TU Graz

SCIENCE
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AndroGUARD: Implementing fingerprinting mitigation on Android

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Outline

1. Motivation
2. Fingerprinting
3. Main Question
4. Background on existing work
5. Our Approach
6. Deployment
7. Validation

Motivation

How does Fingerprinting work

- Extract information about the system
- Analyse extracted information
- Combine unique values into a unique identifier

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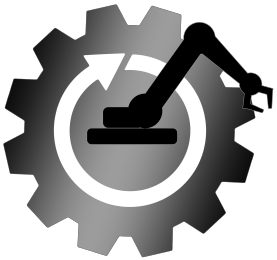
Fingerprinting Sensors

- Builtin Error
- Is consistent over the lifetime of the sensor
- Hardware can be uniquely identified



Fingerprinting Sensors

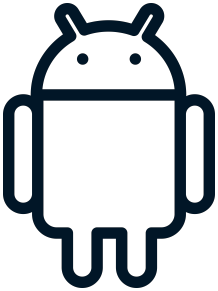
- Records multiple measurements
- Calculates the deviation from expected values

Main Question

How to protect against fingerprinting

Existing Methods

- Access Control



Related Works

- Many papers are looking into exploiting sensor fingerprinting
- Do not implement a solution for the Android API

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Proposed Solutions

- Recalibrate the sensors to be perfect
  - Gets rid of the error
  - Can not be done easily

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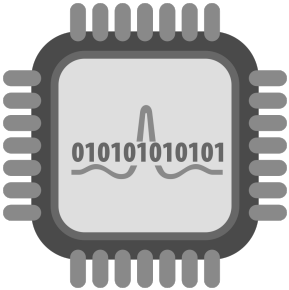
- Add noise to conceal the calibration errors
  - Apply a random offset and gain to each measurement
  - Can be done without any user interaction

Protecting Sensors

- Mask builtin error by added noise
- Use the A2P2 framework for deployment



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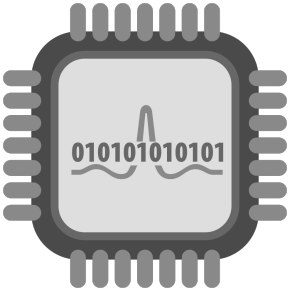

Implementation

- Intercept the original method
- Apply appropriate random noise
- Return obstructed sensor data to original method

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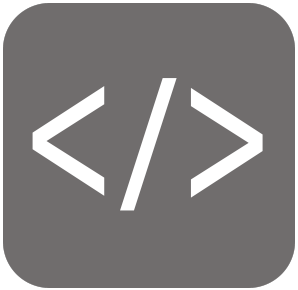
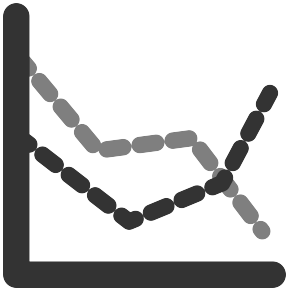
A2P2

- Incorporates the patch into a valid APK
- Intercepts the original function calls
- Executes the patch



Validation

- Comparing values before and after the patch
- Could not be done sufficiently due to limited access to supported hardware



Conclusion

- Masking the sensor values decreases fingerprintability
- Modifying the SensorEventListener makes it easy to incorporate the patch into the Android API