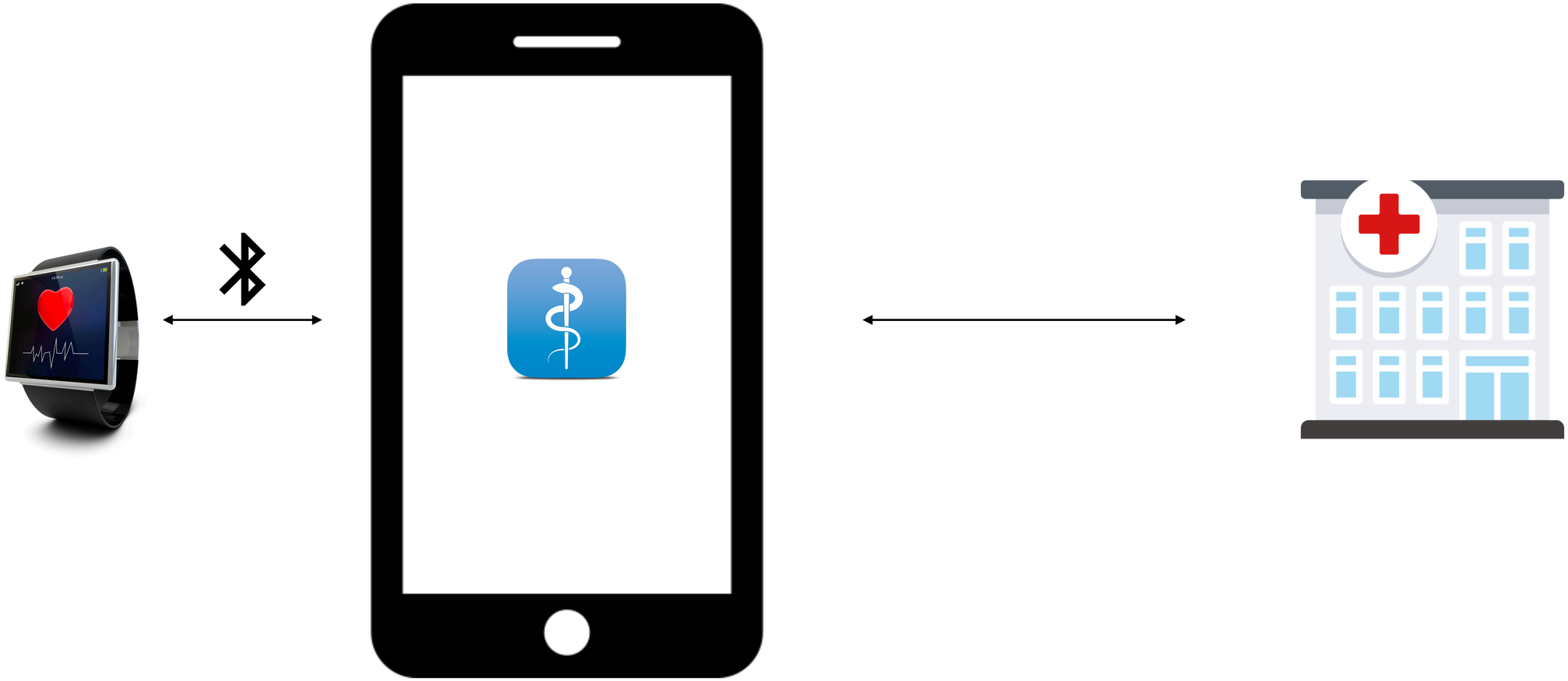
HideMyApp: Hiding the Presence of Sensitive Apps on Android

