

Building Awareness of Invasive Mobile Applications

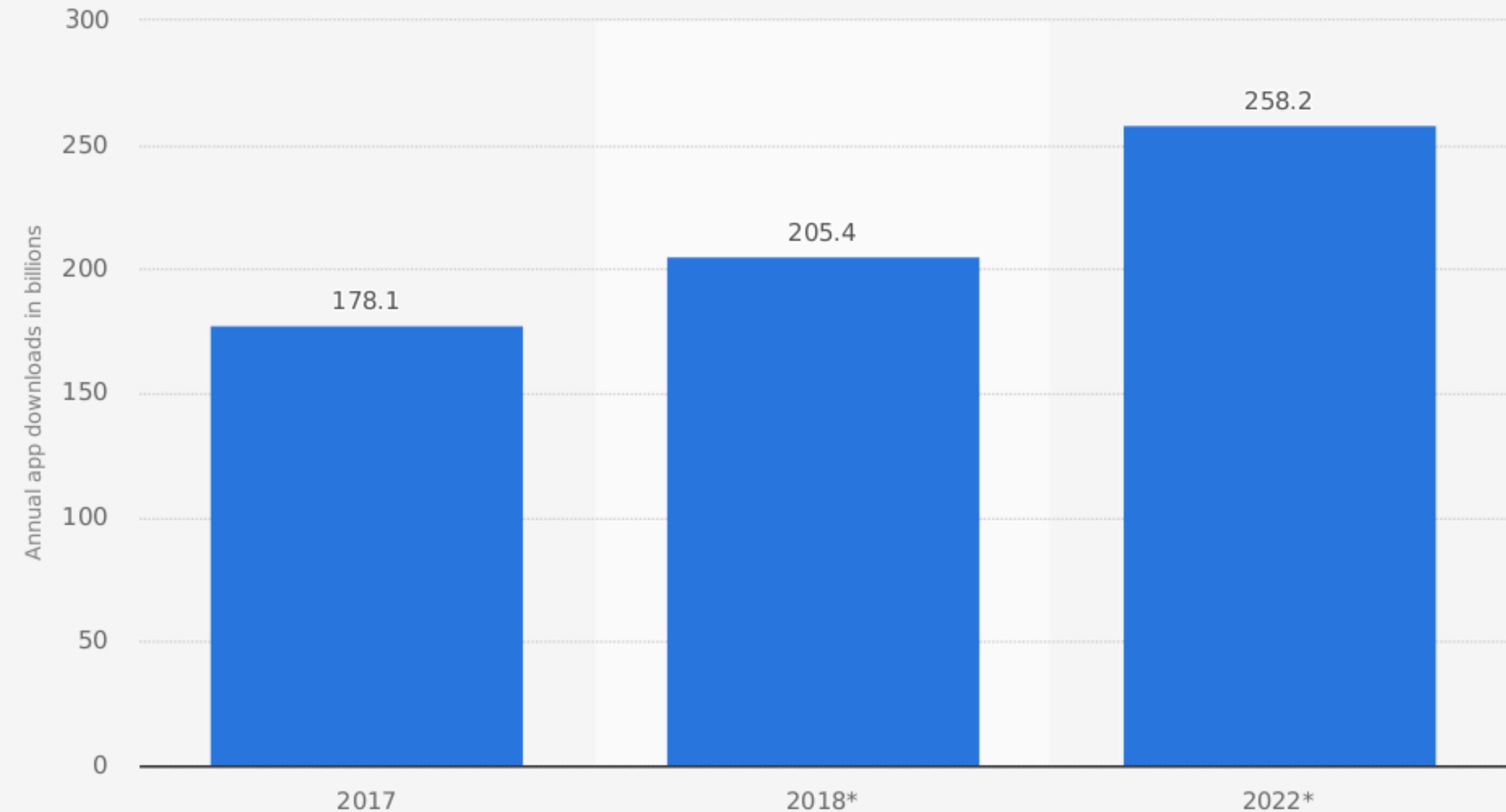
Hilmi Abou-Saleh

CPSC 503 Research Presentation
April 17 2019

How many of you have downloaded an app in the last month?

Over 170 billion applications downloaded in 2017

Number of mobile app downloads worldwide in 2017, 2018 and 2022 (in billions)



Source

App Annie
© Statista 2019

Additional Information:

Worldwide; App Annie; 2017; iOS App Store, Google Play and third-party Android stores combined. Downloads a re-installs and updates are excluded

