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Using Implicit Calls to Improve Malware Dynamic Execution

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Dynamic Analysis: The Need for Malware Triggering

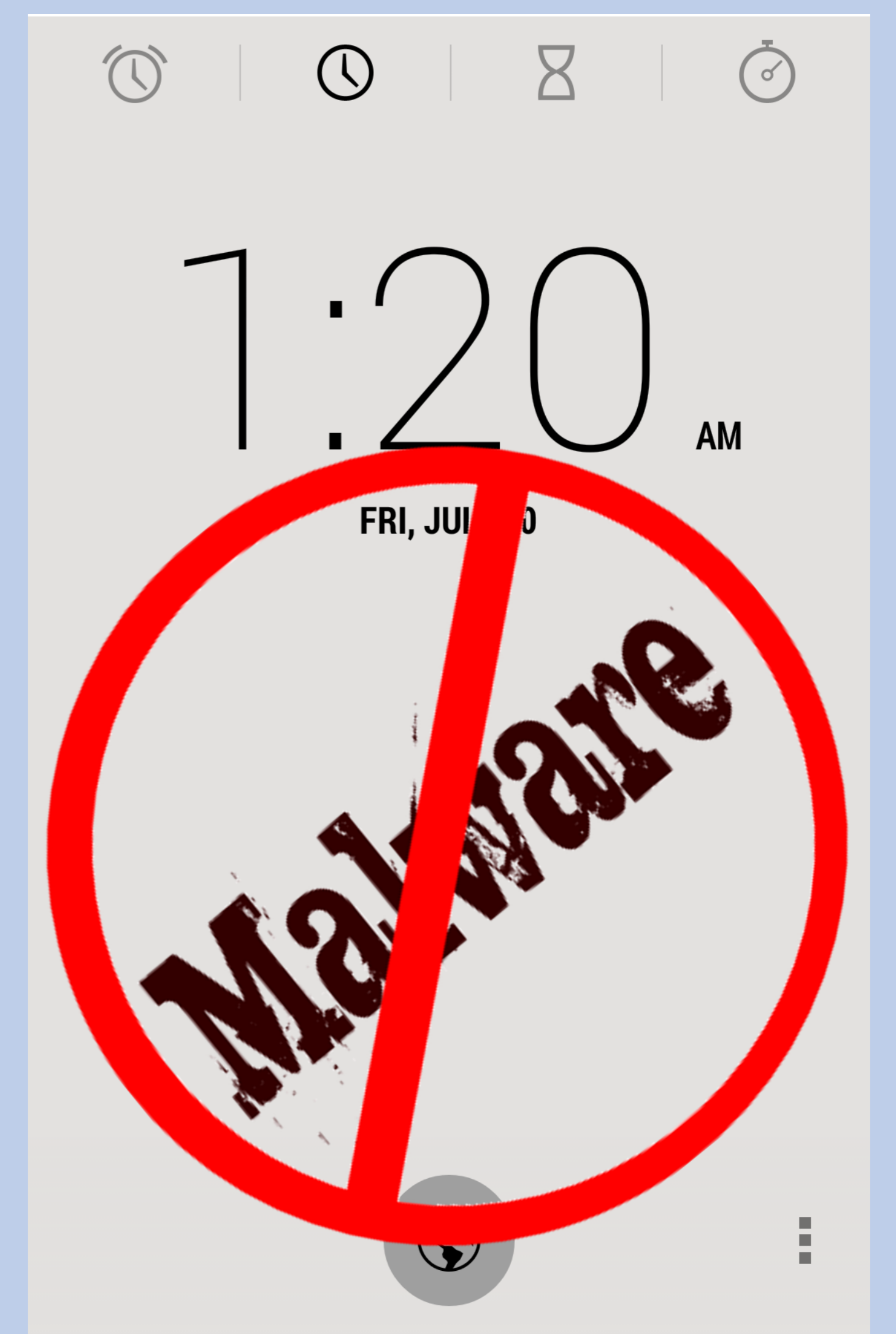
- ▶ Malware evade dynamic analysis
- ▶ Wait for: a specific time, an event, C&C command
- ▶ If **suspicious** code is triggered
→ Capture dynamic behavior

GroddDroid: a Gorilla for Triggering Malicious Behaviors

- ▶ Locates the **suspicious** code
- ▶ Builds an interprocedural control flow graph
- ▶ Finds a path that reaches the suspicious code
- ▶ Instruments & Executes APK