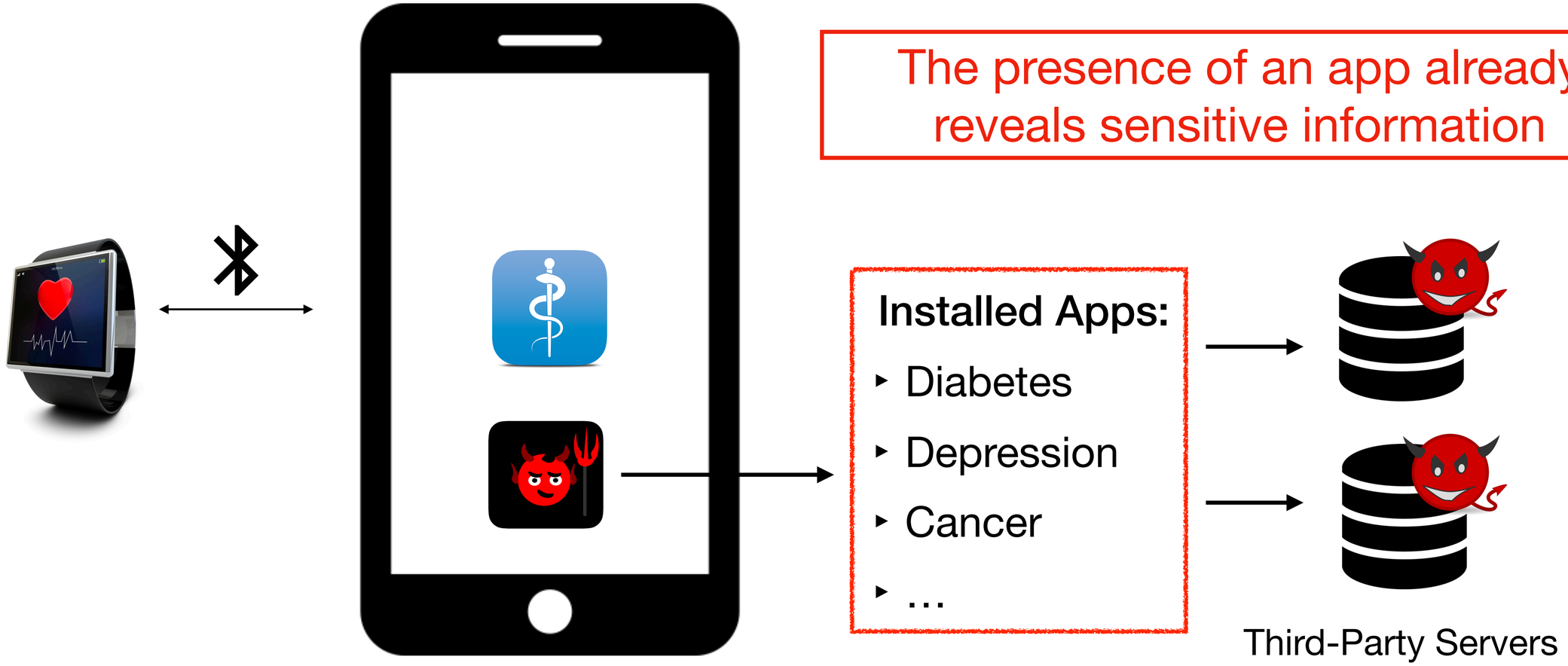
Anh Pham[1,2], Italo Dacosta[1], Eleonora Losiouk[3], John Stephan[1], Kévin Huguenin[4], Jean-Pierre Hubaux[1]

[1]EPFL
[2]ABB Switzerland
[3]Uni. of Padova
[4]Uni. of Lausanne

Mobile Health (mHealth)



Privacy Threat: Apps Fingerprinting Other Apps



Research Questions

Fingerprintability of apps

Apps' interest in fingerprinting other apps

Our solution (HideMyApp)