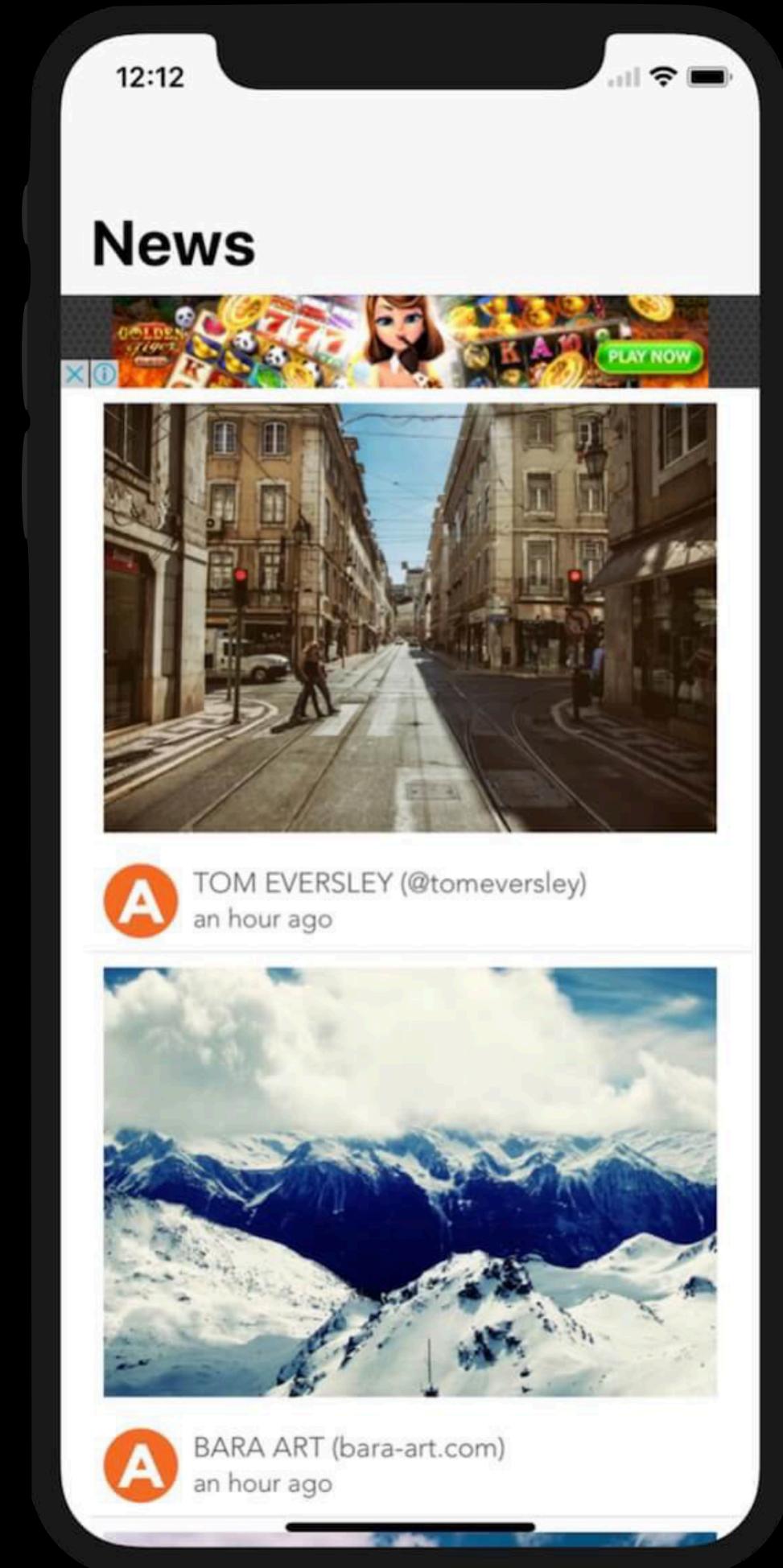
How do these apps make money?

