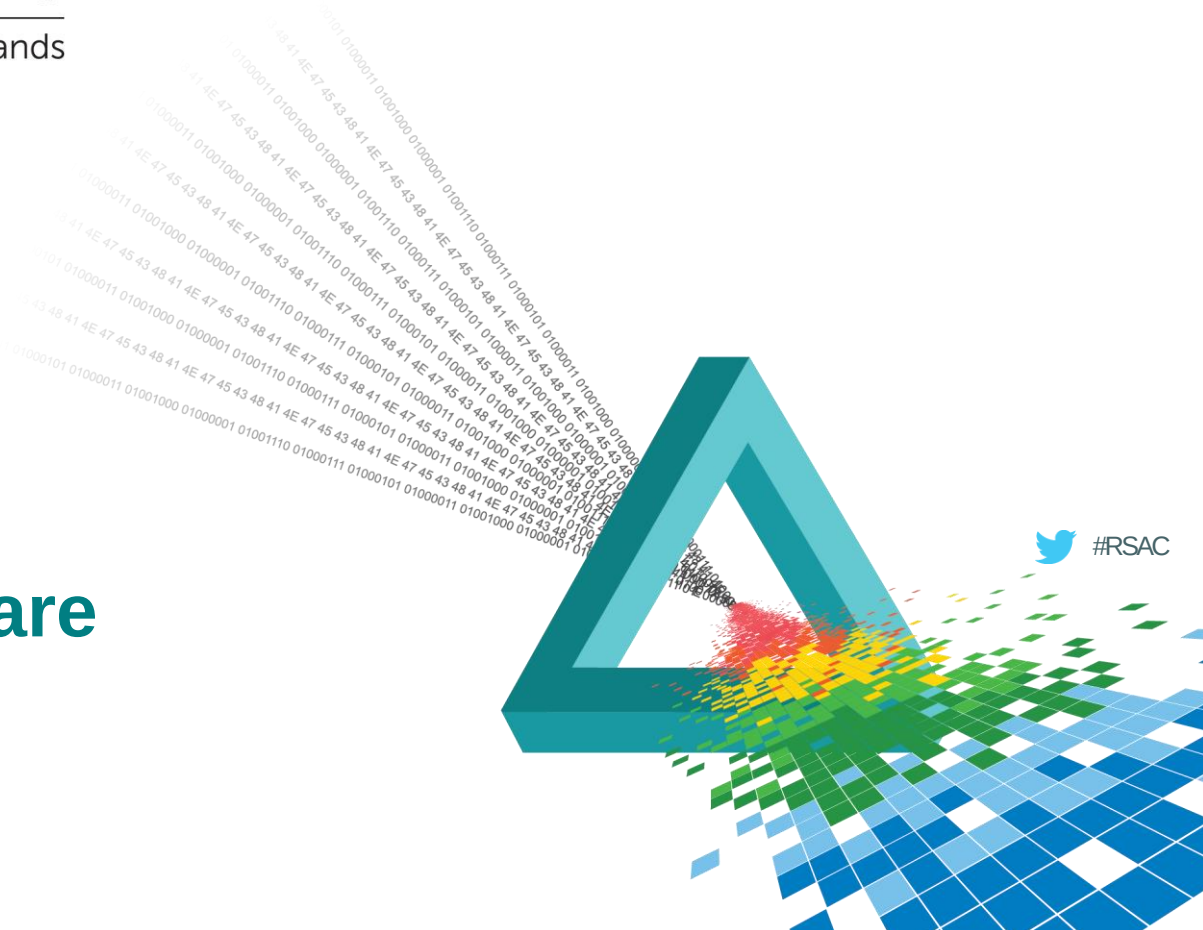


#RSAC

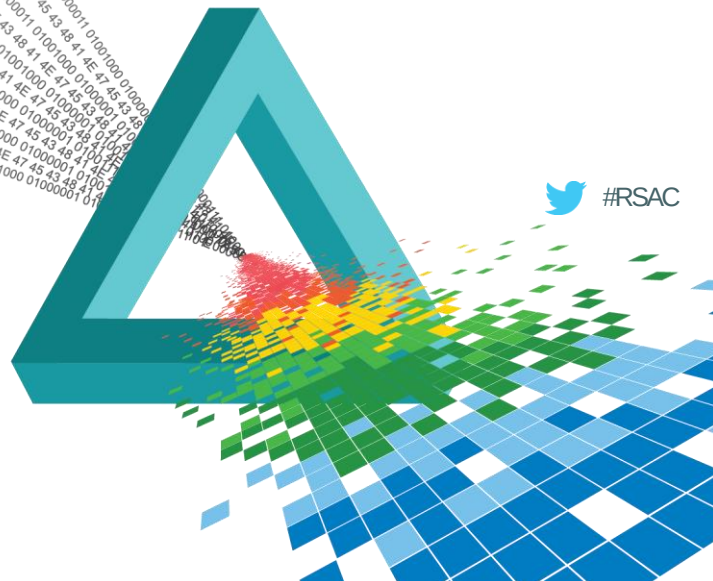
Analysis Tools

- Virtualization – Android SDK
- Android Debug Bridge (ADB)
- Emulator Console (Telnet)
- Network Monitoring and Interception
  - Wireshark - https://www.wireshark.org/download.html
  - Burp Suite - http://portswigger.net/burp/
- JD-Gui
- APKTool
- Dex2Jar
- Smali/Baksmali.jar
- JarSigner

Demo:
Live Mobile Malware Analysis



Demo:
Finding vulnerabilities in the malware

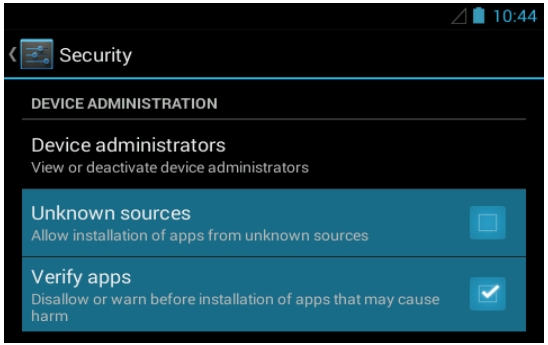


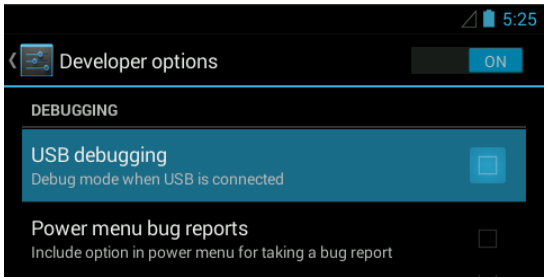
Wrap-up & Summary

- iBanking is one of many active mobile malware projects
- They are maturing (using encryption, avoiding detection and analysis etc)
- Android and Jailbroken IOS platforms are susceptible
- The consumer needs to be aware and vigilant
- The reality of BYOD and MDM solutions

Apply – Short Term

- Always inspect the permissions apps request before installing
- Make sure the “**Verify Apps**” option is turned-on
- Do not allow users to install from sources other than the Google Play Store by disabling the “**Unknown Sources**” option in the Security Settings
- Do not allow “**USB Debugging**” unless needed
- Do not Root or Jailbreak your device
- Make sure that no admin rights are given to applications you really trust them

