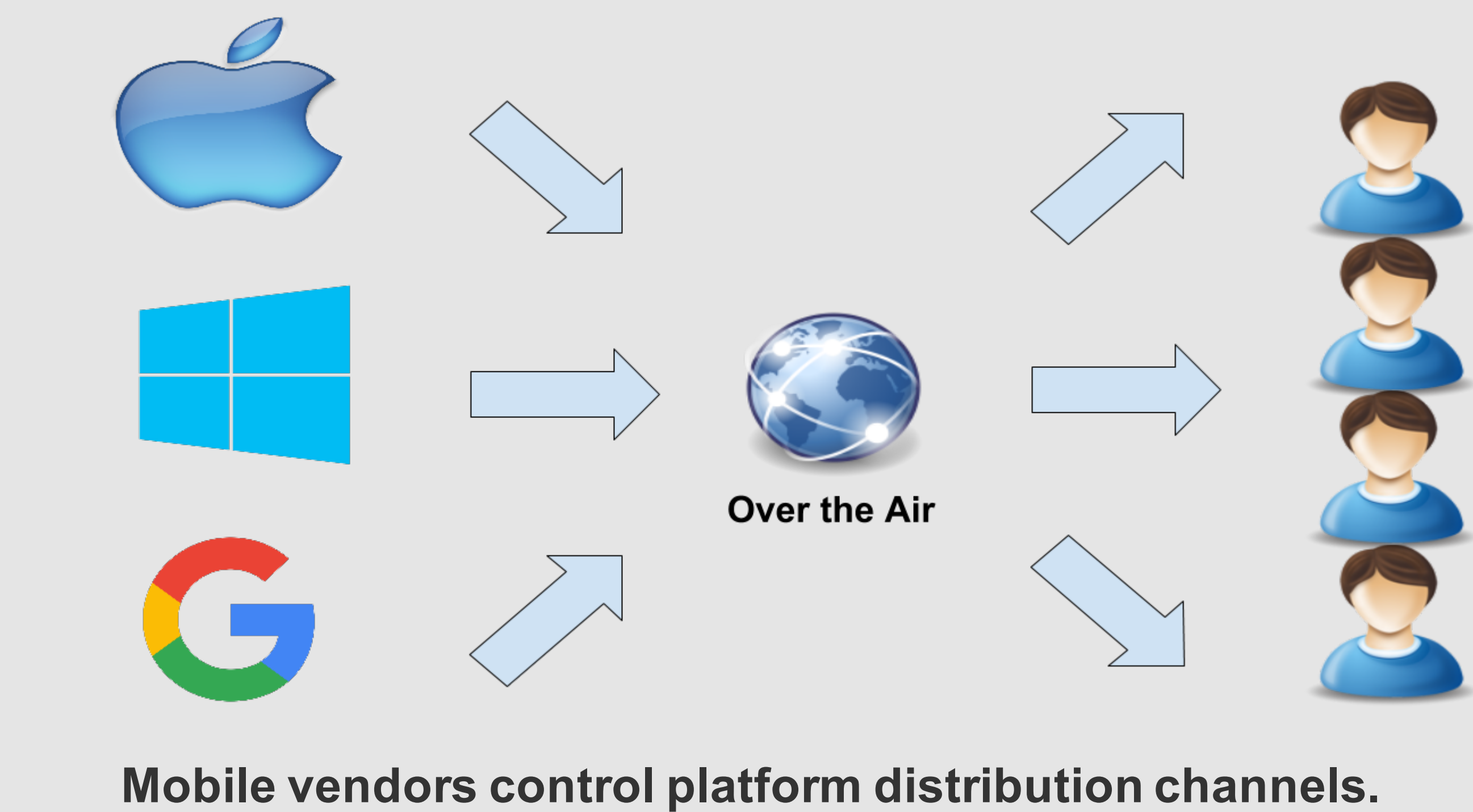


# Realizing API Virtualization on Android