One-time purchases

~~One-time purchases~~

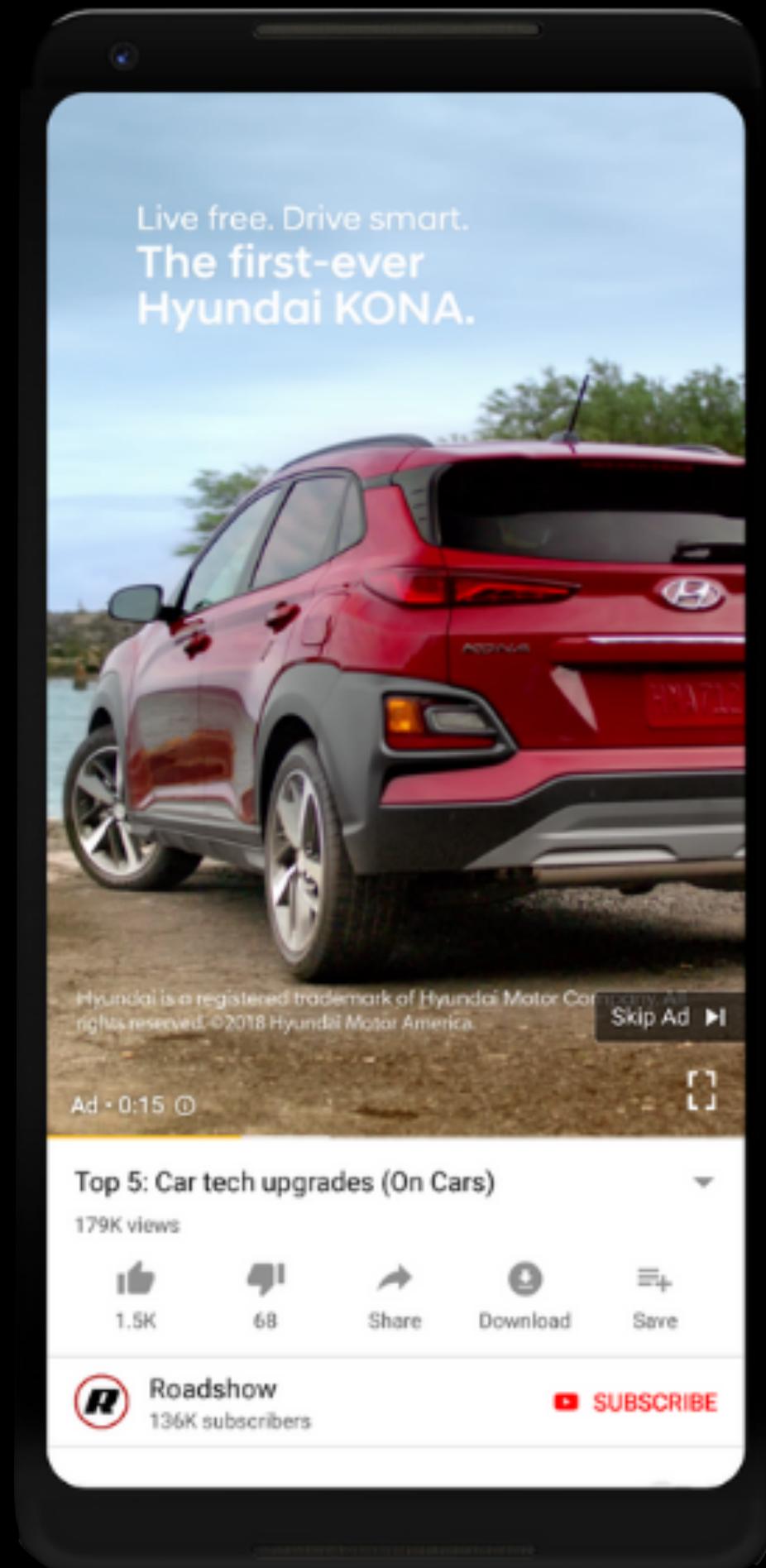
Advertising based revenue

Advertising Based Revenue



Banner Ads

Advertising Based Revenue



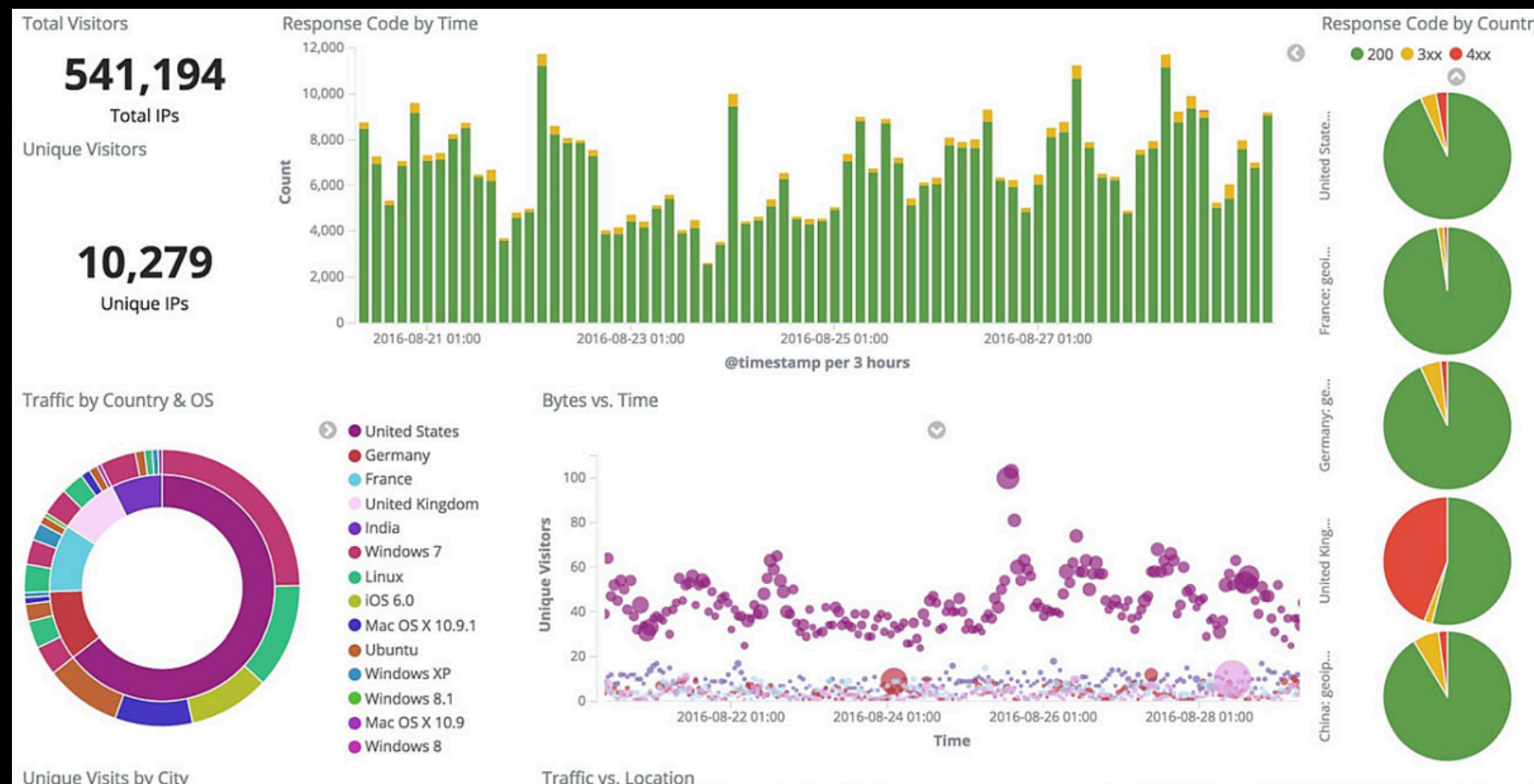
Banner Ads
Full Screen Videos

Advertising Based Revenue

Banner Ads

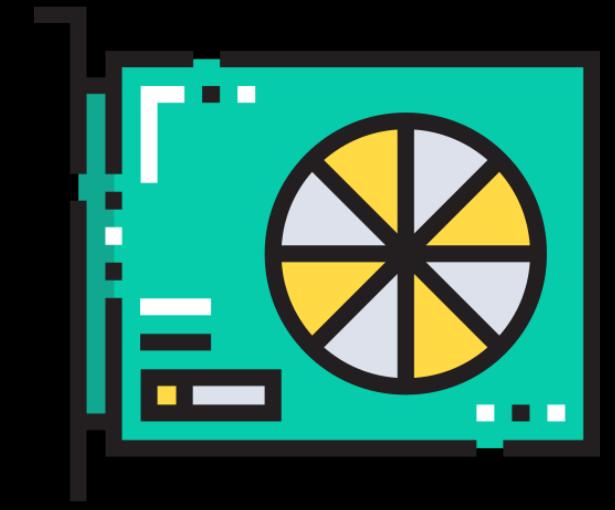
Full Screen Videos

Collect PII



Personally Identifying Information

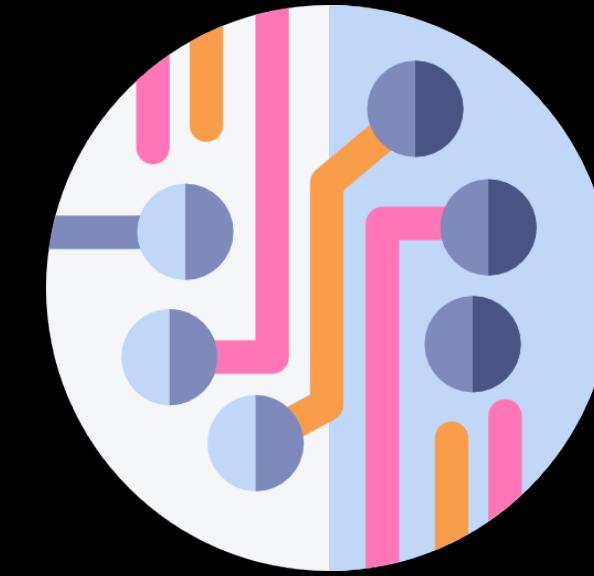
Personally Identifying Information



Hardware

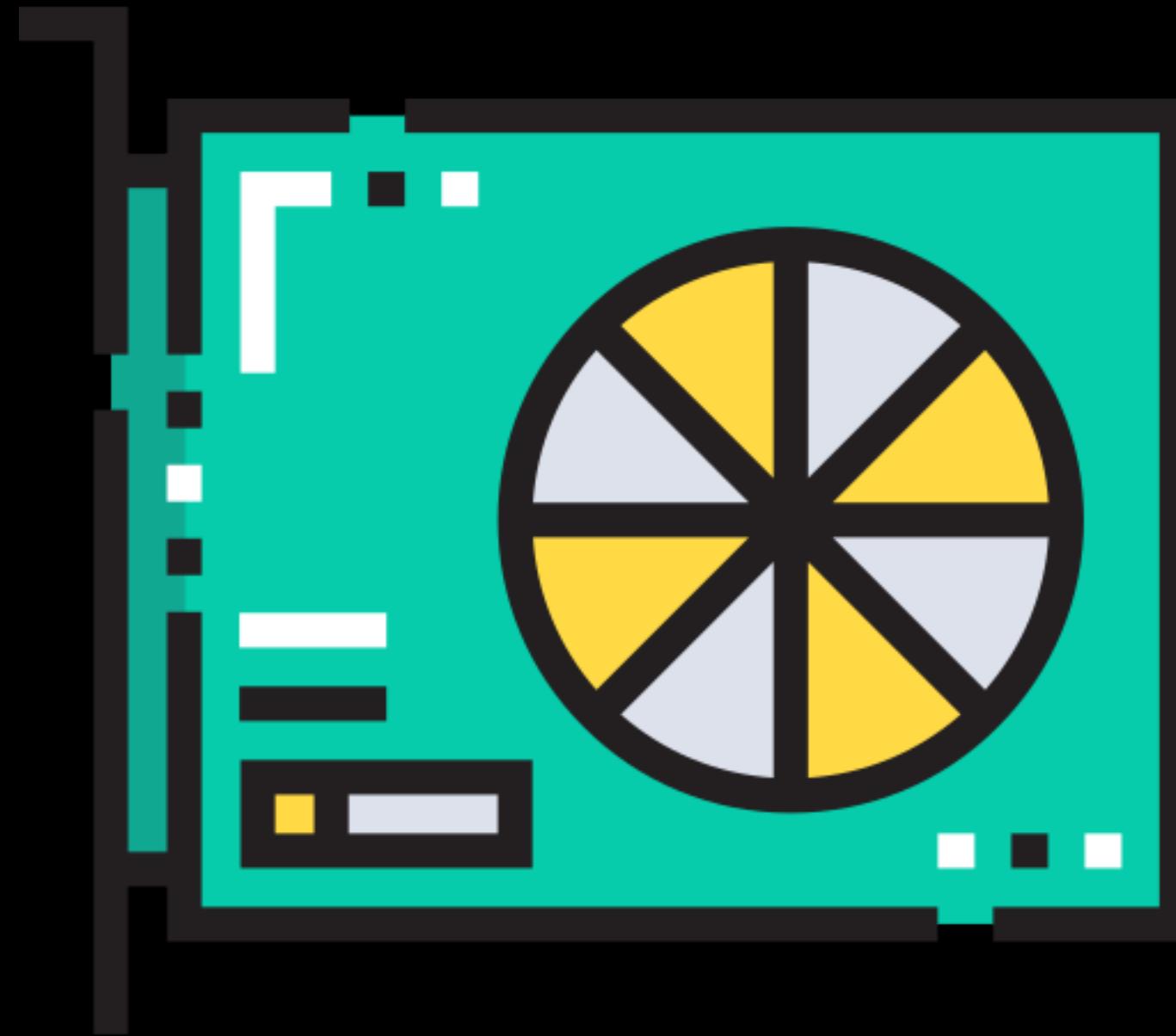


Personal



Sensors

Hardware Identifiers



IMEI

WiFi MAC Address

Serial Number

Personal Information



Phone Number

Email Address

Full Name

Sensors



Location
Microphone
Accelerometer

Why is this important?

“...any data that could potentially identify a specific individual.”

What can we do about it?

Build a tool that educates users

Informed decisions on the applications on their phones

How Ad IDs work

The ads in both Android and iOS apps are supposed to identify the devices the ads run on with temporary identifiers known as Ad IDs (Google) or Advertising Identifier (Apple). These IDs don't actually expire until the user decides to reset them, but at least the user has that option. (On Android, it's Settings > Google > Ads > Reset advertising ID. On iOS, it's Settings > Privacy > Advertising > Reset Advertising Identifier.)

Tom's Guide 2019

If you want to disable location tracking entirely, toggle the “Location Services” setting to off. With location services switched off entirely, you may not be able to use certain services, such as finding yourself on a map.

