

Feature Enhancement of Amandroid, an Open Source Static Analyzer for the Security Vetting of Android Applications.

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The Android Ecosystem

- ▶ Android is the most popular mobile operating system in the world.
- ▶ Android has caught up to windows in terms of the internet use. (Businessinsider, 2017)
- ▶ The Android Ecosystem consists of three major players: the users, the publishers and the app Store agency.
- ▶ Android Ecosystem is not void of malicious apps.

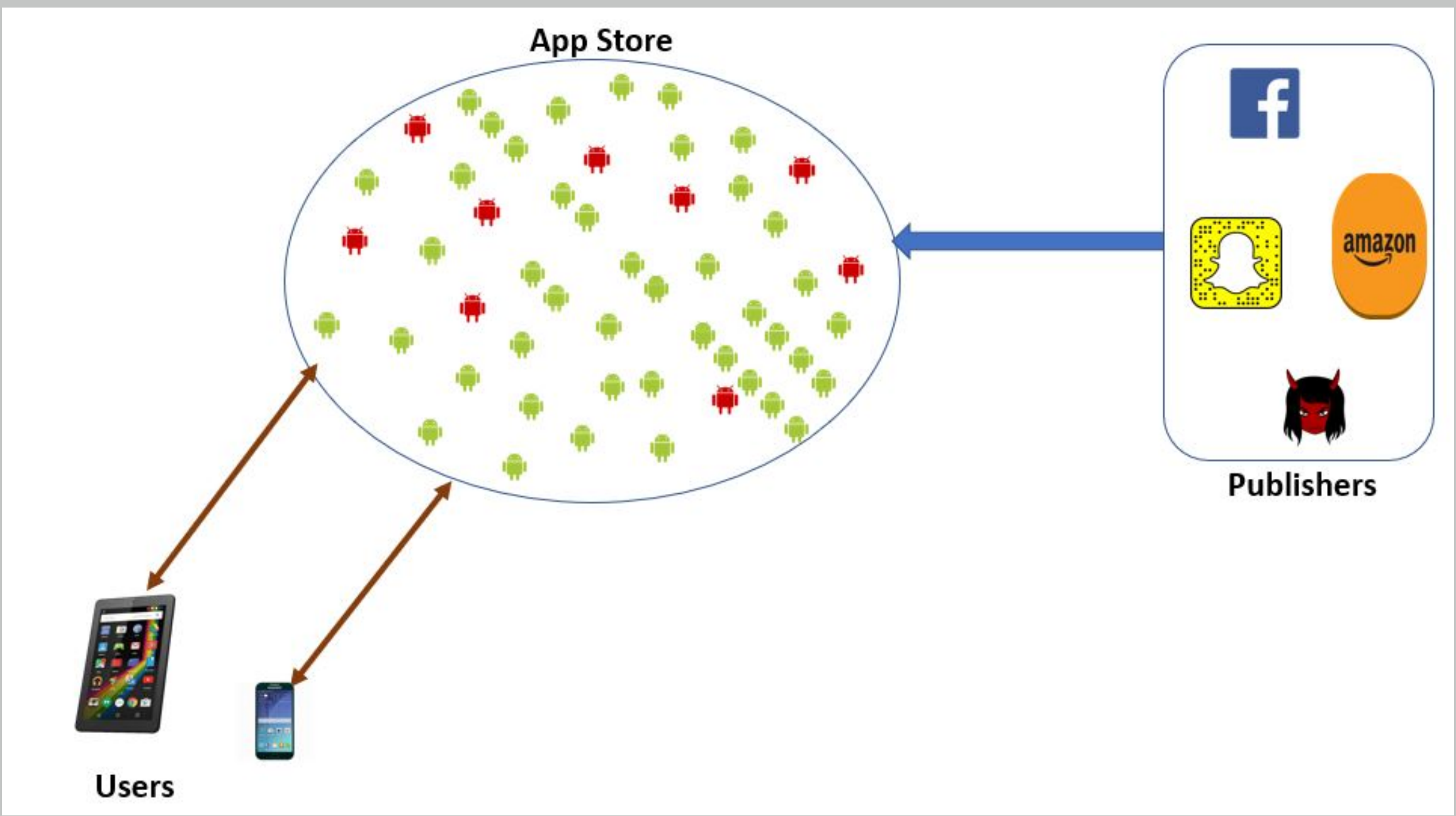


Figure 1:Android Ecosystem

The Art Of Static Analysis

- ▶ Static Analysis is the way of analyzing an application without actually running it.
- ▶ Static analysis is useful in Android Ecosystem to detect malicious apps before users install in their machine or even before they are uploaded to the App store.
- ▶ Static analysis is not perfect.It is not void of false positives and false negatives.