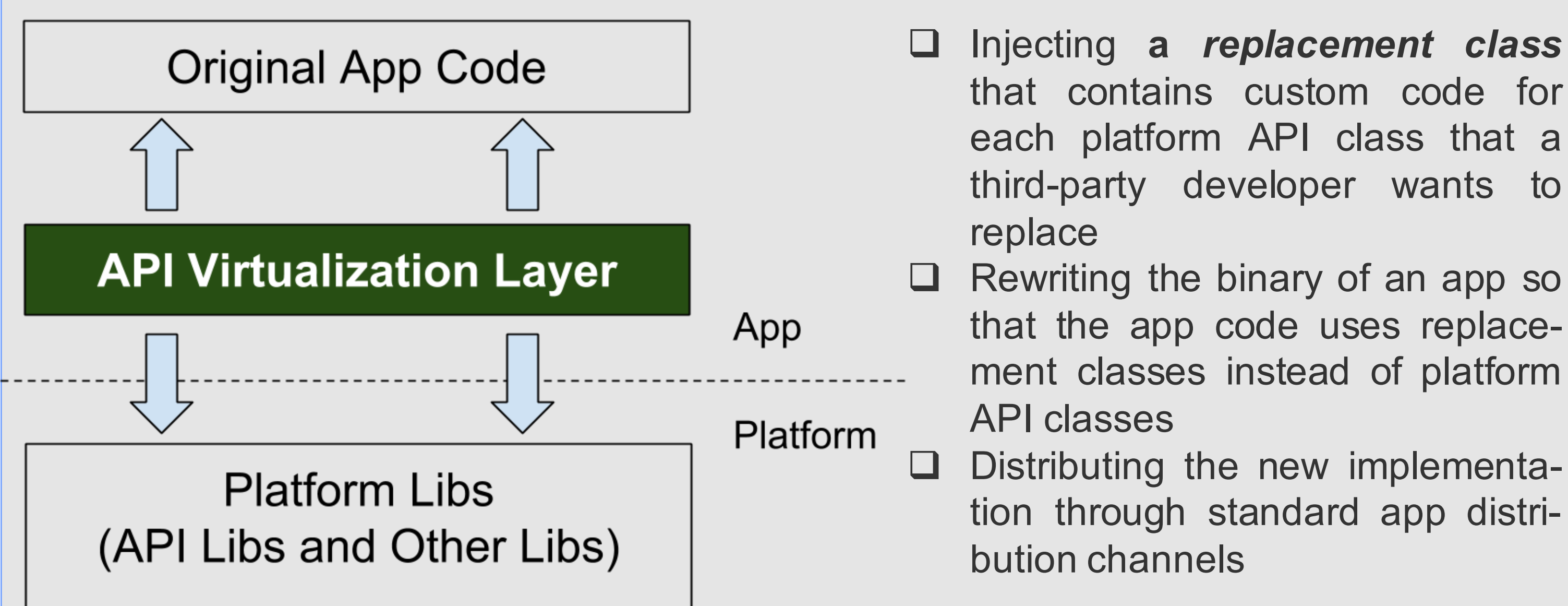
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## I. Motivation