Fingerprintability of Apps

Java API Framework 

w/o Permissions

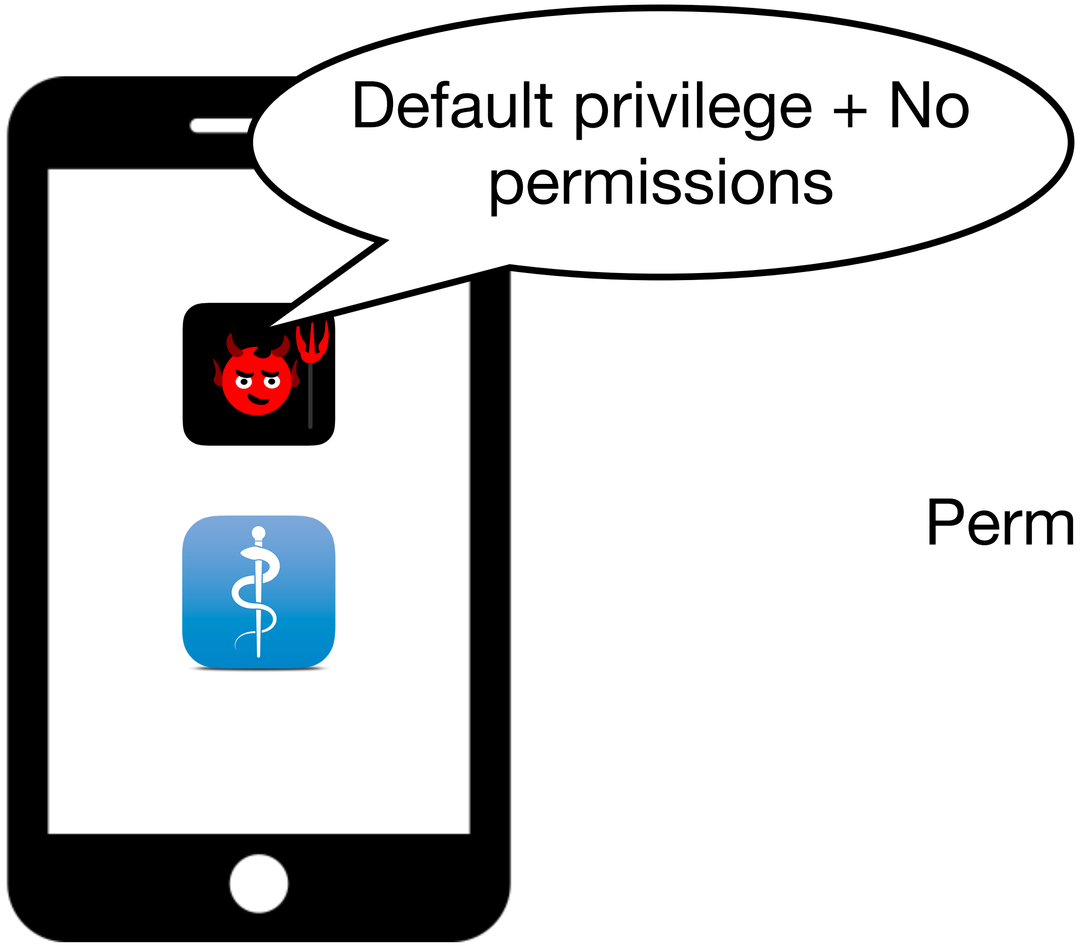
w/ Permissions

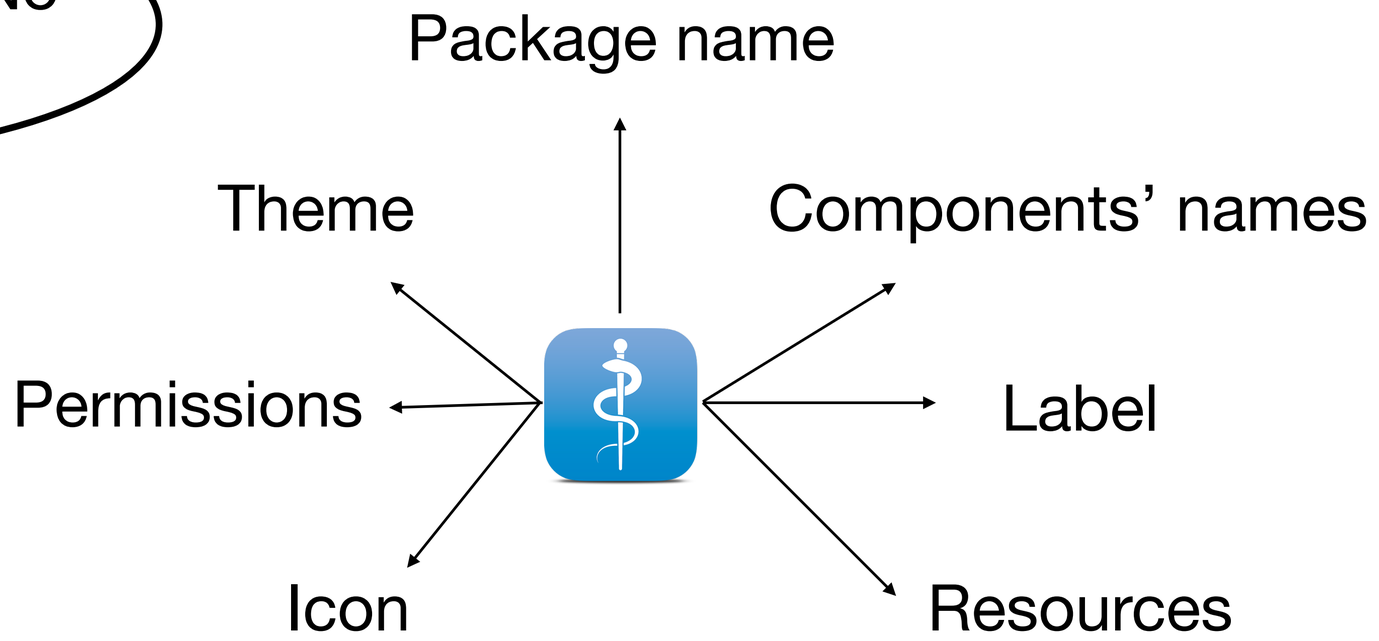
Linux-Layer Interface 

w/ Default Privilege

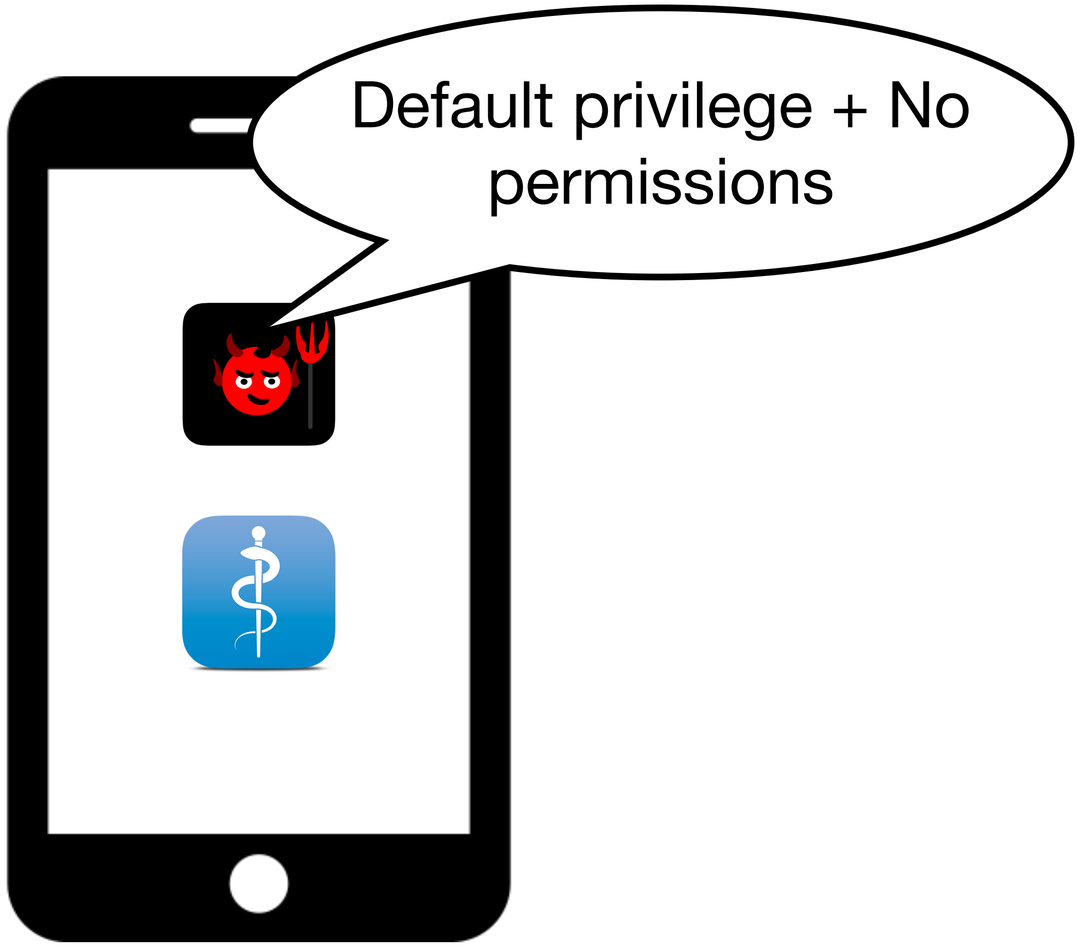
w/ Debugging Privilege

Fingerprintability of Apps





Fingerprintability of Apps



Package name

- To retrieve the list of installed apps:
  - getInstalledApplications()
  - getInstalledPackages()
- To check if a specific app is installed:
  - getResourcesForApplication()
  - getPackageInfo()
  - ....

Removing methods or adding permissions is complicated.

Apps Inquiring about Other Apps

- Analysis on 2917 popular APKs from Google Play
- Static and dynamic analysis

- 19.2% to 57% of apps query for the list of installed apps
- Most requests come from third-party libs
- Free apps query for the list of installed apps more than paid apps

Apps want to fingerprint other apps and millions of users are affected.

