Wroba Android banking trojan targets Japan

avira.com/en/blog/the-android-banking-trojan-wroba-shifts-attack-from-south-korea-to-target-users-in-japan

November 11, 2020

The mobile banking trojan Wroba has been around since 2010. It previously targeted smartphone users, mainly in the U.S, China, South Korea, and the Russian Federation. Cybercriminals have now expanded Wroba's targets, shifting their malware campaign to Japan.

This trojan was first developed as an Android-specific mobile banking trojan, capable of stealing files related to financial transactions. Once it has infected a device, Wroba uses SMS to send messages containing malicious links to the host's stolen contact list.

In this blog, Alexandru Frigioiu, a senior threat researcher at Avira Protection Labs, analyzes a new sample of the Wroba trojan found in the wild. This variant shifts targets from South Korea to Japan. It attempts to compromise banking app users in Japan by displaying a counterfeit version of the Chrome browser with the goal of delivering the payload.

Analysis

We came across a malware sample in the wild. The sample caught our attention because it displayed attributes such as a randomized file name, package name, and activity name. These suggest a packed application and Android malware.

- **Filename:** "vAdOyCy.apk"
- **Package name:** "buhb.uabvv.szxkr"
- **Main activity name:** "zuseoje.QiActivity"

We quickly realized the app is suspicious enough to take a closer look at the app permissions.

Figure 1: *Manifest file*

Looking at the "*Chrome*" application label, we identify that the application was trying to pose as a Chrome browser. However, the discrepancy with the package name made it clear that it was not Chrome and most likely malware.

Additionally, the app was signed with a test certificate from the Android Open Source Project used in the past by several other malware families. Although this certificate is used by some legitimate developers to sign their clean Android apps, this is clearly not the case here.

Installation screen

During our analysis, we saw that the installation screen was trying to pose as a Chrome browser. It was also using the legitimate Chrome icon to make it look familiar.