## II. Propose



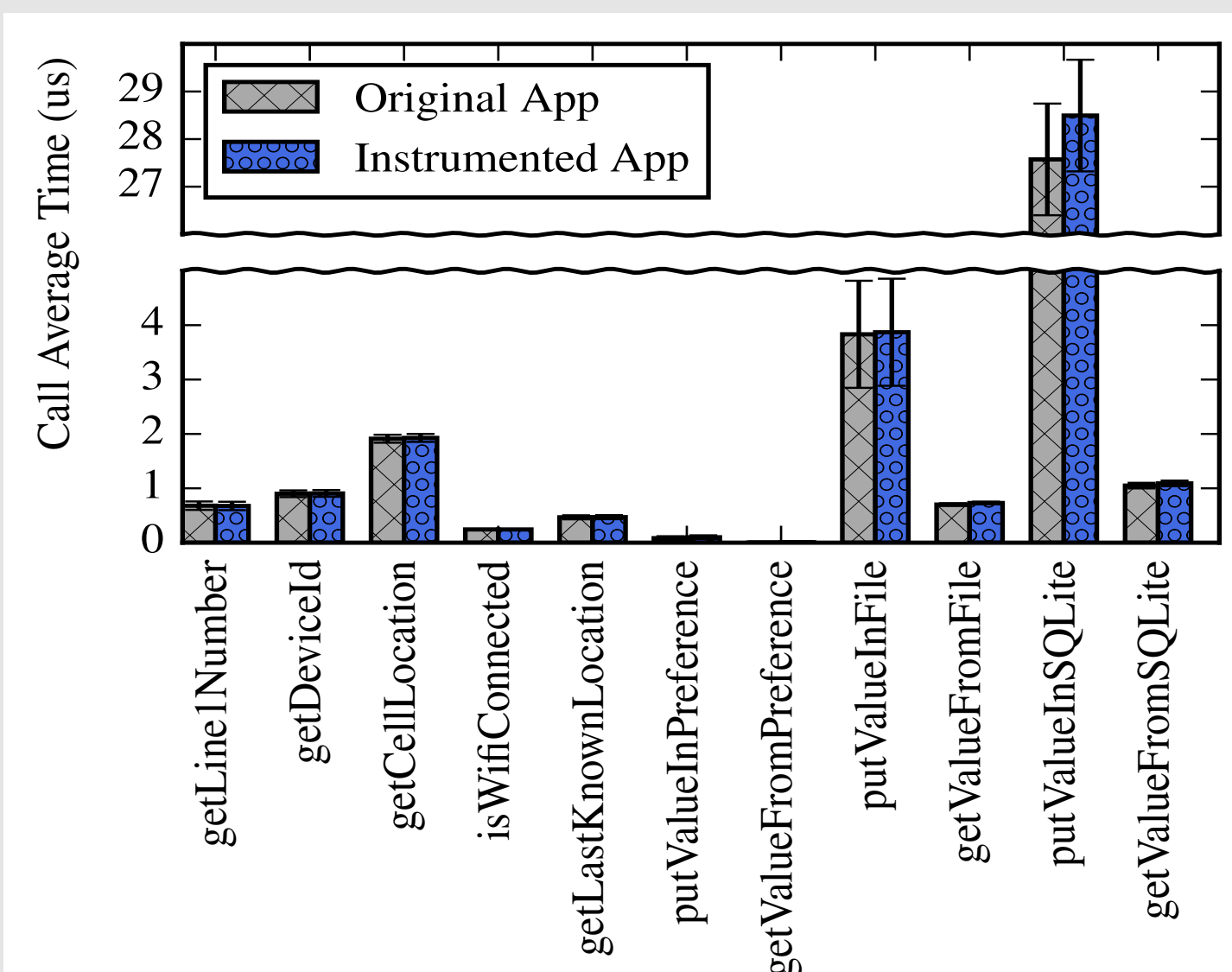
## III. Contribution

- Mitigating the lack of openness in mobile systems by proposing API Virtualization
- Exploring and addressing a unique set of challenges that API Virtualization brings in order to correctly and completely handle all features of Android and Java.
- Realizing API Virtualization prototype, and showing its feasibility and practicality