Apps' Compliance w/ Privacy Guidelines

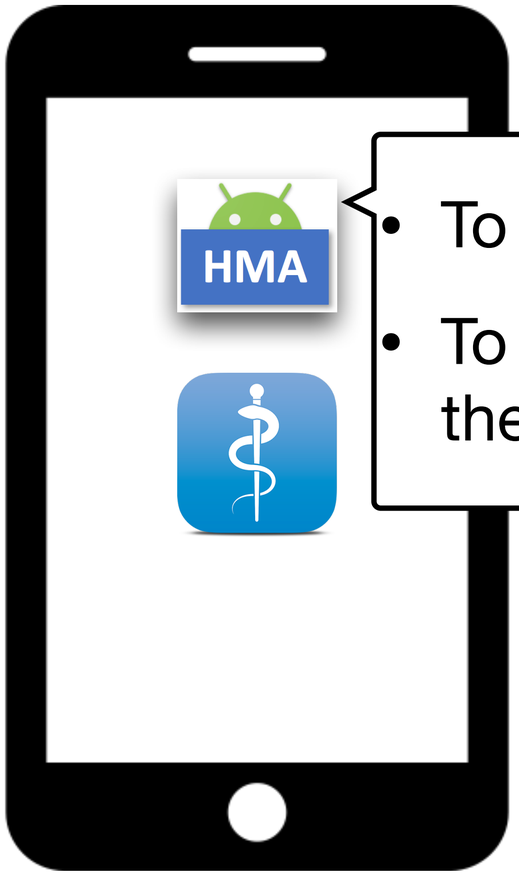
From Google privacy guidelines:

- A list of installed apps (LIA) is sensitive
- Apps collecting LIA w/o users' consent are classified as Mobile Unwanted Software

- From 2917 APKs, collected 2499 privacy policies
- Only 162 apps inform users about LIA collection
- 76 apps state that LIA is non-sensitive

Lack of effective protection mechanisms

Our Solution: HideMyApp (HMA)

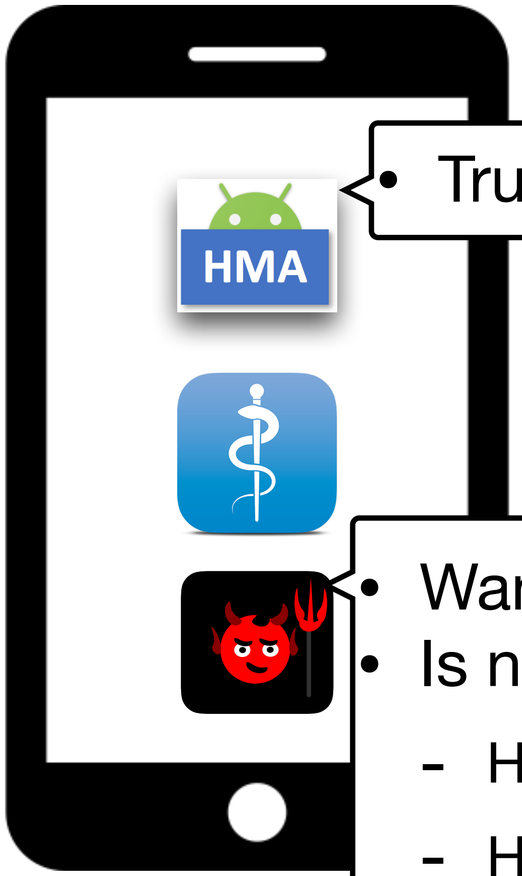


- To (un)install and update apps
- To launch apps installed from the App Store

- To host apps developed by the hospitals

App Store
(controlled by hospitals)

