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Android IME Privacy Leakage Analyzer

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Introduction

- Android input method editor (IME) is a keyboard application.
- Previous work analyzed a small number of IME samples and tested them manually.
- We develop `IMEAnalyzer`, which automatically runs tests and dynamic analysis to identify possible privacy leakages of IMEs.

Challenges

- IME is a service, so common methods for Android app interface testing cannot be utilized.
- User input actions cannot be simulated by keycode APIs because it would bypass IME apps and communicate with the OS directly.
- Most IMEs tend to encrypt their network traffic. It is hard to check if user inputs are sent.

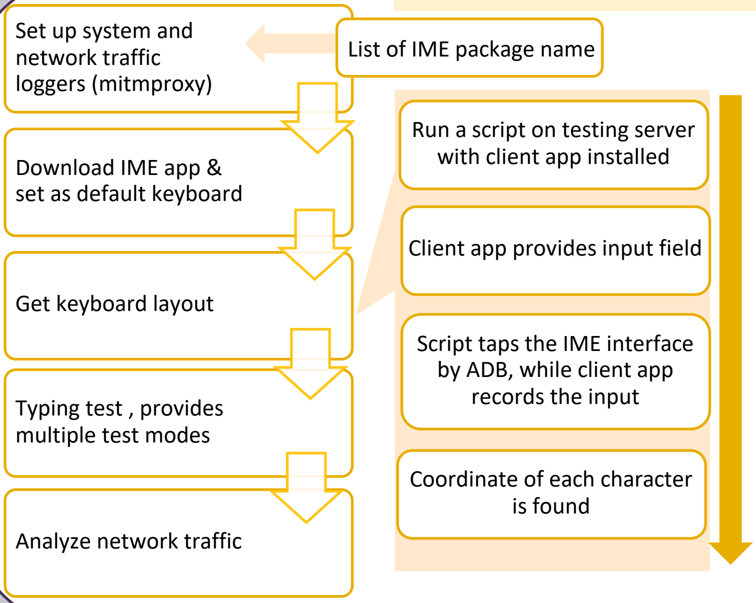
Result

- IMEAnalyzer can successfully analyze 40 top-downloaded apps under two test modes.

	# of IME apps
Probably innocent	21/40
Same behavior	8/40
Suspicious	11/40

- Probably innocent: Nothing sent while user type.
- Supicious: This kind of IMEs will send more packets when user is typing.

Architecture



Set up system and network traffic loggers (mitmproxy)

List of IME package name

Download IME app & set as default keyboard

Get keyboard layout

Run a script on testing server with client app installed

Client app provides input field

Script taps the IME interface by ADB, while client app records the input

Coordinate of each character is found

Typing test , provides multiple test modes

Analyze network traffic

Test modes

Scenario 1: Sending all user input

Determine when the attacker sends back all user input under 3 typing frequencies.

- Normal typing
- Not typing
- Typing in fixed frequency

Scenario 2: Sending sensitive data only

Determine whether the attacker detects and sends back user input when sensitive words are typed. There are two kinds of sensitive words, thus two test modes.

- Typing with keywords
- Typing in specific InputTypes