Problem: Execution paths May Use Implicit Calls

- ▶ Alarm Controller (com.al.alarm.controller)
- ▶ SHA256: 03c32aca9f894b8a7263e65fd8845a53618f1131877ccb818d018e2d07e2f596
- ▶ Decrypts and loads code dynamically
- ▶ Installs malicious apps
- ▶ Displays unwanted ads
- ▶ Malicious code execution path contains an implicit call:
`AsyncTask.execute()` --> `AsyncTask.doInBackground()`
- ▶ GroddDroid cannot find such a path because of implicit calls

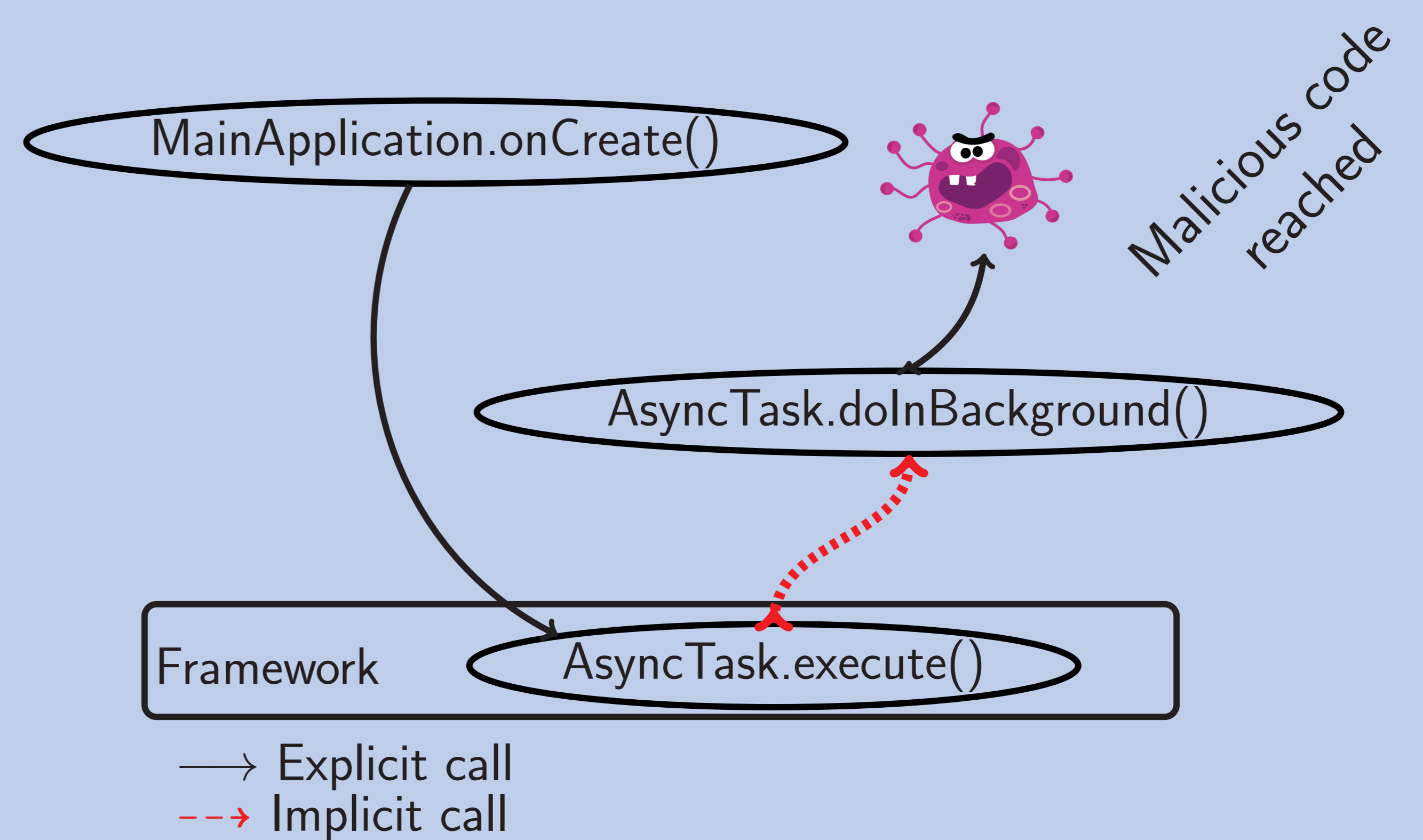
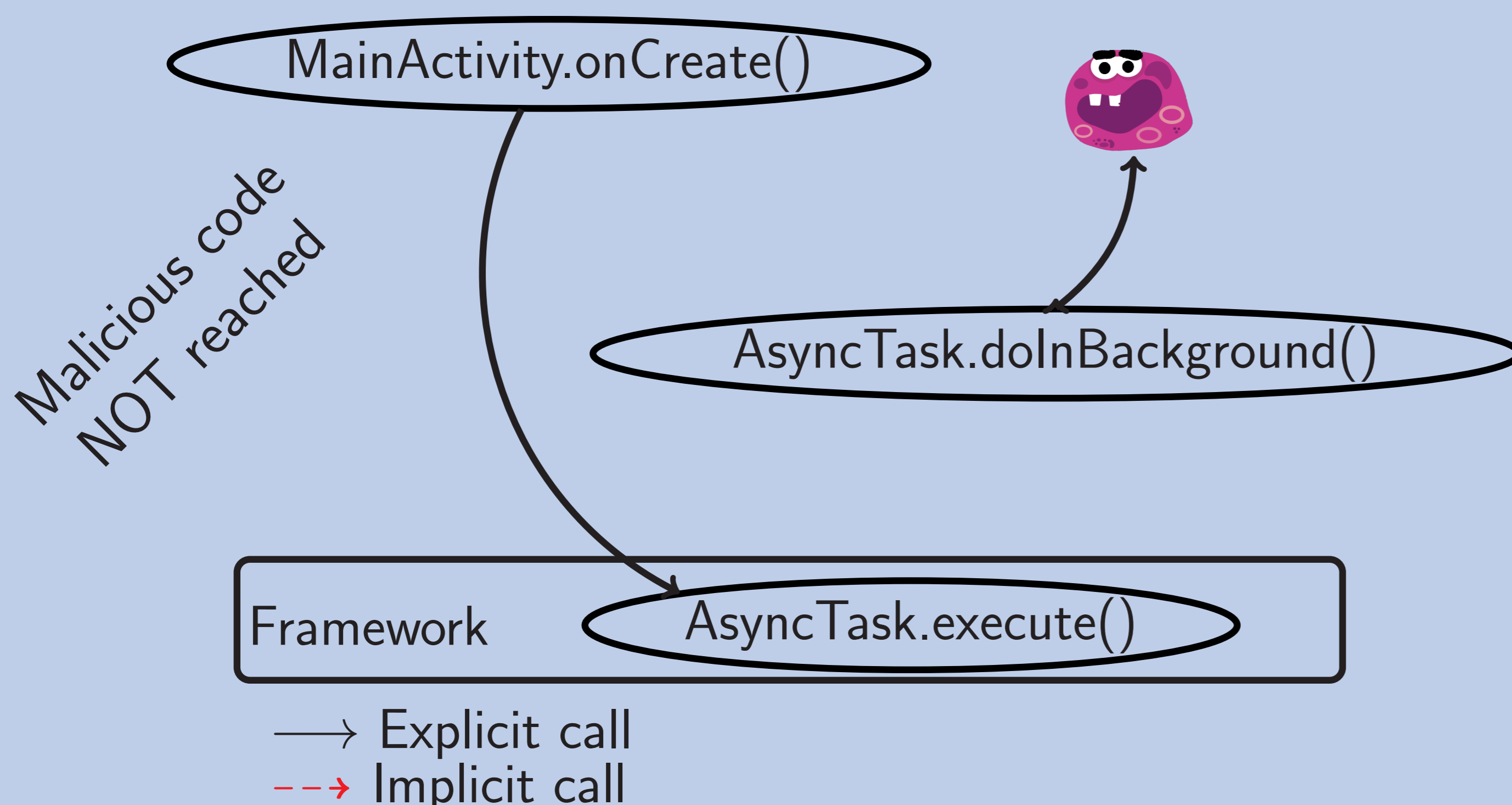


Challenge

Discover execution paths with implicit calls to reach **suspicious** code

Including Implicit Calls into CFGs

- ▶ Without implicit calls
- ▶ **Suspicious** code execution rate for this sample: 37.5%
- ▶ Use pairs of *registration-callback*
- ▶ **Suspicious** code execution rate for this sample: 87.5%



Executing Malware

- ▶ Program designed and implemented
- ▶ Experiments on large sets of malware
- ▶ Measure malicious code coverage with and without implicit calls
- ▶ Online malware analysis platform