ANDROID VULNERABILITIES

Tools for this Workshop

- GenyMotion
- Drozer
- Reverse Engineering
    - APKTool
    - JADX

What you will Gain!

- Insecure Logging
- Hardcoding Issues
- Insecure Data Storage
- Input Validation
- Access Control
- Have some Fun!

Android Debugging Bridge (ADB)

An awesome tool!

ADB

- Tool used to debug your Android Apps
- Java - System.out.println(“**{Print Value}**”);
- Android - Log.d(“**{Key}**”, “**{Print Value}**”);

ADB Basic Commands

- adb devices - List all Devices
- adb push **{local} {android}** - Put file onto device
- adb pull **{android} {local}** - Take file from device
- adb install **{file.apk}** - Install an Application
- adb uninstall **{package name}**
- adb shell **{linux command}** - Run a Linux shell
- adb logcat - View device log

Challenge 1

Insecure Logging

Hints!

adb logcat - View Android Log

grep **{text}** - Search Line that matches text

Look for what you type

Reverse Engineering

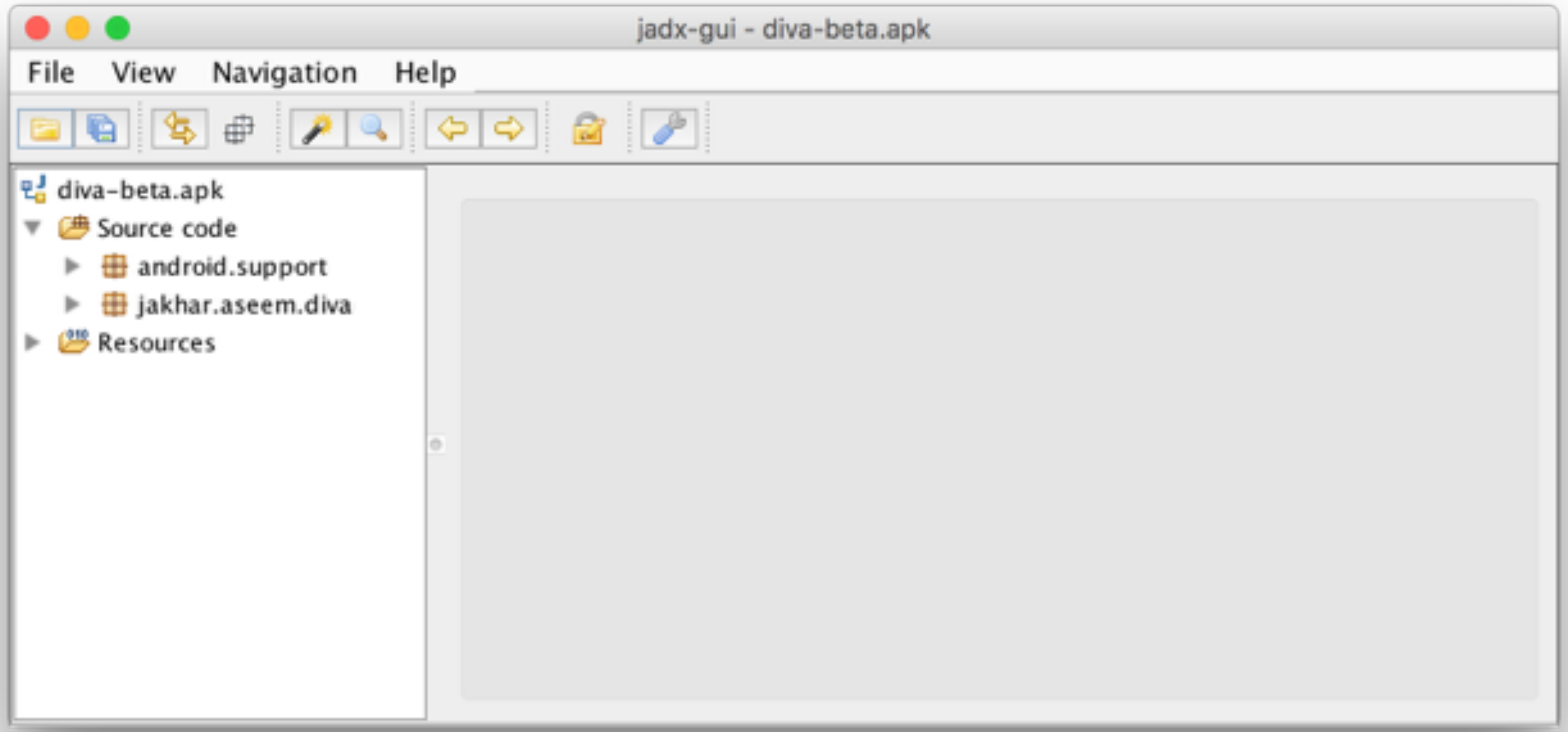
Sounds badass huh? It isn’t that tough

Tools

- APK Tool - Decompile (smali) & Recompile
    - APK Studio - Recompilation
- **JADX** - Provides Deobfuscation
- Dex2Jar & JD-GUI - Command Line Based
    - d2j-dex2jar.sh **{app.apk}**
    - Open Jar with jd-gui.jar