New York Times 2018

More than one unchangeable identifier



AppCensus



AppCensus AppSearch

Search for Android apps in our analysis database

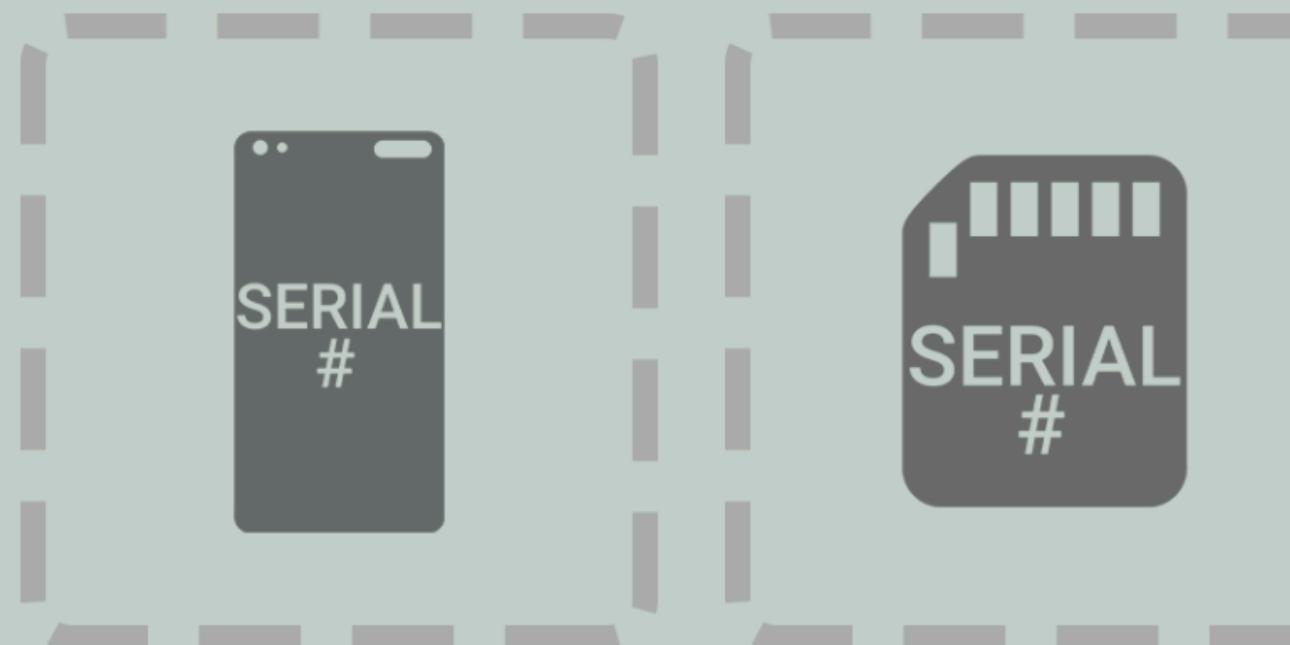
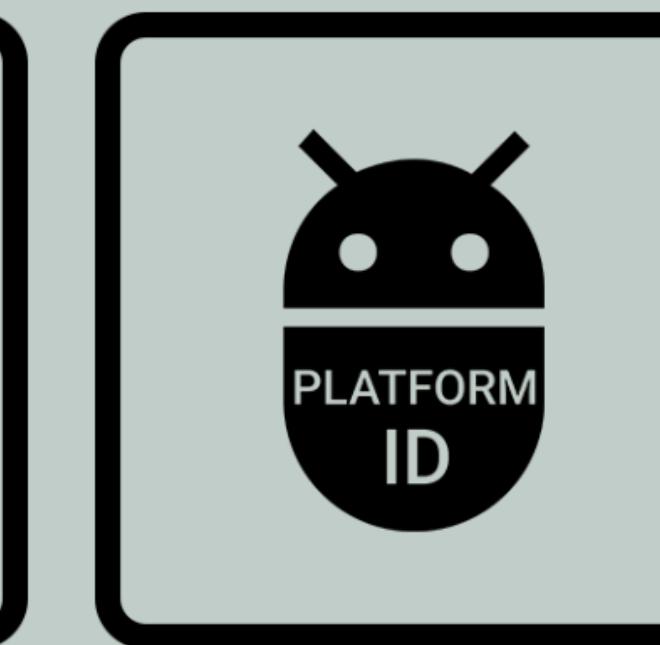


Warning: just because we did not observe a particular data type being transmitted during our limited testing period does not mean that the app definitely will not transmit it when tested under different conditions.

Personal Information



Device Identifiers



Our Solution

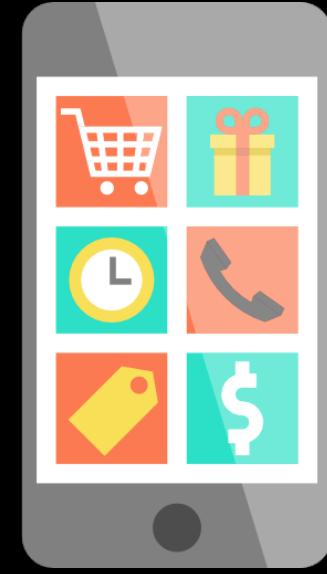
Build an application that educates users

Informed decisions on the applications on their phones

Outline



Evidence



Methodology



Results

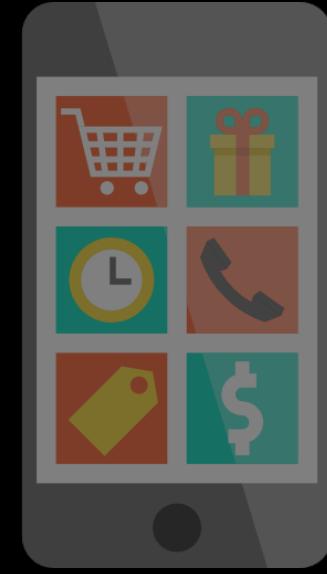


Discussion

Outline



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AppCensus

“Wont somebody think of the children?”

Examining COPPA Compliance at Scale

“...apps that share the resettable ID with advertisers, 66% transmit other, non-resettable, persistent identifiers as well, negating any intended privacy-preserving properties of the advertising ID.”

“these 5,855 apps, 28% accessed sensitive data protected by Android permissions. We also observed that 73% of the tested applications transmitted sensitive data over the Internet.”

“59% will choose to do business with a company over one of its competitors based on good design.”