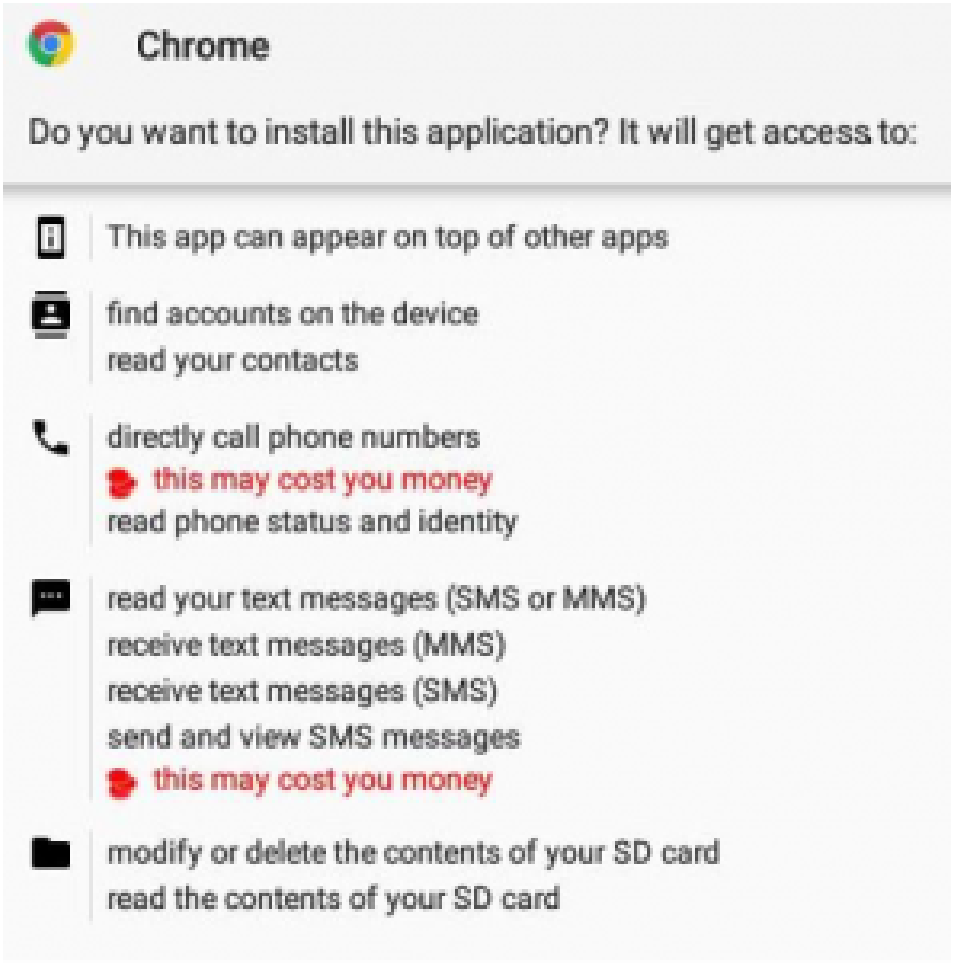


Figure 2: *Chrome application label and icon displayed on the installation screen*

After the permissions were granted, the application was launched, the icon disappeared from the launcher.

APK file structure

After we analyzed the APK file, we saw that apart from typical files found in an android app, there was a random file in the "*assets*" folder:

Figure 3: *APK file structure showing the file with a random name in assets*

This is typically used by malware to hide a second DEX or APK dropped at installation. Then loaded at runtime when the application is launched.

Looking at the contents of the file, we found that it was encrypted. We decompiled the code to find out what the application was doing with this file.

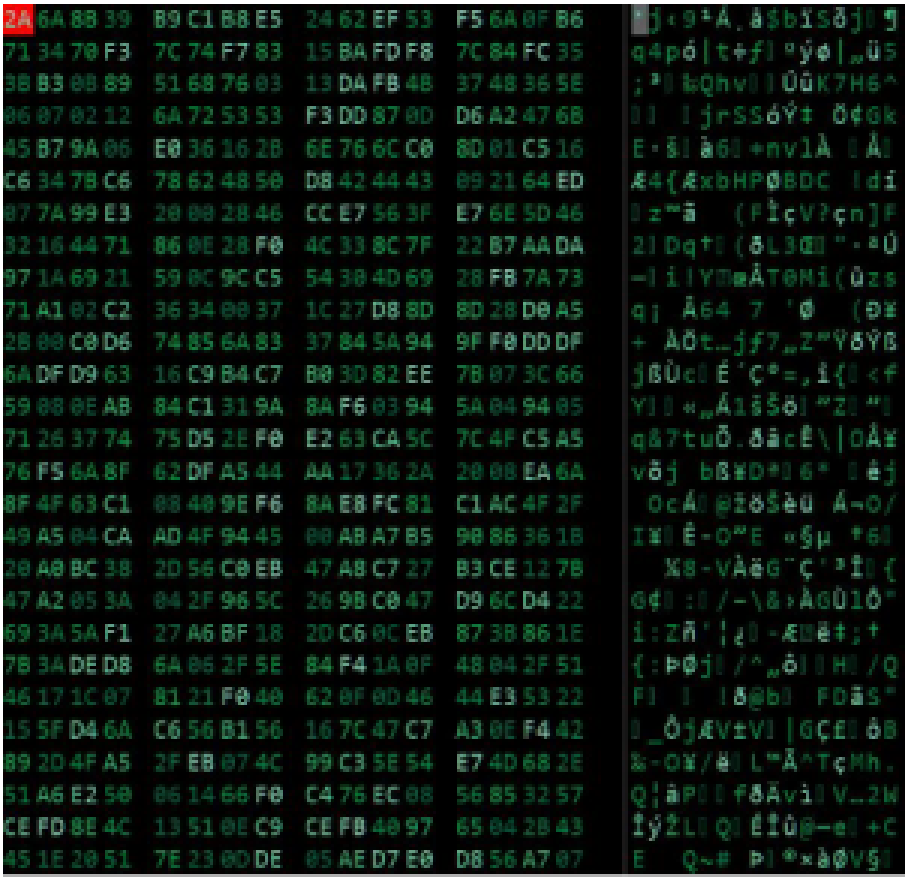


Figure 4: *Encrypted payload*

Hash of the file:
ccdc5c71c18709cea46e8dce04f985e19c054abfcb19a7ee6d875a09e3aa39b1

Main DEX file

The main DEX file is tiny (only 9kb) and we conclude its only function was to decrypt and load the randomly named file from assets.

