Towards Privacy-Preserving Mobile Apps: A Balancing Act

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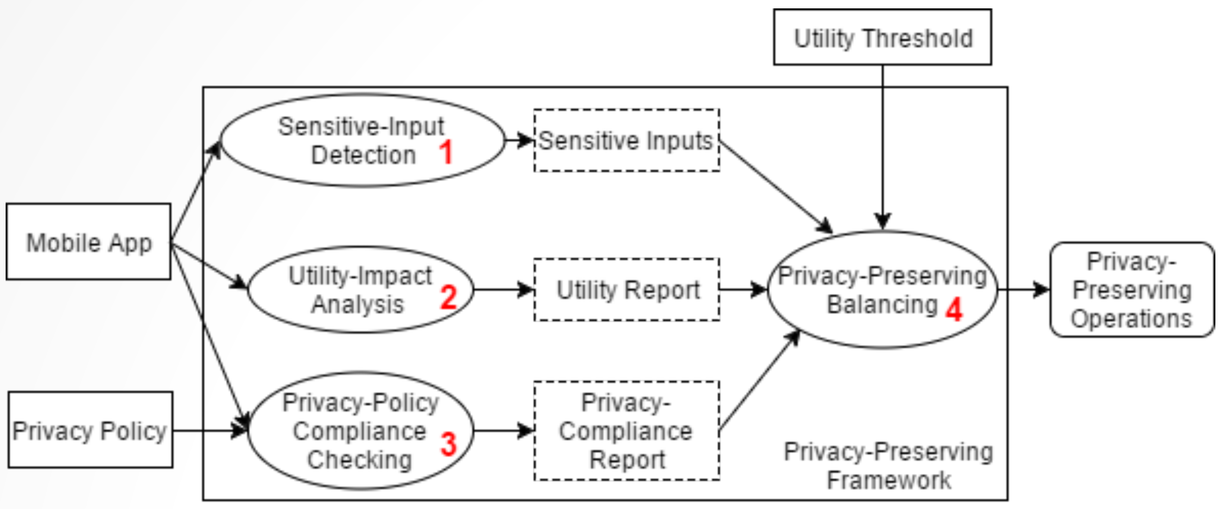
Objective

- Maximize utilities while minimizing the amount of sensitive information exposed to protect users' app usage data



Proposed framework

1.Sensitive-Input Detection

- Leverage UI rendering, geometrical layout analysis, and NLP to identify sensitive input fields
- Leverages static data flow analysis to detect sensitive information (such as a GPS location) obtained from the system

2.Utility-Impact Analysis

- Anonymize each input, and measure its impact on the utilities of an app and produce an utility report
- Provide measurement to show how each input contributes to an app's utilities

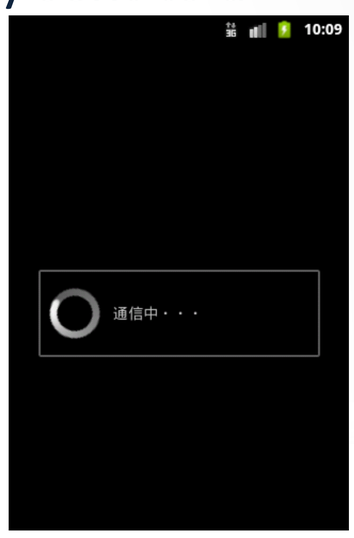
4.Privacy-Preserving Balancing

- Anonymize various sensitive information while assuring that the level of utility efficacy is above a user-predefined threshold

Motivation

- Collecting some highly sensitive information provides little or no benefit towards delivering an app's utilities
- Existing techniques lack customized solutions to preserve user privacy at different levels while delivering user-desirable level of utility efficacy (e.g., the number of enabled features)

Example – App displays videos only if some sensitive information is previously sent to a remote server [1]



3.Privacy-Policy Compliance Checking

- Check whether the sensitive information collected by an app is privacy preserving against the declared privacy policy
- Conduct static data flow analysis on the app and its backend server to generate a usage summary of the obtained sensitive information
- Leverage NLP to annotate declared privacy policy to extract key features related to sensitive-information usage
- Check generated usage summary with extracted key features for inconsistencies

[1] Android Malware Promises Video While Stealing Contacts: https://securingtomorrow.mcafee.com/mcafee-labs/android-malware-promises-video-while-stealing-contacts/

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