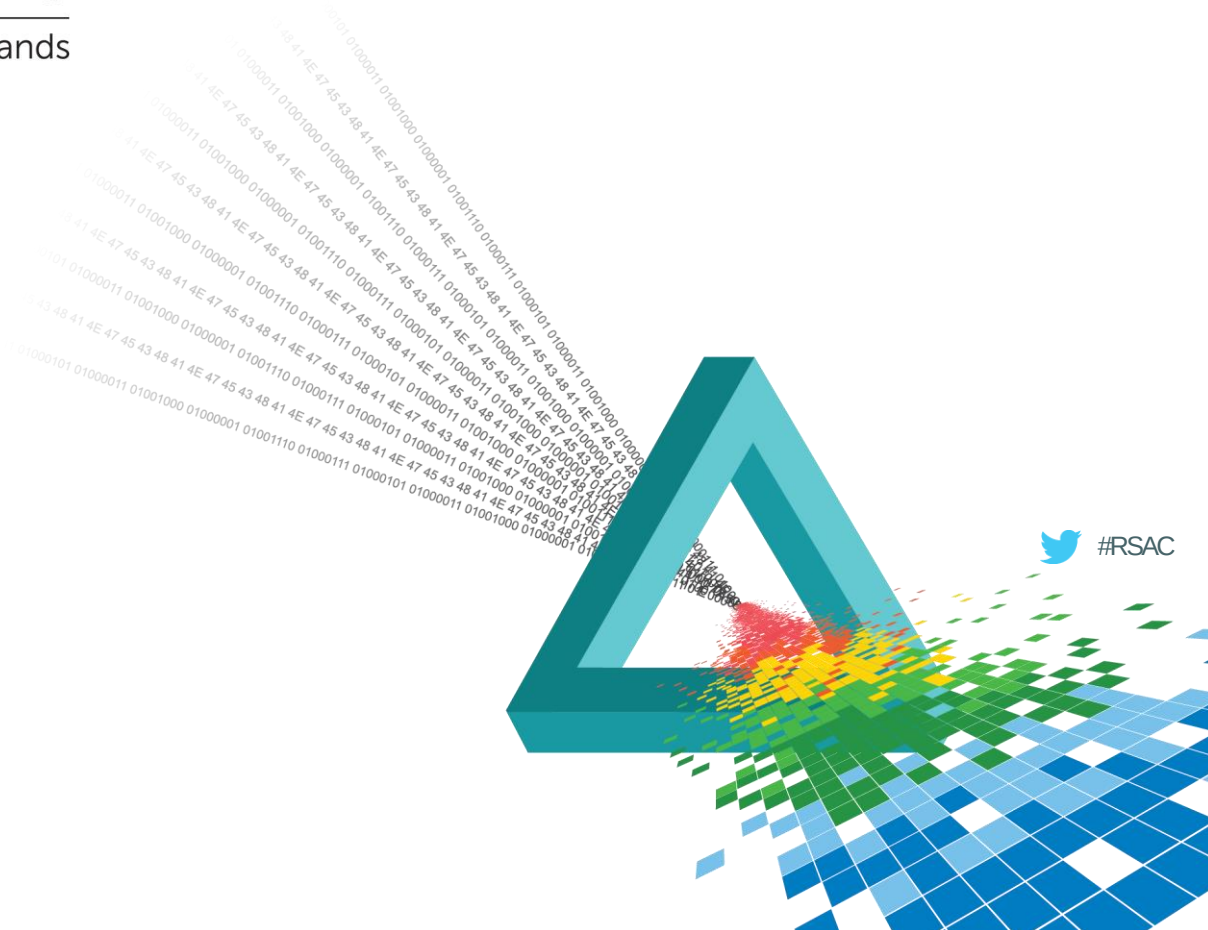




Apply – Long Term

- If your organization is infected with any kind of malware, acquire the knowledge and tools needed and spend the time to analyze and investigate the malware.
- Block any IOC found in any incident.
- Create a short seminar for employees in order to increase their awareness to these attacks and how to avoid them.

Questions?