After decompiling the code, we searched for the file name and found the following method:

Figure 5: *Decryption routine*

We saw that the file from assets is being read and processed to look like a custom decryption routine. After this, a file named “dex” is saved to “*/data/data/buhb.uabvv.szxkr/files/dex*”:

```
private File b() {
        File v1 = new File(this.getFilesDir().getAbsolutePath() + File.separator + "dex");
        if(v1.exists()) {
            v1.delete();
        }
        return v1;
    }
```

Figure 6: *Resulting file name*

We also saw that this file built the string “*dalvik.system.DexClassLoader*” out of separate strings (to avoid detection), which is then used to execute the payload:

```
private static Class<?> d() {
    StringBuffer stringBuffer = new StringBuffer();
    stringBuffer.append("dalvik".substring(0));
    stringBuffer.append(".");
    stringBuffer.append("SYS".toLowerCase());
    stringBuffer.append("Tem.".toLowerCase());
    stringBuffer.append("  Dex".substring(2));
    stringBuffer.append(ClassLoader.class.getSimpleName());
    return Class.forName((String)stringBuffer.toString());
}
```

Figure 7: *building “dalvik.system.DexClassLoader”*

Decryption routine

The function first opens the file from assets, skips the first 4 bytes, and reads the 5th byte used as an XOR key. Then reads the rest of the file in 1024 byte blocks, XOR-es it with the 5th byte, and passes the resulting data to the “this.a” method.

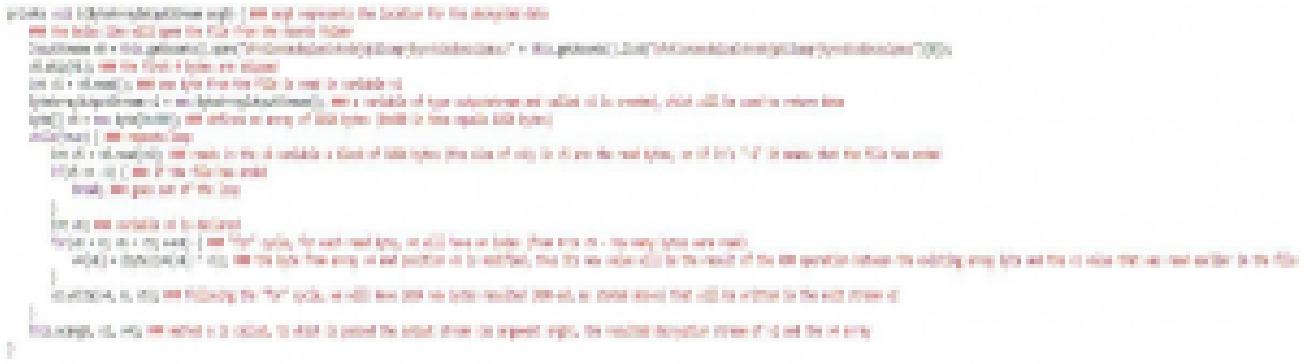


Figure 8: *Analysis of decryption routine*

The next function is decompressing the data using the deflate method:

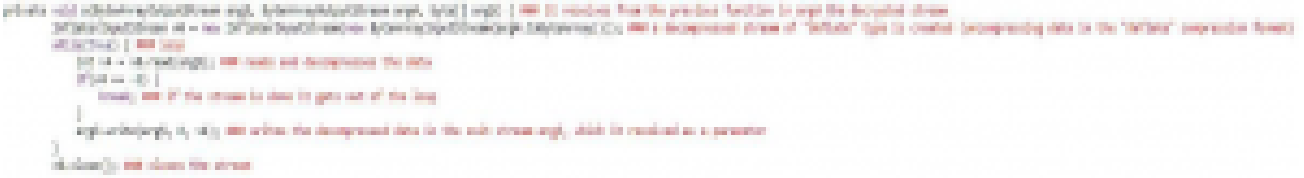
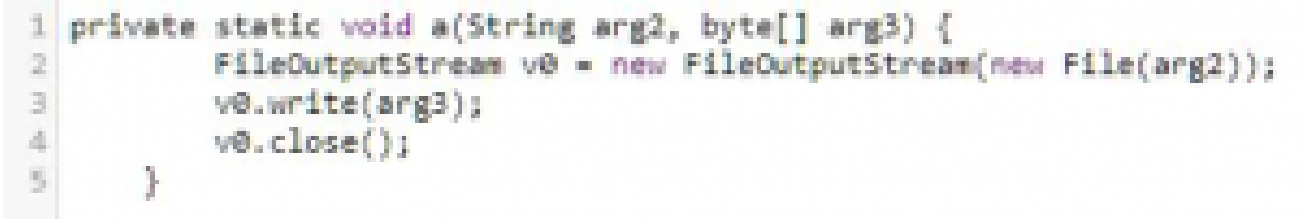


