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Towards Automatic Triggering of Android Malware

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The problem: malware hiding techniques

Malware wait before running to evade dynamic analysis

- ▶ 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

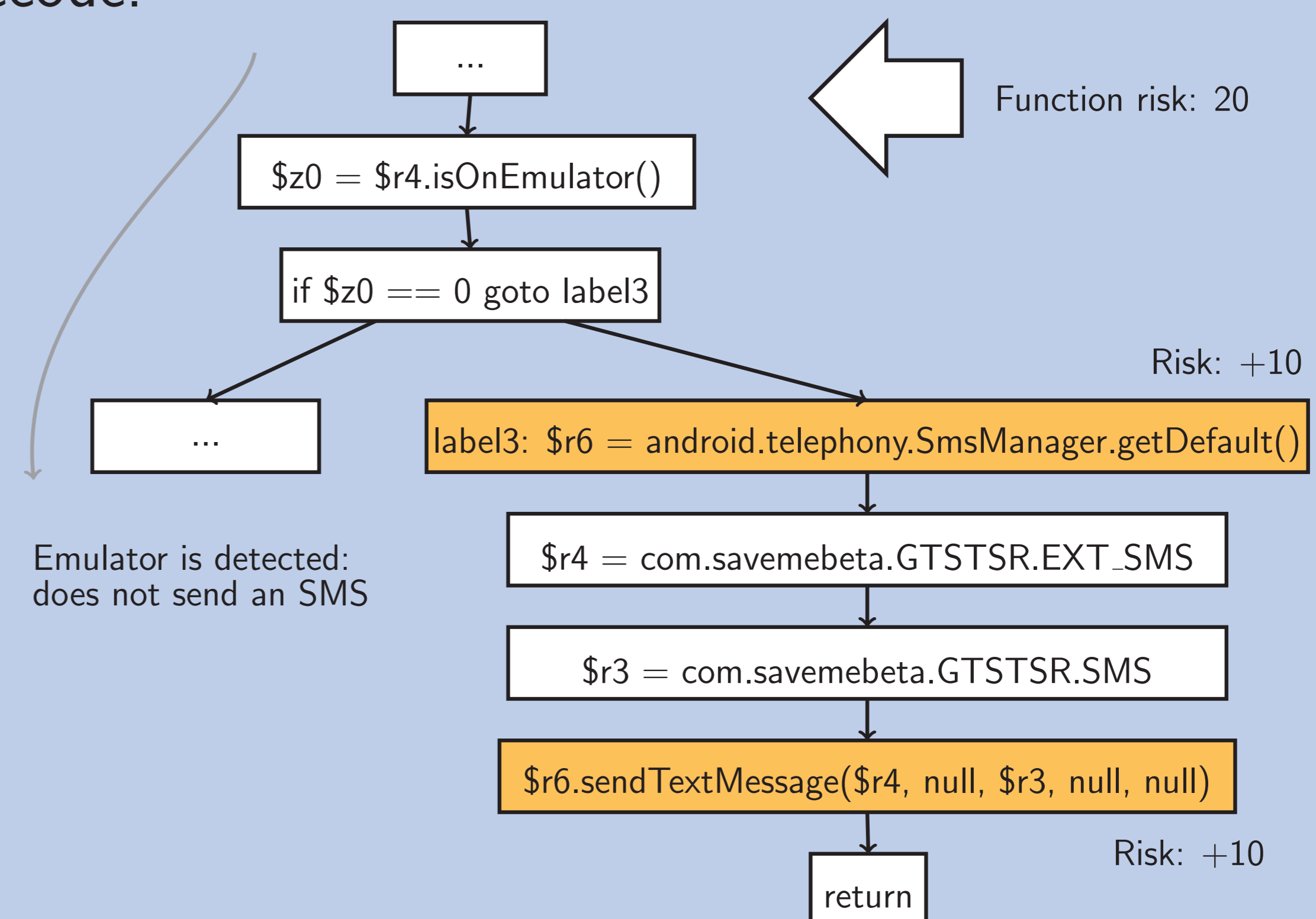
1. it is uncertain
2. it is unnecessarily expensive

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:

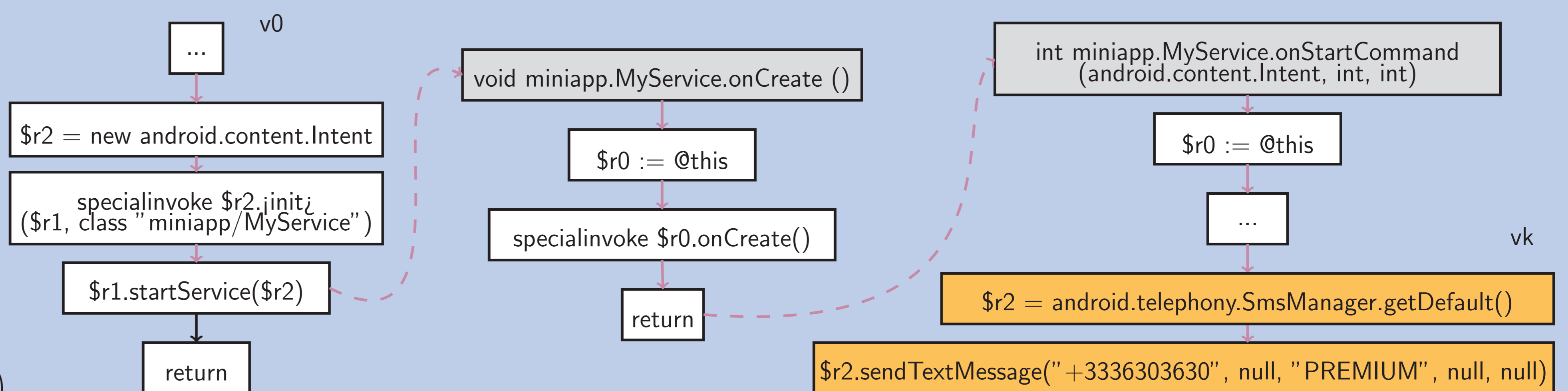
- ▶ android.telephony.SmsManager for sending SMS
- ▶ android.telephony.TelephonyManager for getting device infos
- ▶ android.context.pm.PackageManager for installing/removing apps
- ▶ java.util.Timer, TimerTask for the implementation of *timebombs*
- ▶ java.lang.Runtime, Process for executing native 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:

- ▶ $\forall f$, functions of the malware, compute: $G_f = (V_f, A_f)$. Let $G = \cup_f G_f = (V, A)$
- ▶ \forall intents, events from $v_i \in V_i$ to $v_j \in V_j$: Add (v_i, v_j) to A
- ▶ Let v_k the scored unit of code
- ▶ Let v_0 the entry point (`onCreate()`)
- ▶ Compute $path = shortest_path(G, v_0, v_k)$



Third step: forcing the execution path

To **force the execution** of the most scored unit of code $path$:

- ▶ Make a *standard* execution
- ▶ Let $path = (v_1, \dots, v_e, \dots, v_k)$: v_e is the last unit of code executed.
- ▶ $\forall i > e > k$, 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