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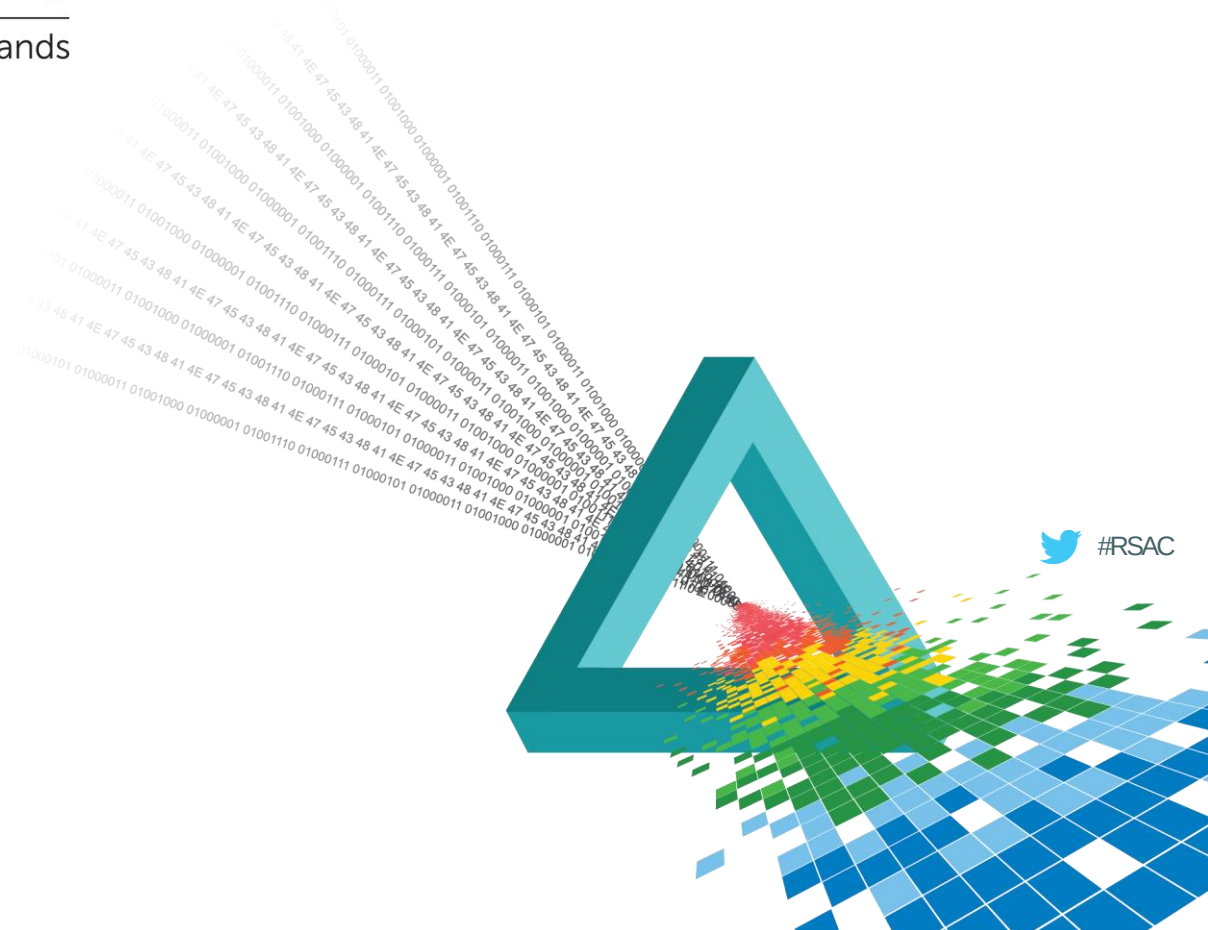
Thank-You!



Appendix – Table of Contents

- Mobile Malware Analysis Basics
- Dynamic Analysis Tools
- Live Environments/VM’s
- Dalvik – Android Java VM
- Android Architecture
- ByteCode – JIT
- Smali/Baksmali
- APK

Mobile Malware Analysis Basics

- Dynamic Analysis
  - Running the Malware in a confined environment, such as an emulator or a VM. In our case the most popular tool is the Android SDK.
- Static Analysis
  - Reviewing the Malware's package, and more specifically the code and the malware's resources.

Dynamic Analysis Tools

- Virtualization
  - Virtual Box - http://www.oracle.com/technetwork/server-storage/virtualbox/overview/index.html
  - VMWare - http://www.vmware.com/
  - Android SDK - http://developer.android.com/sdk/index.html
  - Google x86 Android (No Emulation=Works Faster) – https://code.google.com/p/android-x86/downloads/list

Dynamic Analysis Tools

- Android Debug Bridge (ADB)
- Emulator Console (Telnet)
- Network Monitoring and Interception
  - Wireshark - https://www.wireshark.org/download.html
  - Burp Suite - http://portswigger.net/burp/