## IV. Initial Results

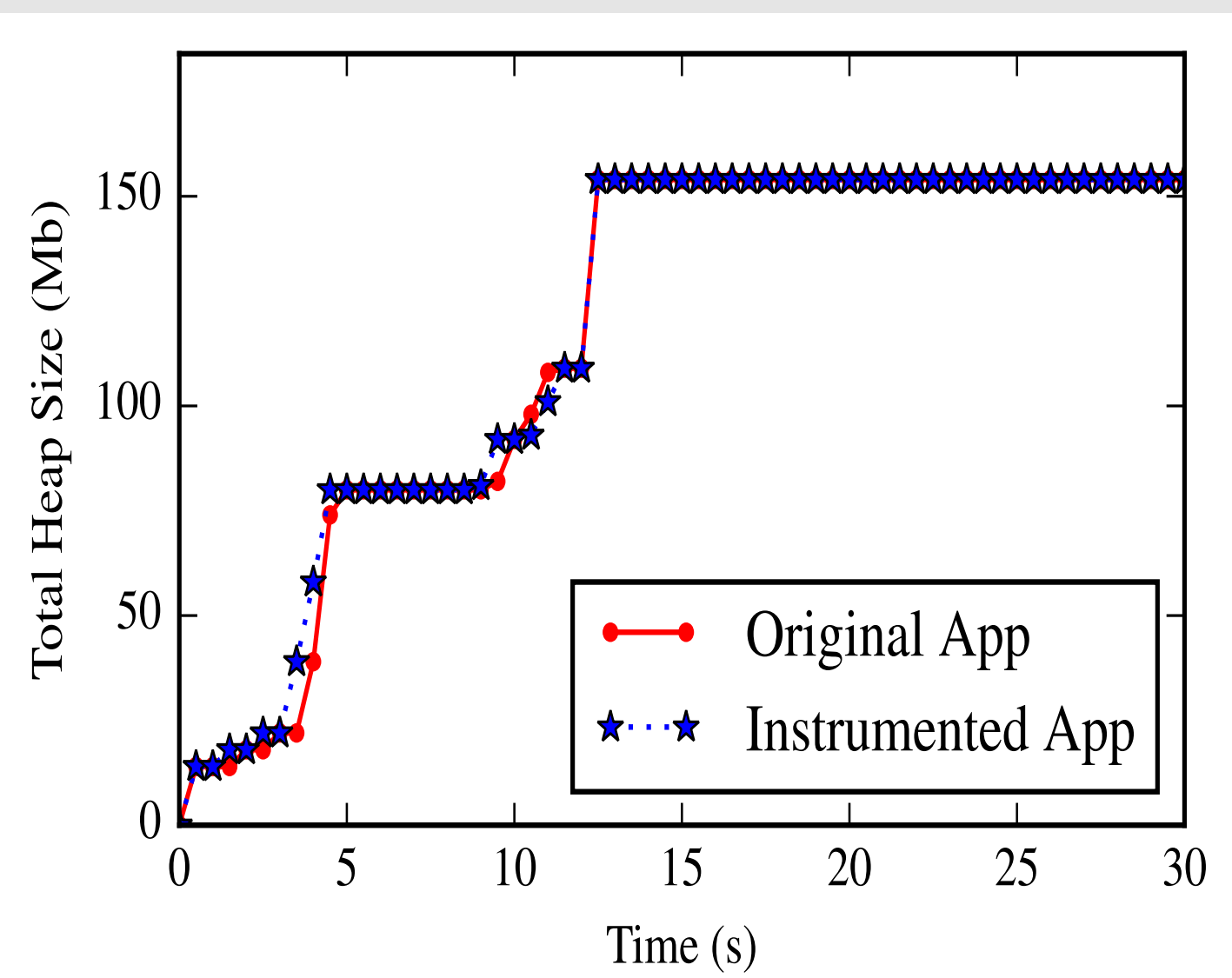
- Samsung Galaxy Nexus Devices running Android 4.4
- Enabling stay-awake mode
- Set CPU governor to "Performance"

Call Latency to Invoke Platform Methods



- To measure call latency, we use a micro-benchmark app that calls eleven platform methods from four categories: device information, network, storage, and sensing (GPS).

Heap Usage of Temple Run



- To measure runtime memory usage, we use one popular game that uses accelerometer and gyroscopes on a mobile phone for game play, and contains a heavy UI component.

Instrumentation Statistics

App Name	#Class	APK Size	Inst. Time
WatchESPN (Sports)	7192	9.7M	N/A
WatchESPN*	9388	11M	133.1 (sec)
The Weather Channel (Weather)	8377	14M	N/A
The Weather Channel *	10724	16M	146.2 (sec)
TempleRun (Game)	1213	23.8M	N/A
TempleRun*	2689	24.7M	26.44 (sec)

Power Consumption Measurement

App Name	Average Consumption (10 minutes / 5 runs)	Std. Deviation
WatchESPN (Sports)	781.5	20.0
WatchESPN*	790.3	17.4
The Weather Channel (Weather)	170.2	13.6
The Weather Channel *	181.4	8.9
TempleRun (Game)	991.5J	29.5J
TempleRun*	992.95J	22.3J