Adversarial Model



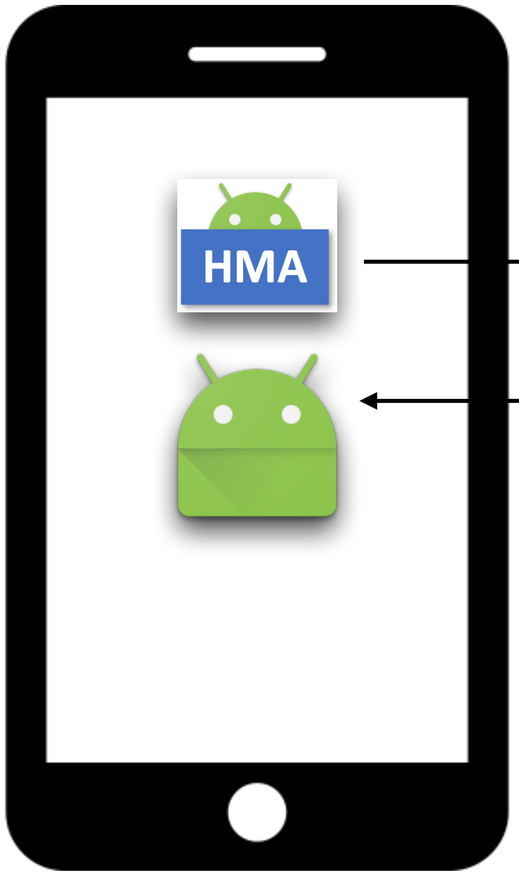
- Trusted and secure

- Wants to learn if a specific app is installed
- Is nosy
  - Has default app privilege
  - Has all dangerous permissions

- Trusted and secure

App Store
(controlled by hospitals)