Figure 9: *The deflate method in function*

The data is then base64 decoded:

Figure 10: *Base 64 decode mechanism*

and the result is written to the file:



```
1  private static void a(String arg2, byte[] arg3) {
2          FileOutputStream v0 = new FileOutputStream(new File(arg2));
3          v0.write(arg3);
4          v0.close();
5      }
```

Figure 11: *New file is created*

Now that we know where the decrypted file is stored, we can retrieve it from the device to analyze it:

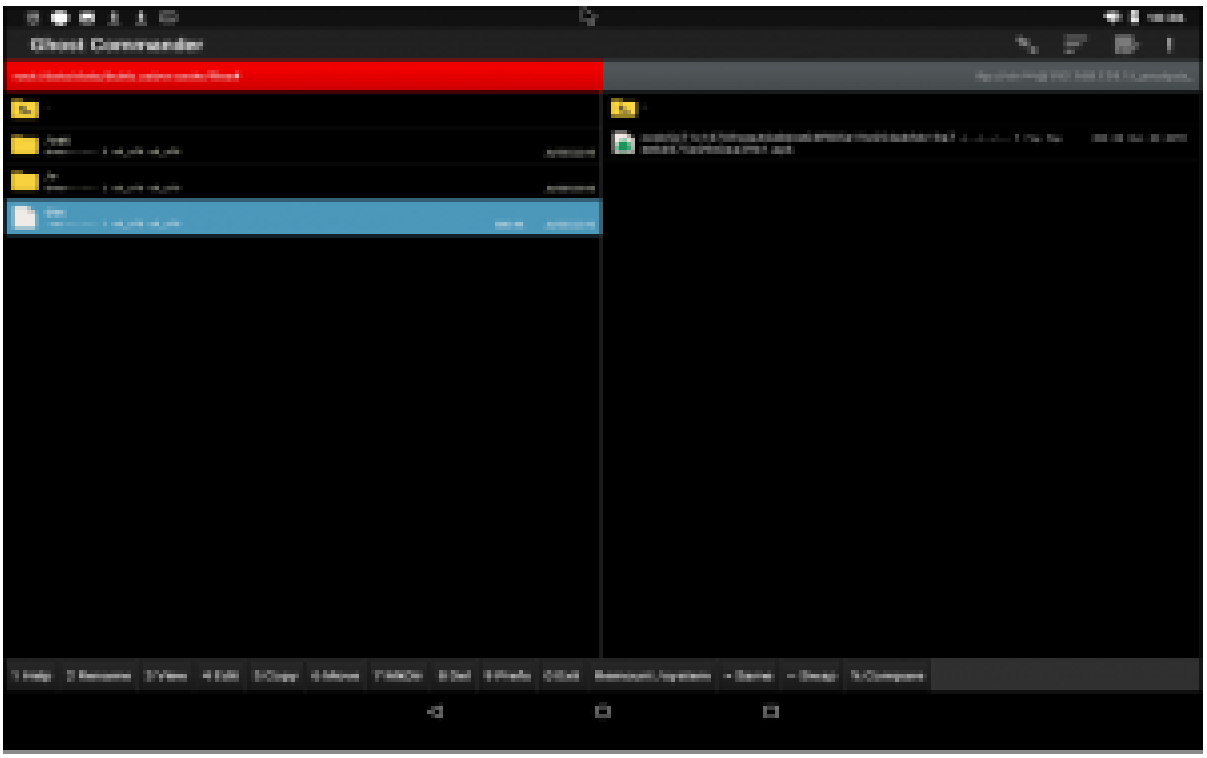


Figure 12: *Decrypted payload (upper left), named “dex”*

Payload analysis

The decrypted dex file (*0cd2b17aa21cd8de63842da21e3464df7bb2bd4a278fffbbfea6b294c3ca9e6d*) turned out to be a malware, as expected.