Set up JADX

- Go to **Tools/Reverse Engineering/jadx-0.6.0/bin/jadx-gui**
- Select **diva-beta.apk** in APK folder



Challenge 2

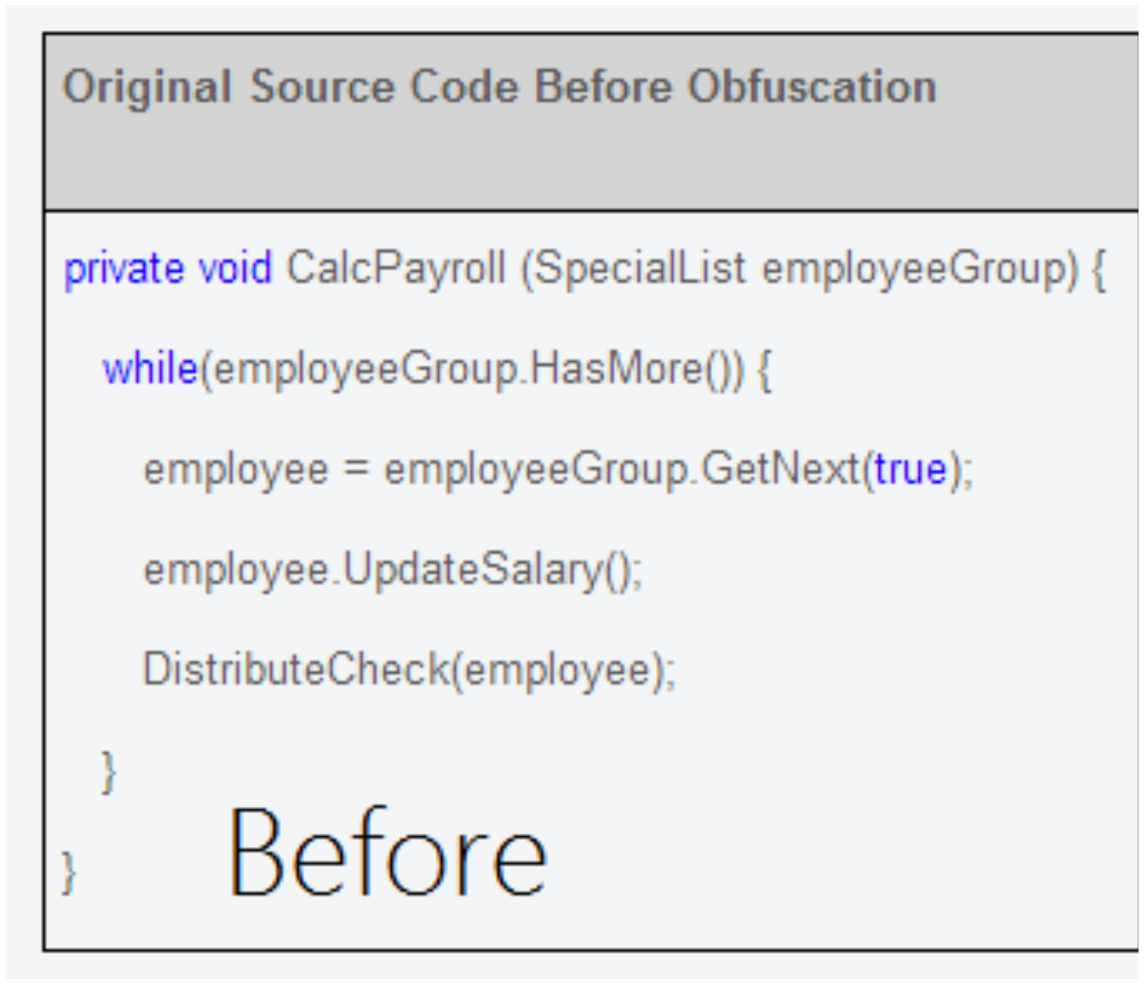
Hardcoding Issues

Obfuscators

- ProGuard - http://proguard.sourceforge.net/
- yGuard - http://www.yworks.com/products/yguard
- DexGuard - https://www.guardsquare.com/dexguard
    - String Encryption

http://proguard.sourceforge.net/index.html#alternatives.html

What it does



Original Source Code Before Obfuscation

```
private void CalcPayroll (SpecialList employeeGroup) {
  while(employeeGroup.HasMore()) {
    employee = employeeGroup.GetNext(true);
    employee.UpdateSalary();
    DistributeCheck(employee);
  }
}
```

Before

Recompiling APKs

- adb uninstall jakhar.aseem.diva
- apktool d diva-beta.apk
- cd diva-beta/smali/jakhar/aseem/diva
- Edit **HardcodeActivity.smali** using a text editor
- apktool b diva-beta
- cd diva-beta/dist
- keytool -genkey -v -keystore my-release-key.keystore -alias alias_name -keyalg RSA -validity 10000
- jarsigner -verbose -keystore my-release-key.keystore diva-beta.apk alias_name
- jarsigner -verify diva-beta.apk