Amandroid: A Tool Of The Trade

- ▶ Amandroid is an open source static analyzer used for the security vetting of Android Apps.
- ▶ The idea behind Amandroid is to perform data flow, control flow and the data dependence analysis for each of the components of an Android App.
- ▶ This helps detect possibilities of malicious activities such as:
 - ▷ Sensitive data leakage.
 - ▷ Data injection.
 - ▷ Misuse of sophisticated APIs.

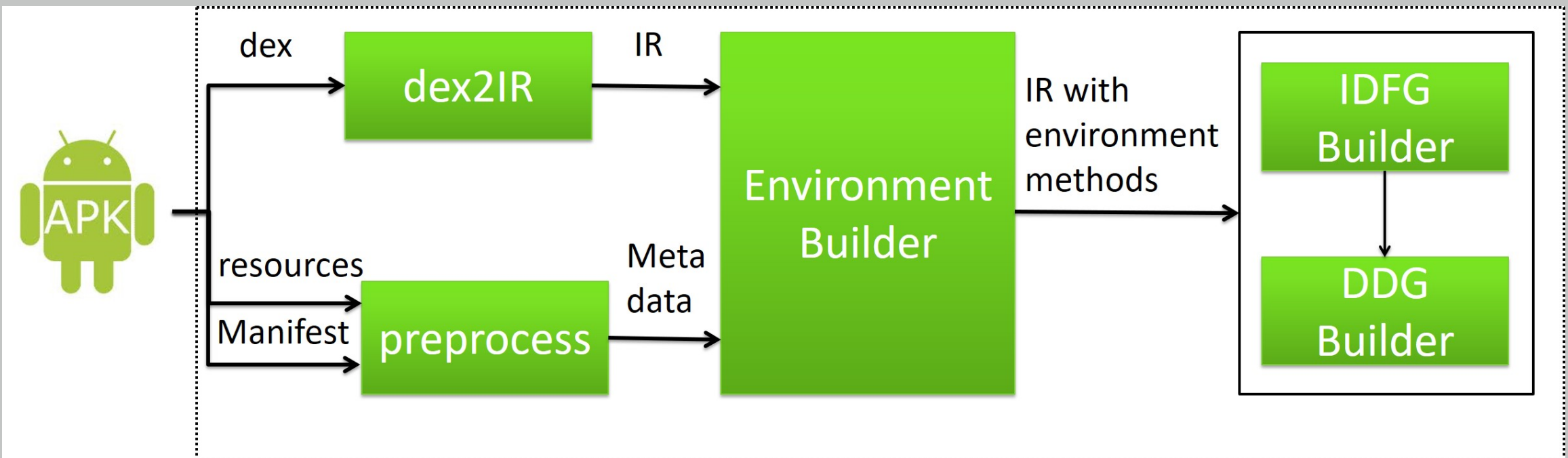


Figure 2:Amandroid block diagram(Wei Et. Al)

- ▶ Amandroid can be downloaded in the form of a jar file, and can be used to detect malicious activities in any APKs.

Problem Statement

- ▶ Attackers are implementing newer techniques to create malicious apps.
- ▶ Every static analysis tools have to be updated and enhanced to detect the newer forms of malicious activities.
- ▶ Currently, Amandroid doesn't have plugins to detect potential malicious activities such as:
 - ▷ Blackmailing users through the misuse of LockScreen.
 - ▷ Dynamic loading of Hexcode from network or the asset folder of the Android app. Etc.
- ▶ The motto of this work is how the features of Amandroid can be enhanced so that it detects newer forms of potential malicious activities.