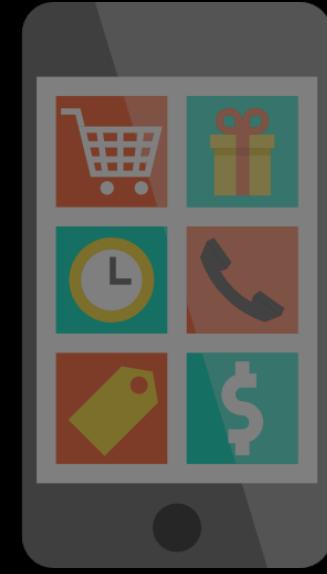
Adobe 2016

What can we do to make the design better?

Outline



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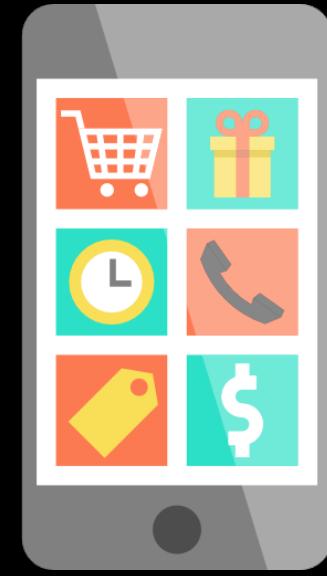


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Discussion

Properties

An easy-to-use interface that allowed users to quickly see the offending apps

The ability to determine offending apps on a per-user basis

A list of information regarding the offending apps

Properties

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Easy-to-use interface

Quickly see the offending apps

Properties

An easy-to-use interface that allowed users to quickly see the offending apps

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Properties

An easy-to-use interface that allowed users to quickly see the offending apps

The ability to determine offending apps on a **per-user** basis

A list of information regarding the offending apps

Based on user's installed apps

Properties

An easy-to-use interface that allowed users to quickly see the offending apps

The ability to determine offending apps on a per-user basis

A list of information regarding the offending apps

Database that contains:

Suggestions similar to the application

The PII transmitted by the application

Website is **not** feasible

Properties

An easy-to-use interface that allowed users to quickly see the offending apps

The ability to determine offending apps on a **per-user** basis

A list of information regarding the offending apps

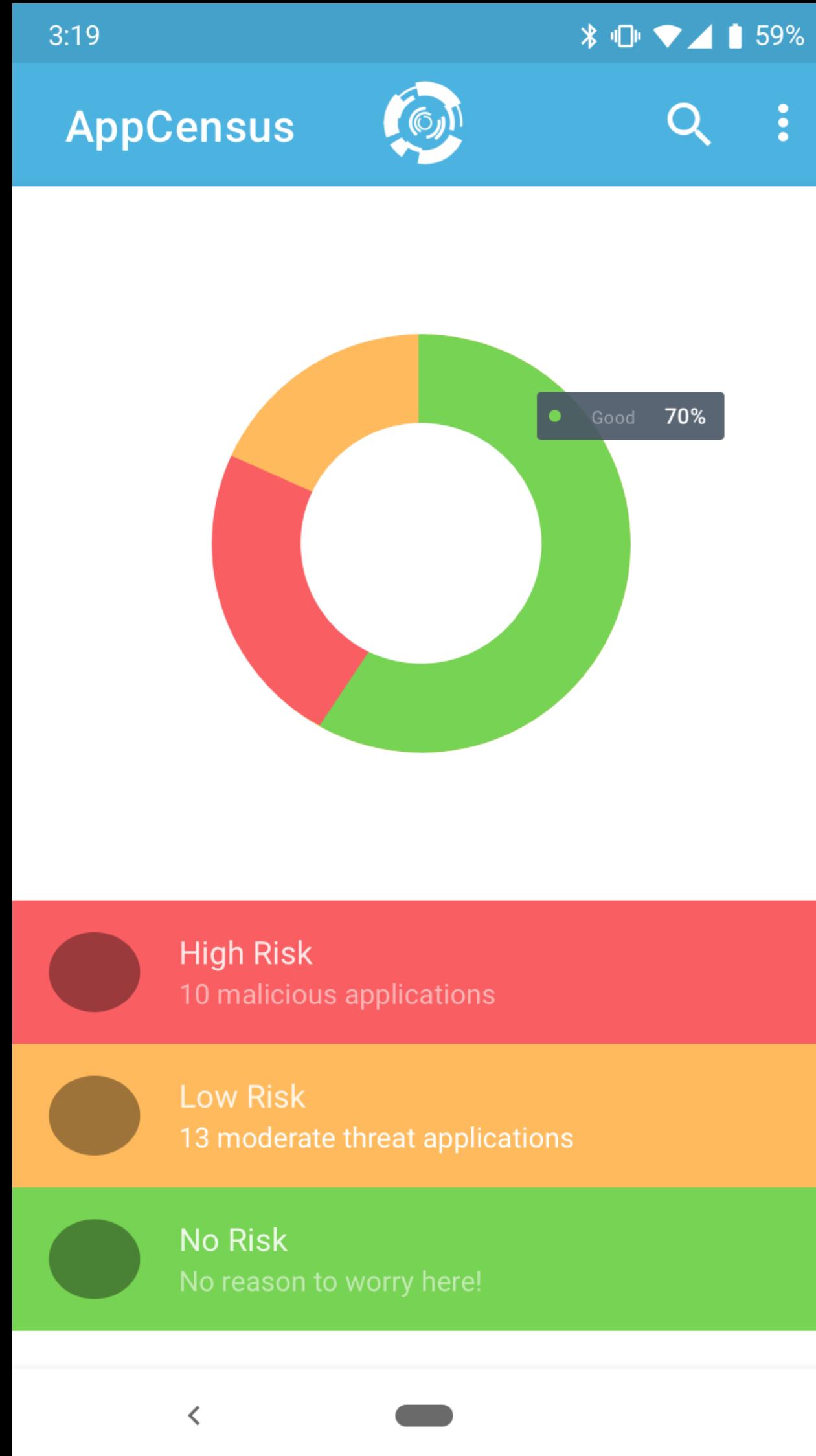
iOS is **not** feasible

Android as our target



Sketch

Prototyping