Storage on Android

How it saves your data

Data Storage

- Shared Preferences
    - Store private primitive data in key-value pairs
- SQLite Databases
    - Store structured data in a private database
- Internal Storage
    - Store private data on the device memory
- External Storage
    - Store public data on the shared external storage

Android Data Folders

- /data/app - APK Files
- /data/data - Application Data Directory
- /data/system - System Data Directory

http://freeandroidforensics.blogspot.sg/2014/11/some-artifacts-in-datasystem-directory.html

Challenge 3,4,5,6

Insecure Data Storage

I’ve lost count of the number of challenges here

Hint: check **/data/data**

Lessons Learnt

- **NEVER** store sensitive information on a phone
- Encrypt the data
  - Shared Preferences - https://github.com/scottyab/secure-preferences
  - SQLite - https://github.com/sqlcipher/android-database-sqlcipher
- **Obfuscate** your Code!

Data Inputs

Don’t take what people say as what it is

Data Inputs

- SQL Injection
  - Attacker injects own SQL statements
  - Web, Mobile & Any Application that uses a Database.
- File Traversal
  - file://**{Directory}**
  - Try it on Chrome

Challenge 7, 8

Input Validation

Input Validation

- Always sanitize your inputs
- Use **PreparedStatements**

```
SQLiteDatabase db = dbHelper.getWritableDatabase();
SQLiteStatement stmt = db.compileStatement("SELECT * FROM
Country WHERE code = ?");
stmt.bindString(1, "US");
stmt.execute();
```

Access Control

Let me get into what you don’t expose me to

Types of Intents

- Every screen, process or message are called intents in Android
- **Activity** - Single screen in an app
- **Service** - Component that performs background operations without a user interface
- **Broadcast** - Message that any app can receive

Intents

- **Explicit Intents** - launch a specific app component, such as a particular activity or service in your app

```
Intent downloadIntent = new Intent(this, DownloadService.class);
downloadIntent.setData(Uri.parse(fileUrl));
startService(downloadIntent);
```

- **Implicit Intents** - Any app on device can perform the action

```
// Create the text message with a string
Intent sendIntent = new Intent();
sendIntent.setAction(Intent.ACTION_SEND);
sendIntent.putExtra(Intent.EXTRA_TEXT, textMessage);
sendIntent.setType("text/plain");

// Verify that the intent will resolve to an activity
if (sendIntent.resolveActivity(getPackageManager()) != null) {
    startActivity(sendIntent);
}
```

Drozer

- Comprehensive security audit and attack framework for Android
- Exposes Activities that are not well protected
- Metasploit for Android

https://labs.mwrinfosecurity.com/tools/drozer/

https://labs.mwrinfosecurity.com/assets/BlogFiles/mwri-drozer-user-guide-2015-03-23.pdf

Let’s set it up

- adb install agent.apk
- Open drozer app and select **ON**
- adb forward tcp:31415 tcp:31415
- drozer console connect

Let’s Roll!

- run app.package.info -a jakhar.aseem.diva
- run app.package.attacksurface jakhar.aseem.diva
- run app.activity.info -a jakhar.aseem.diva
- run app.activity.start --component jakhar.aseem.diva jakhar.aseem.diva.MainActivity
- help app.activity.start
- run app.provider.info -a jakhar.aseem.diva

Challenge 9,10

Access Control

Content Providers

- Sharing data between applications through the single ContentResolver interface.

- For example, the contacts data is used by multiple applications

```
getContentResolver().query(NotesProvider.CONTENT_URI, new
String[]{"_id", "title", "note"}, null, null, null)
```

https://developer.android.com/reference/android/content/ContentProvider.html

Challenge 11

Content Providers

Optional Challenges

Are you up for the **Challenge?**

Challenge 12

JNI Hardcode Vulnerability

Use **objdump** & **readelf**

Challenge 13

JNI Input Validation

Use **adb logcat**

Android Security

- **Handling Credentials**
  - In general, we recommend minimizing the frequency of asking for user credentials—to make phishing attacks more conspicuous, and less likely to be successful. Instead use an authorization token and refresh it.
  - Where possible, **username and password should not be stored on the device.** Instead, **perform initial authentication** using the username and password supplied by the user, and then **use a short-lived, service-specific authorization token**.
  - Services that will be accessible to multiple applications should be accessed using AccountManager. If possible, use the **AccountManager** class to invoke a **cloud-based service** and **do not store passwords on the device**.
  - https://developer.android.com/training/articles/security-tips.html#WebView

We’ve Conquered it!

There are tons of Tools!

- Covering today’s topic and much more!
- https://github.com/tjunxiang92/Android-Vulnerabilities
- https://santoku-linux.com/
- https://developer.android.com/training/best-security.html