It was found to be a banking trojan from the Wroba family. This family has been in the wild since 2010, and its name is a concatenation of two terms, “we” and “rob”.

Malware functionality:

- tricks the user that the internet connection will be faster if the (suspicious) permission is granted
- spreads itself directly from the victim’s smartphone by sending phishing messages to the phone’s contact list
- grabs and monitors all incoming and outgoing SMS messages to bypass two-factor authentication

- monitors Android package names that are related to banking apps and overlay over them to capture credentials: *“com.wooribank.pib.smart”, “com.kbstar.kbbank”, “com.ibk.neobanking”, “com.sc.danb.scbankapp”, “com.shinhan.sbanking”, “com.hanabank.ebk.channel.android.hananbank”, “nh.smart”, “com.epost.psf.sdsi”, “com.kftc.kjbsmb”, “com.smg.spbs”.*

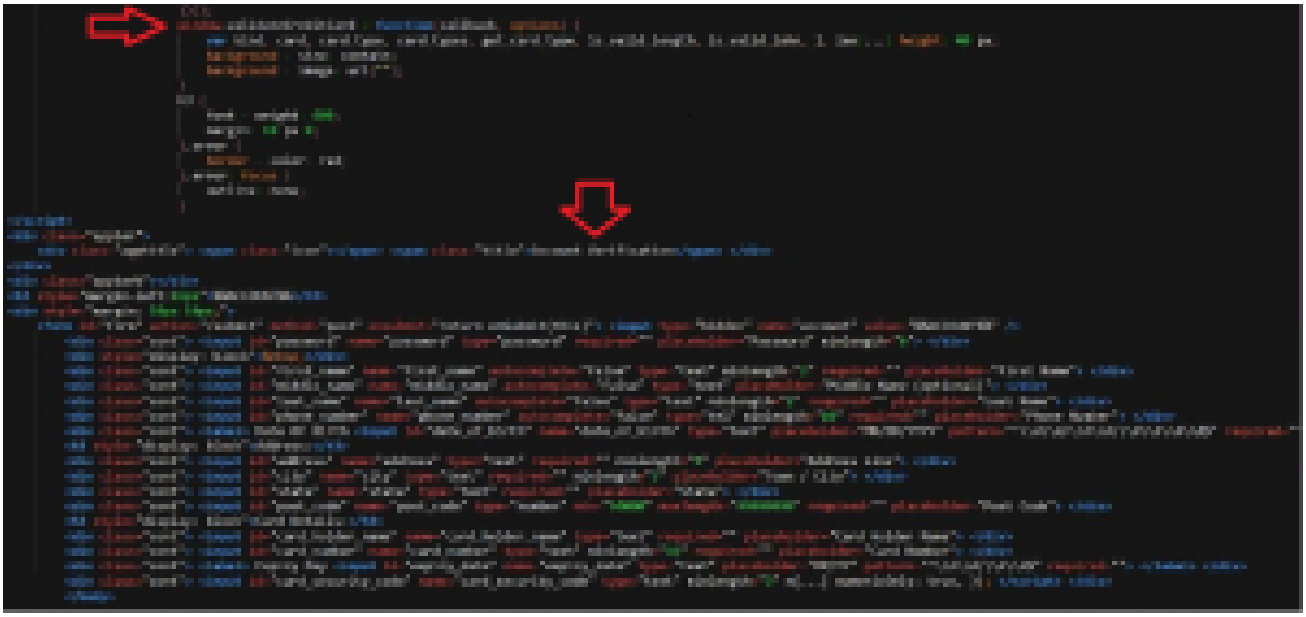


Figure 13: *HTML code of overlay*

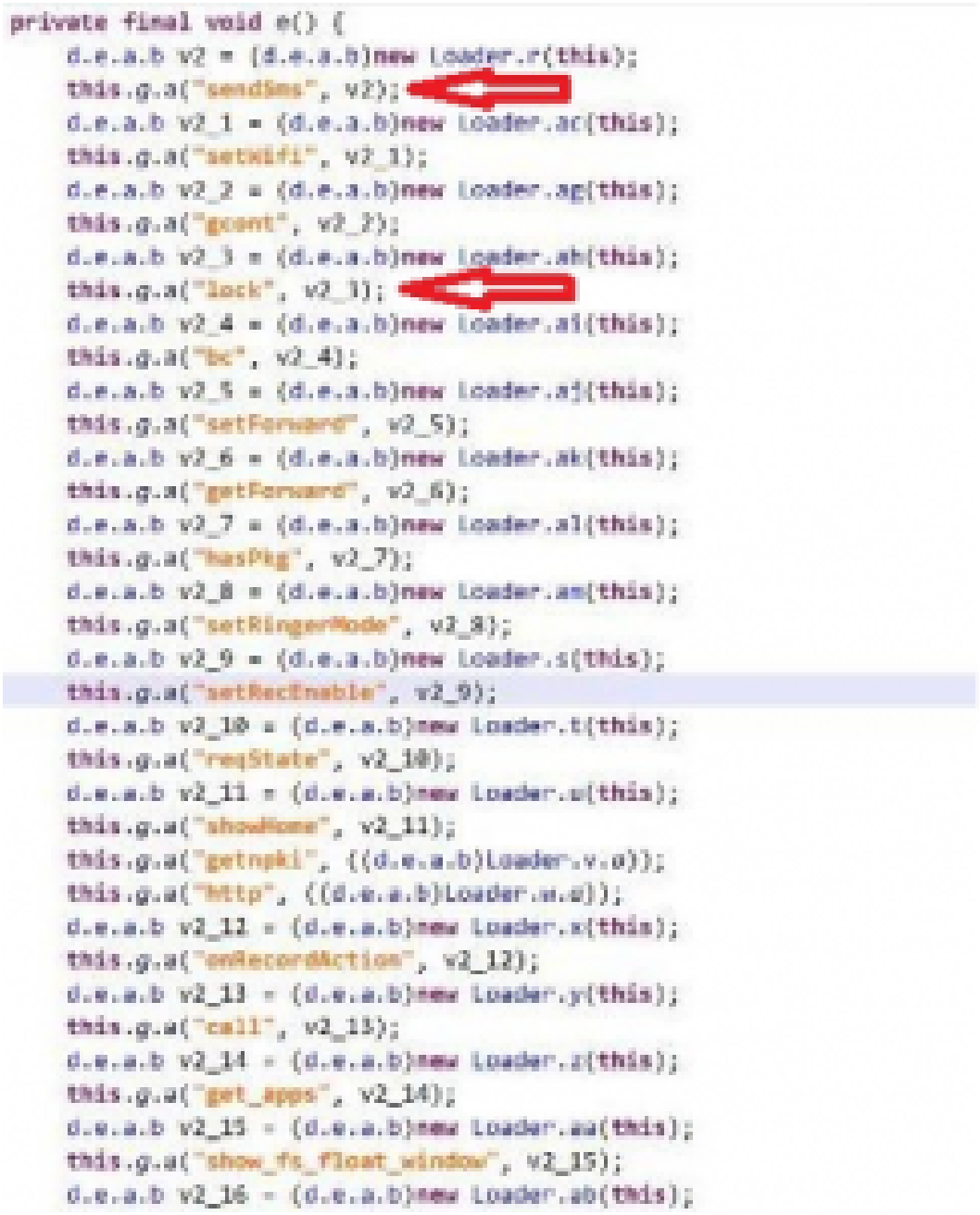


Figure 14: *Class showing some of the malware functionalities*

Figure 15: *Preparing overlay HTML content*

Figure 16: *Targeting Japanese banking apps*

Conclusion

Avira detects the original APK, dex file, decrypted payload, and other APKs from the Wroba family as Android/Wroba.