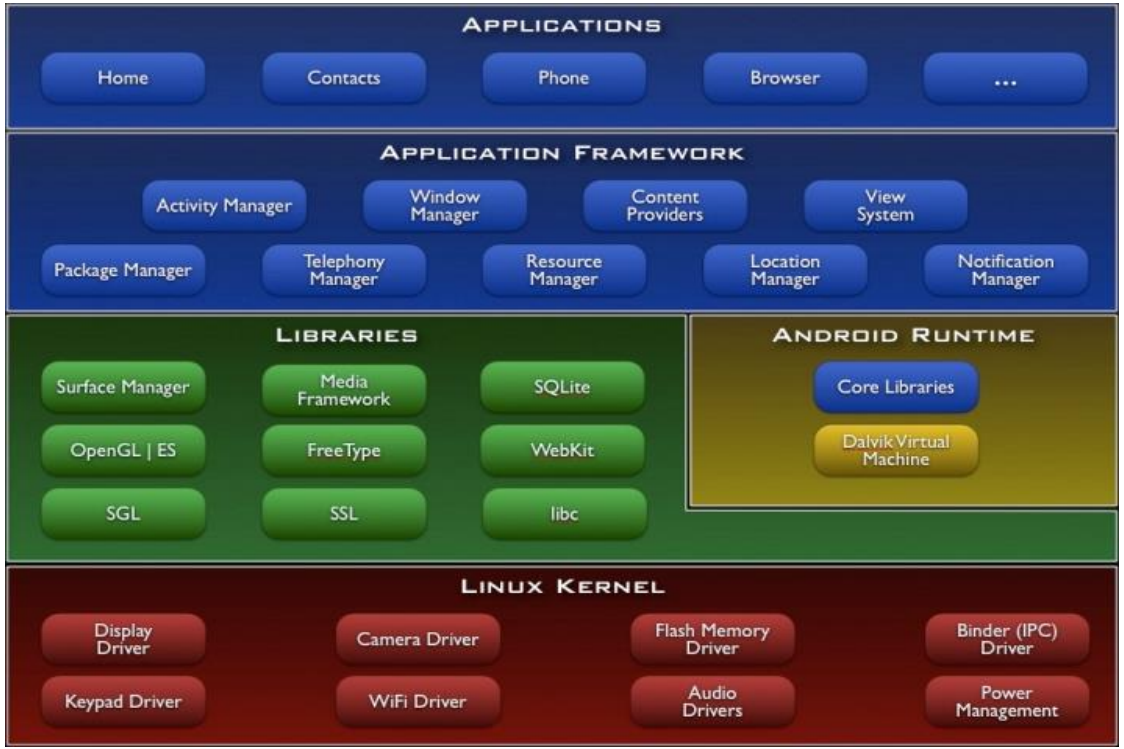
Live Environments/VM's

- AppUse by AppSec Labs - https://appsec-labs.com/AppUse
  - Reframworker
  - Has all the needed tools already set up and good to go.
- Santoku Linux - https://santoku-linux.com/
- Kali Linux - http://www.kali.org/downloads/

Dalvik – Android Java VM

- Dalvik is the virtual machine (VM) in Google's Android operating system.
- It is the software that runs the apps on Android devices.
- Dalvik is thus an integral part of Android, which is typically used on mobile devices such as mobile phones and tablets.

Android Architecture



Dalvik – Android Java VM

- Programs are commonly written in Java and compiled to Bytecode.
- They are then converted from Java Virtual Machine-compatible .class files to Dalvik-compatible .dex (Dalvik Executable) files before installation on a device.
- The compact Dalvik Executable format is designed to be suitable for systems that are constrained in terms of memory and processor speed.

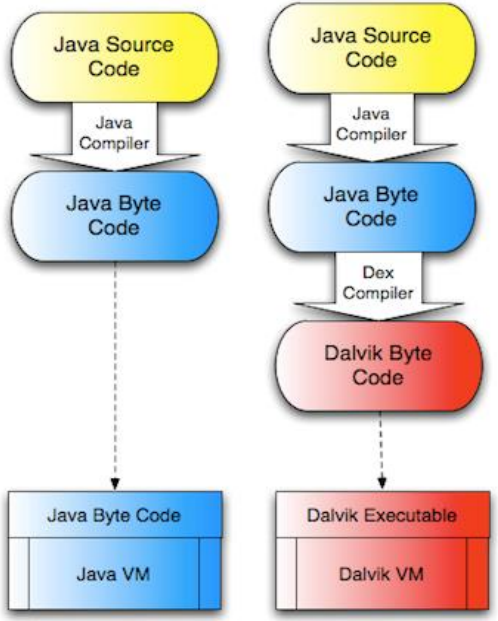
Bytecode?

- **Bytecode,** is a form of instruction set designed for efficient execution by a software interpreter.
- The name bytecode stems from instruction sets which have one-byte opcodes followed by optional parameters.

  - Opcode is the binary representation of a specific bytecode instruction.

ByteCode - JIT

- Some systems, called dynamic translators, or "just-in-time" (JIT) compilers, translate bytecode into machine language as necessary at runtime: this makes the virtual machine hardware-specific, but doesn't lose the portability of the bytecode itself.