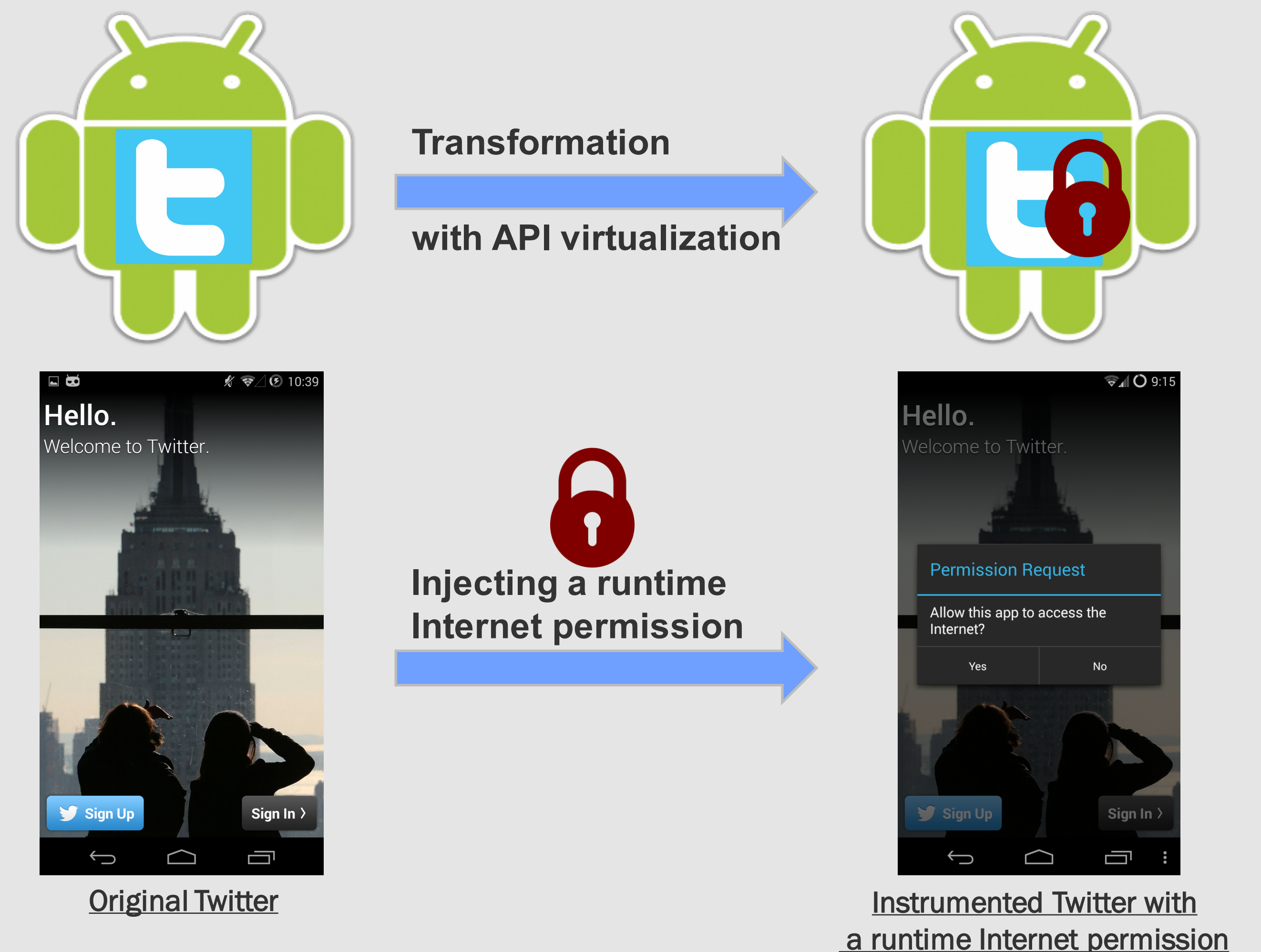
() denotes application category and \* denotes an instrumented app.

## V. Use Cases

### 1. Vendor-Tied Library Switching: Google Maps to Amazon Maps



### 2. Runtime Permissions: Runtime Internet Permission



## VI. Conclusion

**API Virtualization** enables open innovation in Android. Also, it allows third-party developers to inject custom code into an app binary. Through API virtualization prototype on Android, we show the feasibility and practicality of our API virtualization, and the low overhead that API virtualization imposes.