HMA Overview



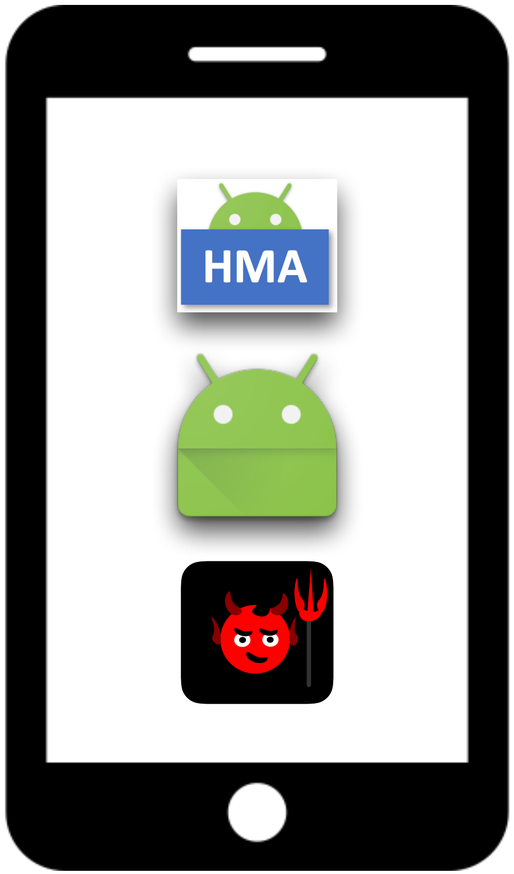
Request to retrieve an mHealth app

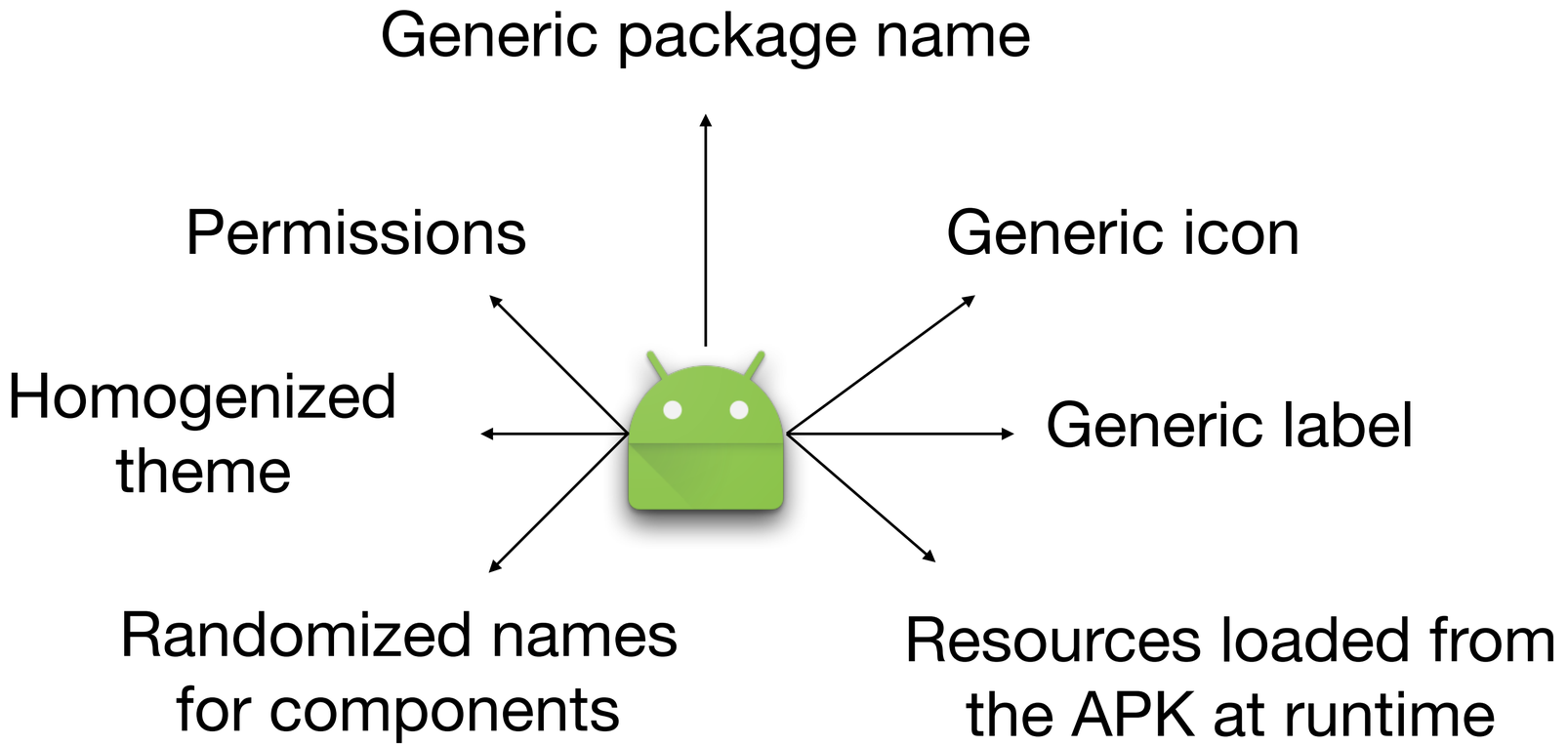
A container app

- Has a generic package name
- Obfuscated
  - Static information
  - Runtime information

App Store
(controlled by hospitals)

Obfuscation: Static Information





Evaluation: Dataset

- 50 mHealth apps from Google Play
- Chosen based on their popularity, sensitivity and functionality
- Examples:

Beurer HealthManager

Cancer.Net Mobile

What's Up? - Mental Health

Evaluation Criteria and Implementation

Compatibility w/ apps

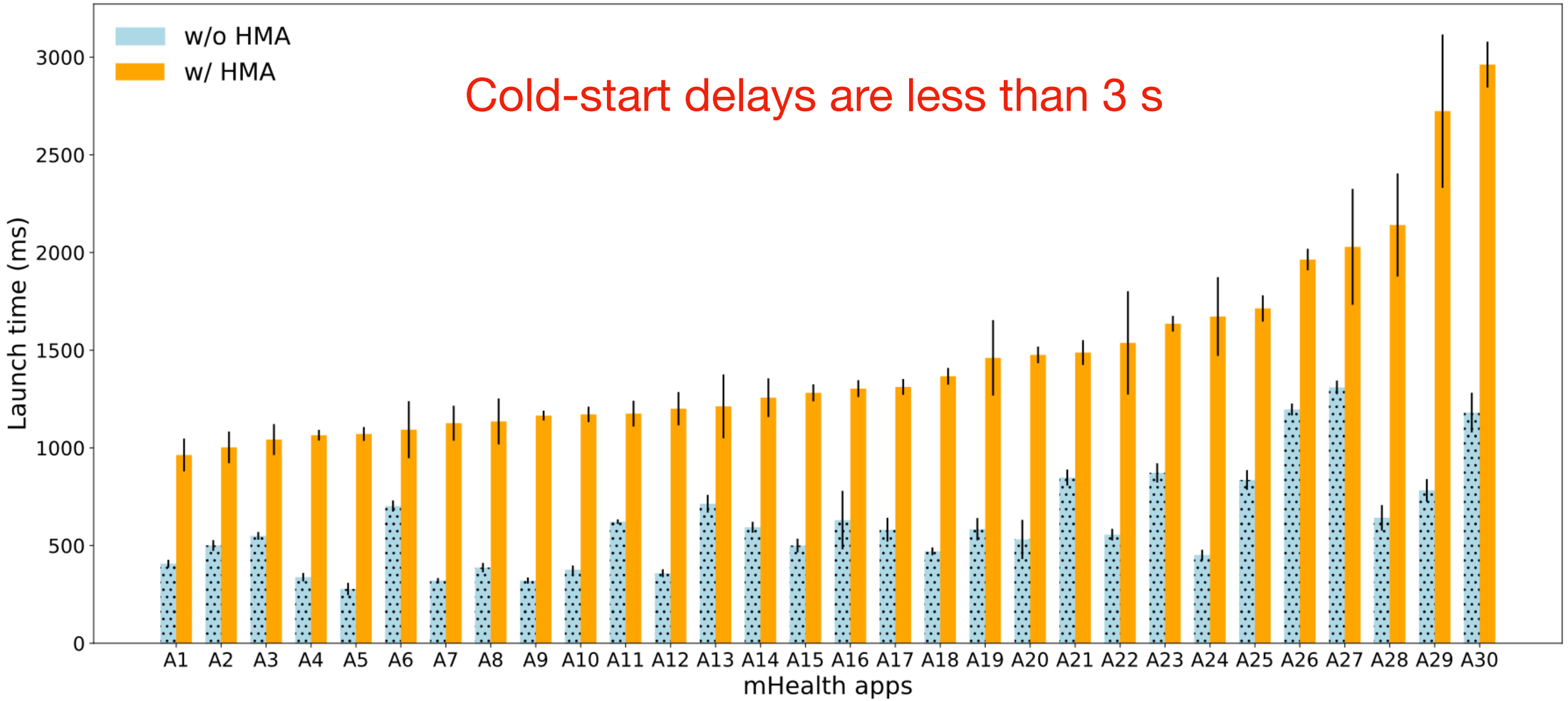
Performance overhead

Usability

- Implementation: [1]
  - HMA App Store
  - Manager App
  - Rely on DroidPlugin library for user-level virtualization [2]

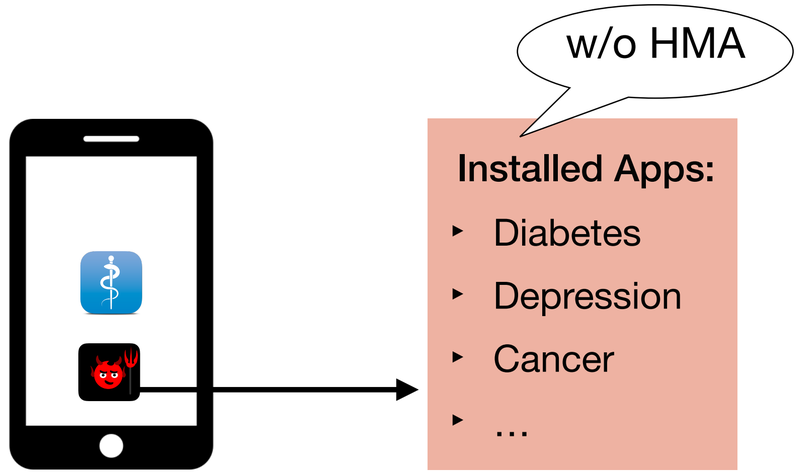
[1] https://hma.epfl.ch
[2] https://github.com/DroidPluginTeam/DroidPlugin

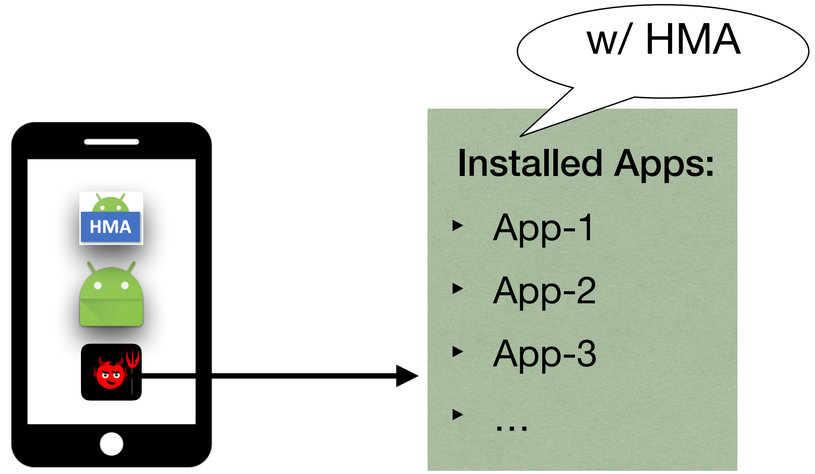
Cold-Start Delays: w/ and w/o HMA



Conclusions

- Apps can and do fingerprint other apps
  - 57% of apps query for the list of apps
- Existing solutions are ineffective
- HMA: the first solution for hiding apps
  - Compatible with existing apps
  - Effective and usable
  - Runs on stock Android devices





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