Smali/Baksmali

- Smali/Baksmali is an assembler/disassembler for the dex format used by dalvik (Android's Java VM implementation).
- The syntax is loosely based on Jasmin's/dedexer's syntax.

Smali/Baksmali

- The names "smali" and "baksmali" are the Icelandic equivalents of "assembler" and "disassembler" respectively.
- Why Icelandic you ask? Because dalvik was named for an Icelandic fishing village.

Java-Smali Comparison

- Hello World Program in Java

```
import java.io.PrintStream;

public class HelloWorld {
    public static void main(String[] paramArrayOfString) {
        System.out.println("Hello World!");
    }
}
```

Java-Smali Comparison

- Hello World in Smali

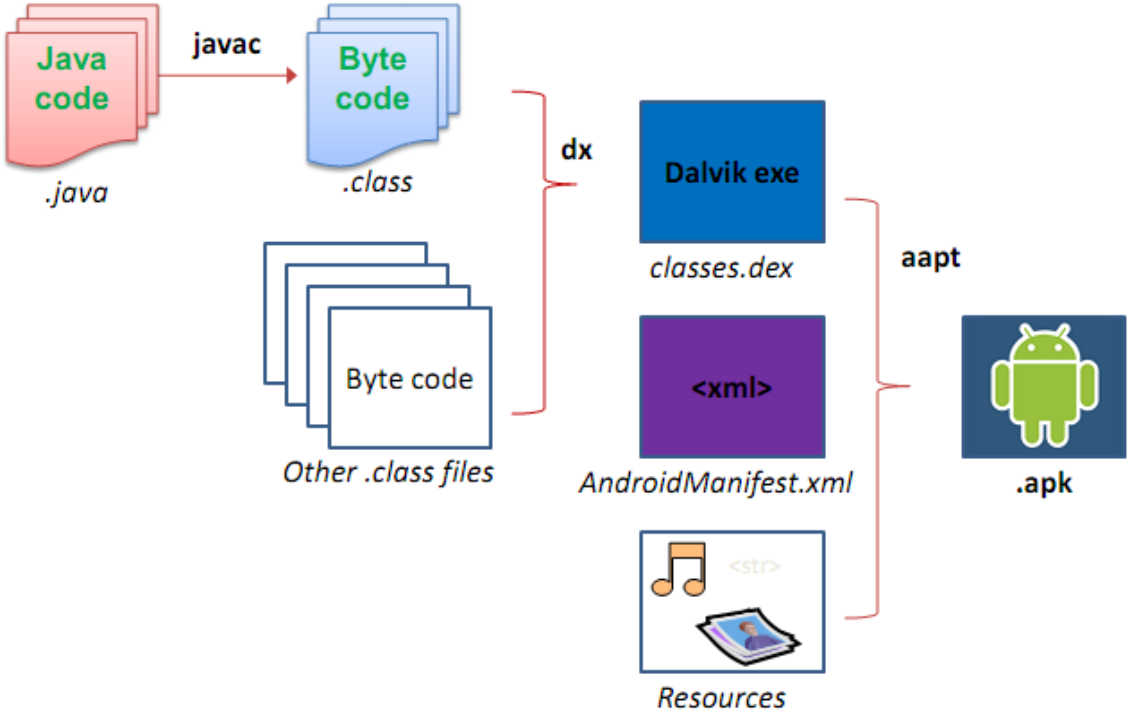
```
.class public LHelloWorld;
.super Ljava/lang/Object;

.method public static main([Ljava/lang/String;)V
    .registers 2
    sget-object v0, Ljava/lang/System;->out:Ljava/io/PrintStream;
    const-string  v1, "Hello World!"
    invoke-virtual {v0, v1}, Ljava/io/PrintStream;->println(Ljava/lang/String;)V
    return-void
.end method
```

APK

- Android **application package file** (**APK**) is the file format used to distribute and install application software and middleware onto Google's Android operating system.
- An APK file contains all of that program's code (such as .dex files), resources, assets, certificates, and manifest file.
- APK files are ZIP file formatted packages based on the JAR file format, with .apk file extensions.

APK


Java code
javac
Byte code
.java
.class
dx
Dalvik exe
classes.dex
aapt
Byte code
Other .class files
<xml>
AndroidManifest.xml
.apk
<str>
Resources