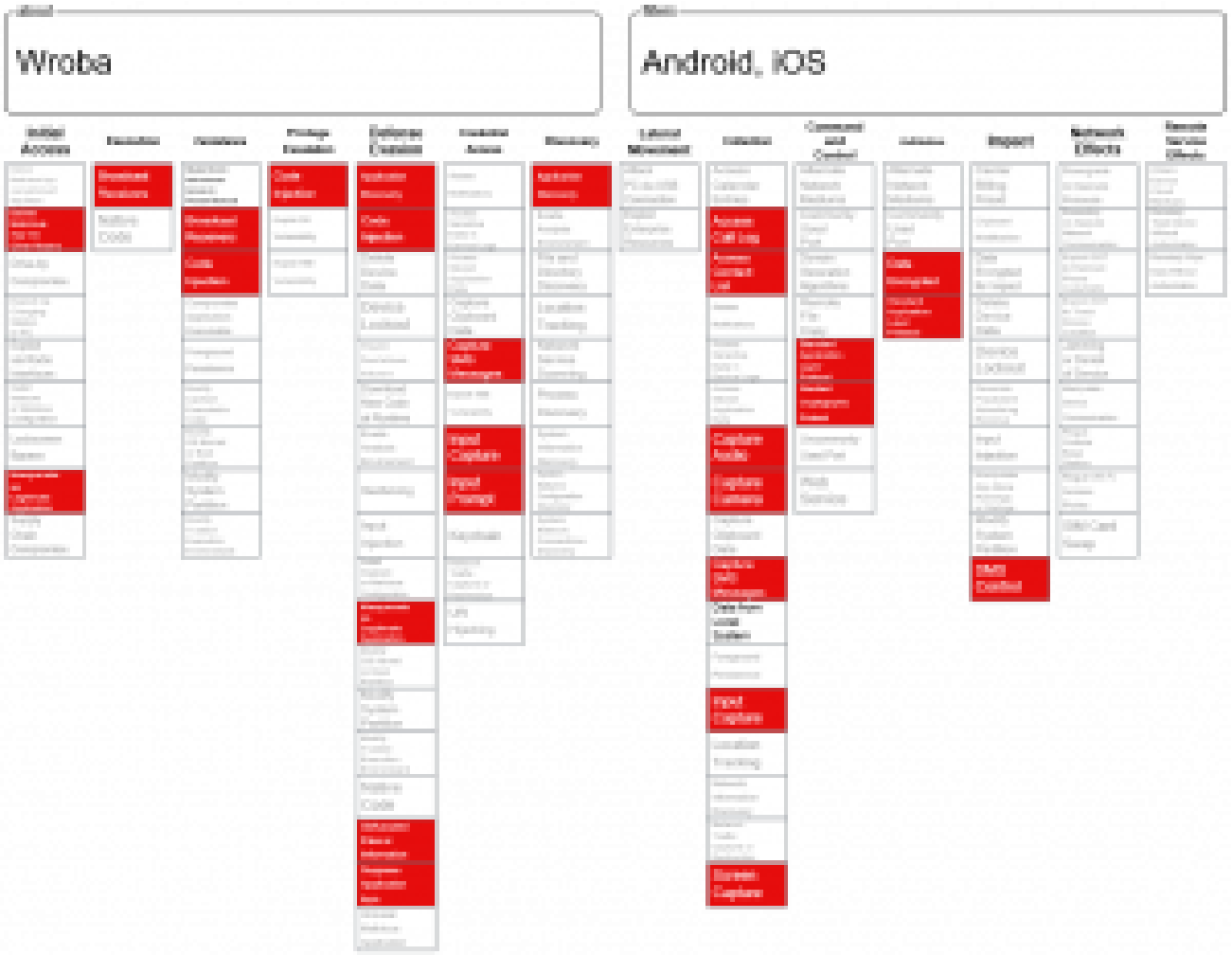
We strongly recommend Android phone users use an anti-virus package. These are available from Avira and other quality digital security providers.

Consumers should always keep the "*Unknown Sources*" option disabled in their Android device's settings to avoid installing apps from unknown sources. Android applications should only be installed from official stores such as Google Play, and even then care should be taken!

Everyone, on any device, Android, Windows, macOS and iOS should avoid clicking on unknown links received through SMS messages, emails, ads, and social media posts from untrusted sources.