Motivating example I : LockScreen

- ▶ **Malicious Symptoms:**
 - ▷ Once the app is installed, it covers the entire screen of the Android device.
 - ▷ The victim is not able to close the malicious App or access any other apps already installed in their device.
 - ▷ The app may consist of some blackmailing information.
- ▶ **The lockScreen detector plugin:**
 - ▷ Checks for the presence of signature that can be malicious.
 - ▷ Checks for a particular value of the parameter in the call statement which confirms the presence of LockScreen.

Motivating Example II: Dynamic loading

- ▶ **Malicious Symptoms:**
 - ▷ Loads Dalvik Bytecode from asset folder or network.
 - ▷ The hidden Dalvik Bytecode has malicious intent.
- ▶ **Why attackers use dynamic loading ?**
 - ▷ Because it's difficult for an static analysis application to analyze the source code dynamically loaded from another source.
- ▶ **The Dynamic loading detector plugin:**
 - ▷ Checks for the presence of signature that can be malicious.
 - ▷ Checks for the use of DexClassLoader class.

Testing and Verification

- ▶ Both the LockScreen and DynamicLoading detector plugins were tested using **ScalaTests**.
- ▶ Both the plugins passed 5 different test cases.

Experimental Results

- ▶
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Future Works

- ▶ Writing more plugins to detect newer tricks used by attackers.
- ▶ Using Machine Learning techniques to detect malicious and benign apps.
 - ▷ Result of each plugin becomes one feature for the classifier.

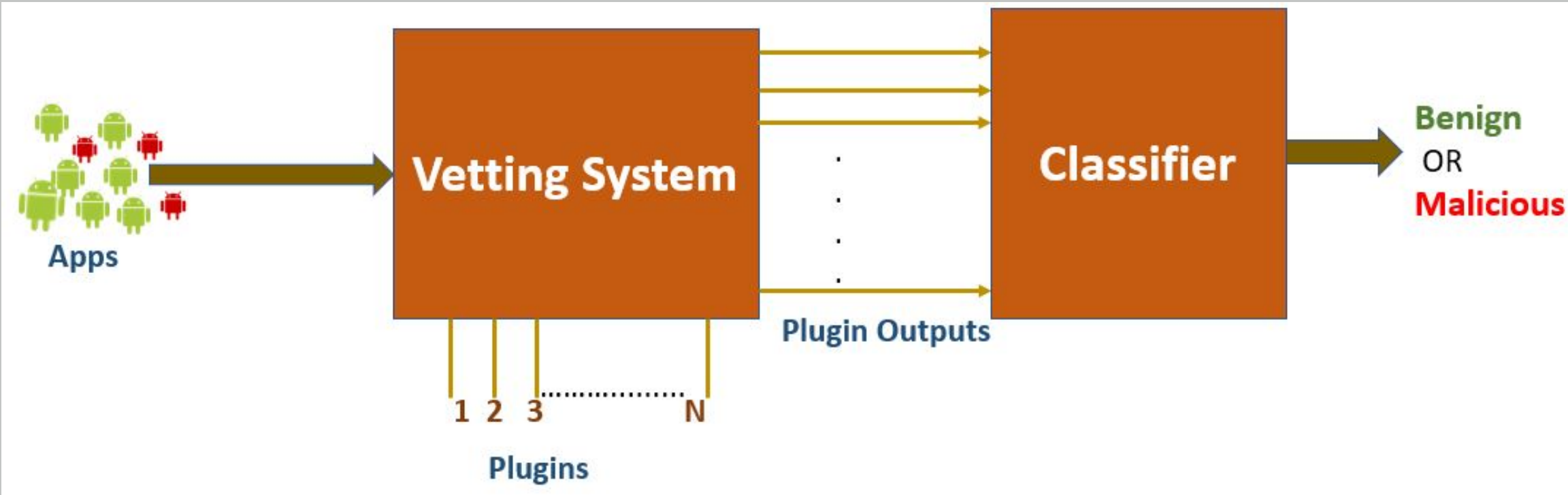


Figure 3:Machine Learning based Classifier

References

1. Amandroid: ACM CCS 2014, <http://pag.arguslab.org/argus-saf>

Acknowledgments

- ▶ Fengguo Wei, Dewan Chaulagain, Steven Arzt.