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Towards Automatic Triggering of Android Malware

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The problem: malware hiding techniques

- a fixed or dynamic period of time
- a user input
- a system event
- an order from a remote server
- a particular state of their hosted application
- something else?

Existing solutions

Some frameworks proposed to test the infected application
1. using random inputs
2. running a maximal branches of code

BUT
1. it is uncertain
2. it is unnecessarily expensive

First step: static identification of malicious code

A scoring function computes an indicator of risk for each instruction in the bytecode.

The score increases with calls to specific Java methods such as:
- android.telephony.SmsManager for sending SMS
- android.telephony.TelephonyManager for getting device infos
- java.util.Timer,TimerTask for the implementation of timebombs
- java.lang.Runtime,Process for executing native binaries
- dalvik.system.DexClassLoader for loading code dynamically

Second step: recomputing an execution path to the identified malicious code

To compute an execution path to the most scored unit of code:
- For each function of the malware, compute:
  $G_f = (V_f, A_f)$
  Let $G = U_f G_f = (V, A)$
- For each event from $v_i \in V_f$ to $v_j \in V_f$:
  Add $(v_i, v_j) \in A$
- Let $v_k$ the scored unit of code
  Let $v_0$ the entry point (onCreate())
  Compute $\text{path} = \text{shortest} \_	ext{path}(G, v_0, v_k)$

Third step: forcing the execution path

To force the execution of the most scored unit of code path:
- Make a standard execution
- Let $\text{path} = (v_1, v_2, \ldots, v_k)$:
  $v_k$ is the last unit of code executed.
- If $v_i > v_k$, if $v_i$ is a condition, Force($v_i$)
- Execute the malware again.

Benefits:
- a malware that is executed shows its effects
- detection tools can be trained or evaluated