Finally, mobile phone providers and network operators need to take steps to protect their customers and consider integrating anti-malware technologies such as Avira's own Anti-malware SDK for Android, and explore threat intelligence solutions that deliver mobile application reputation information.

Mitre attack matrix



IoCs

APKs containing encrypted dex files:

88193107c23011527c499e50ba6cddc8db9a4f9551e0a6e3043393aef65fd006

c4fce4222fca96055d42dde49fd85231c31978f69ebfb888e9c73252e8b7726e

96bb44eb5843debe02d460f95d427ae4122debc752dfd9477c93374065c3052b

c223f07bd07304c0b730111d22946b35b17e5b28d6bf2c2aab3dca98f1002f5d

d8feccdaed372d6cba46db534dffdea63537f7563f501add3c9b9a1087166ca6

2a378736b70a586afcab79541c6b2702ab53233ea1b6faddf8bfe2016f38f167

ccdc5c71c18709cea46e8dce04f985e19c054abfcb19a7ee6d875a09e3aa39b1

811da5d07b631e01a94899db448409d139fb9ab0eedec89dccdc170a5cdb3e0c

Encrypted dex files:

438cd827722e897248695e3c4c8b73acfdc7a6f58133bc13d7a90582ef30a76a

ed57cd7911b42a1d49b45b92776941f2be1aa2aab38f0a0c148acc2dcf9ed6fd

9f1a27161cd02e7a01d6677da4b1c6386031e33728ab5a6d2194a8006d6c047f

e169f1866e3f5acf38d384b5b1448e12bc94d6810b442e5cfd3c89686fac8064

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1f07092d63093c2706e5908991be3afdf478c187aeafbf84a4a3233889ae2286

c22a73489397bc63745dc92d41717e904f7c270a75821b223a856caf19d37d6d

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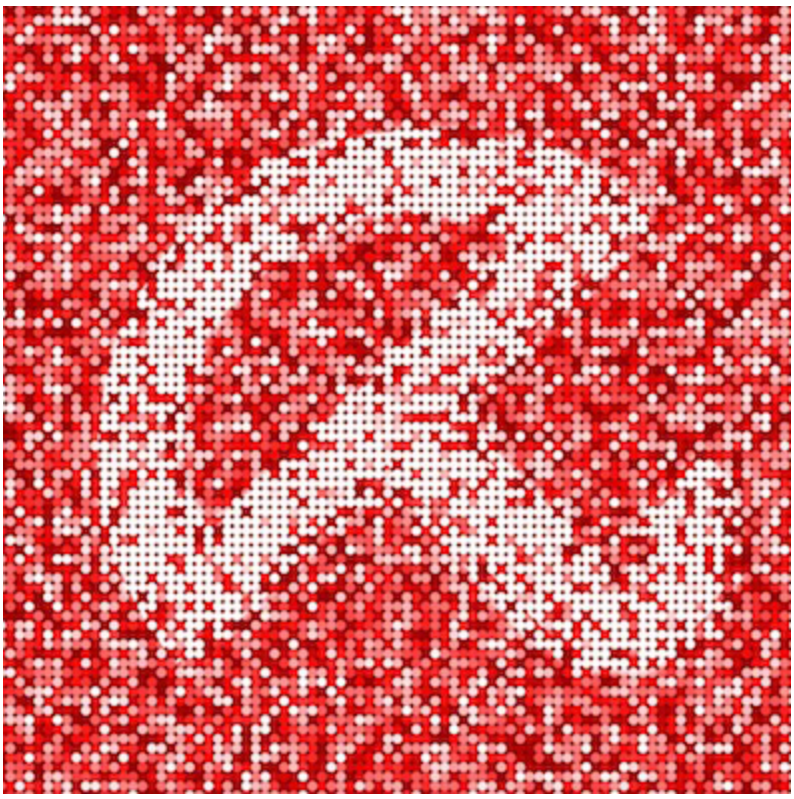

Avira Protection Labs

Protection Lab is the heart of Avira's threat detection and protection unit. The researchers at work in the Labs are some of the most qualified and skilled anti-malware researchers in the security industry. They conduct highly advance research to provide the best detection and protection to nearly a billion people world-wide.