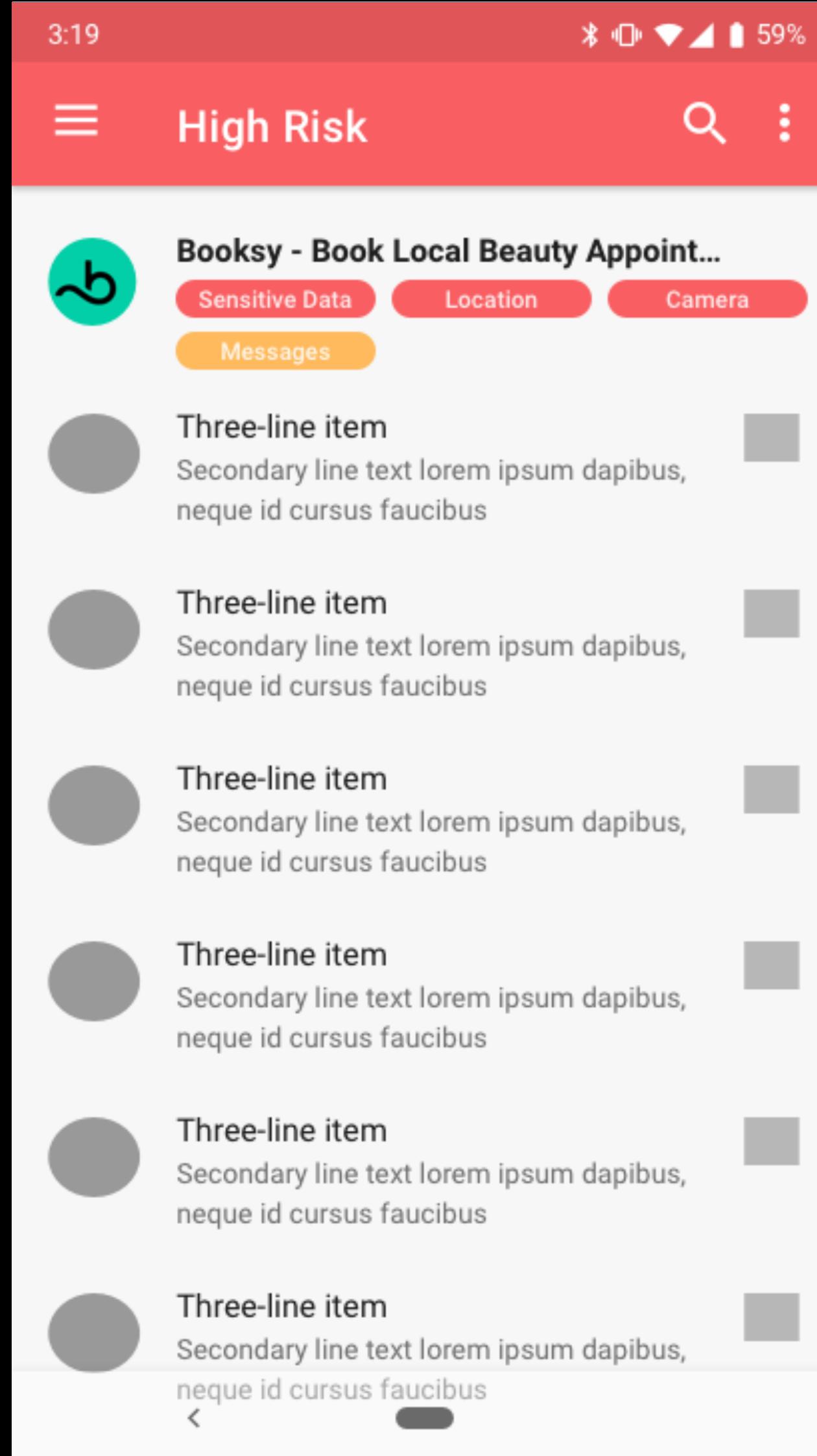


Aesthetic design

List of all apps installed

Using Google's Material Design Guidelines

Prototyping

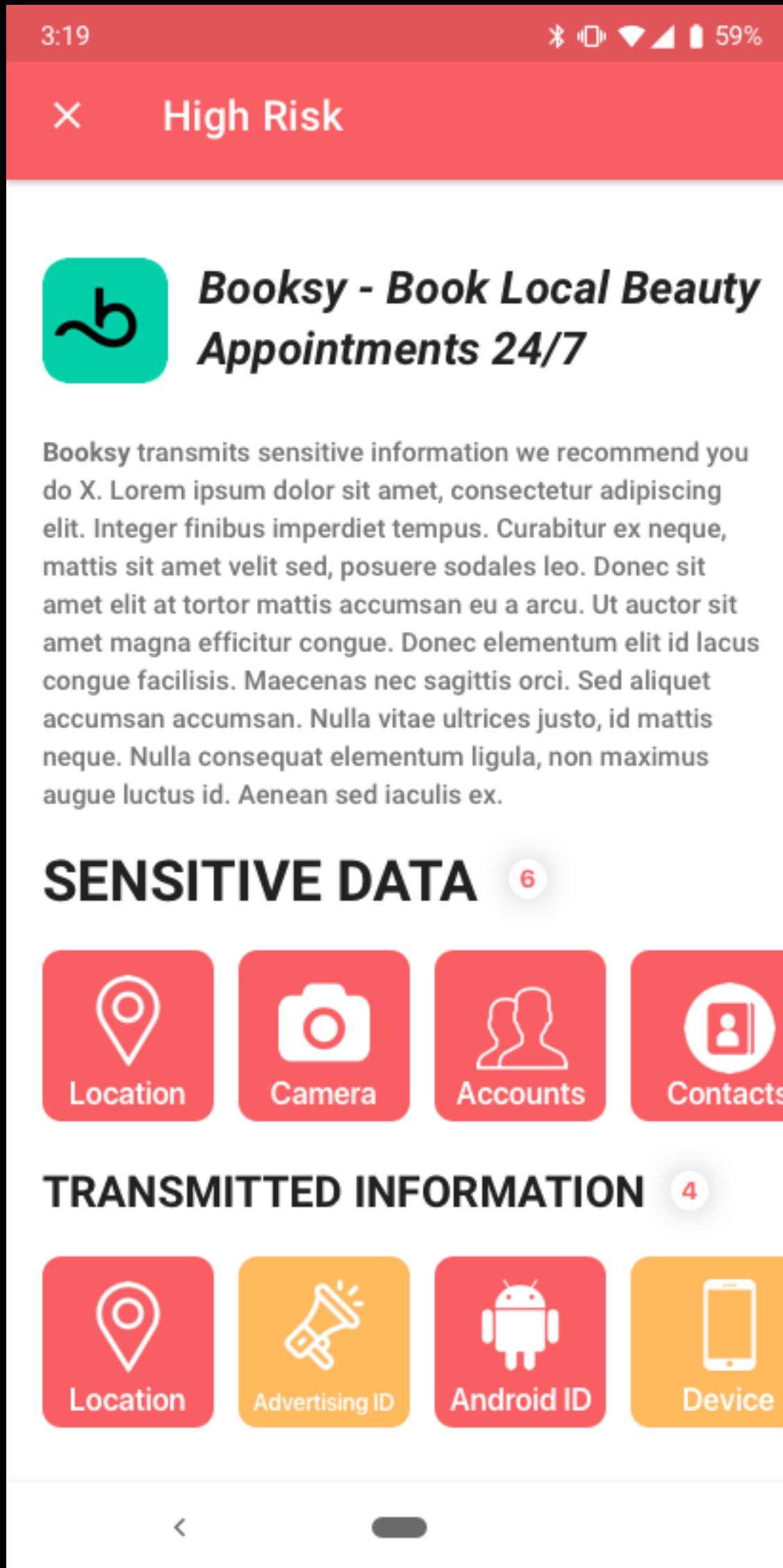


Aesthetic design

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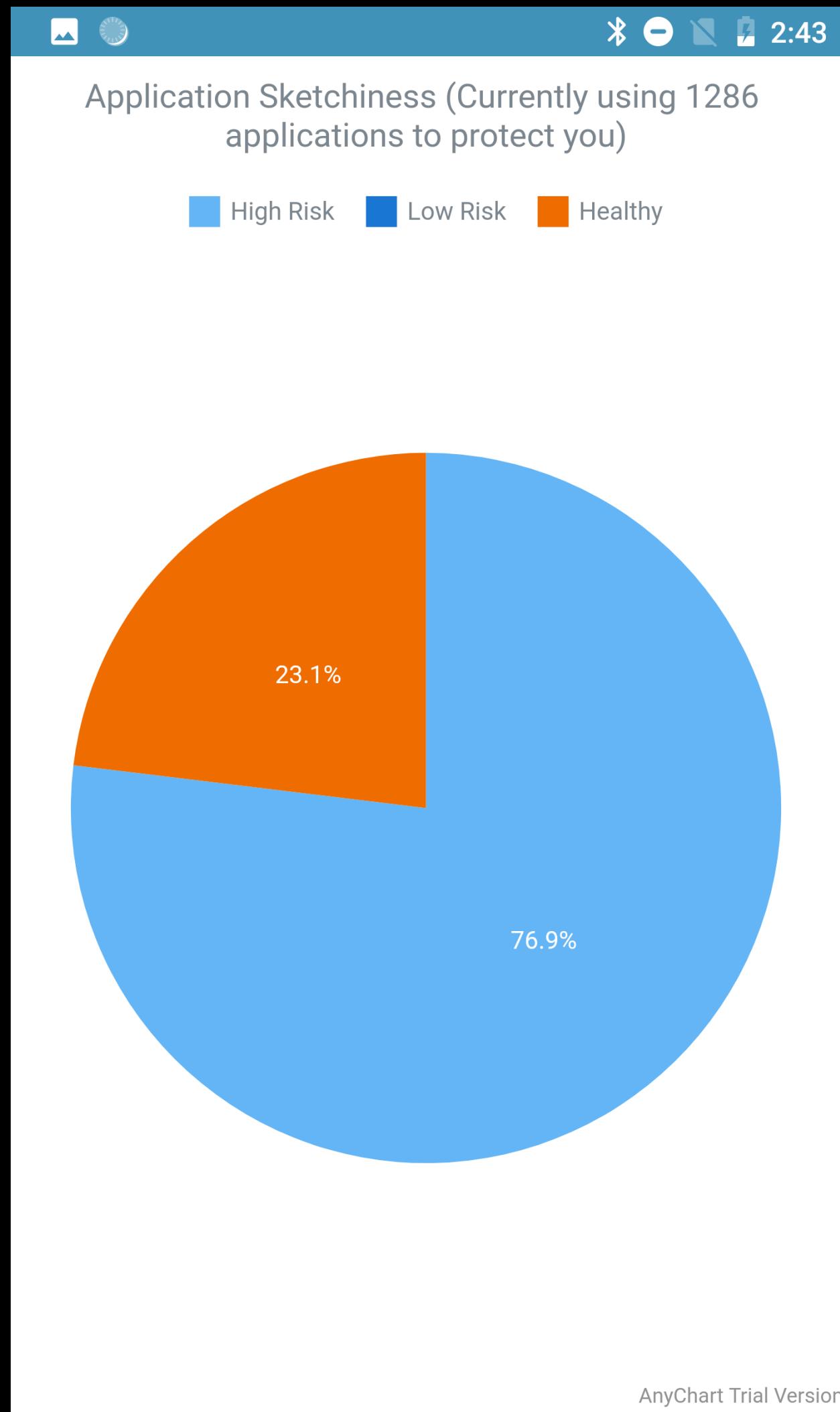
Aesthetic design

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Using Google's Material Design Guidelines



Implementation

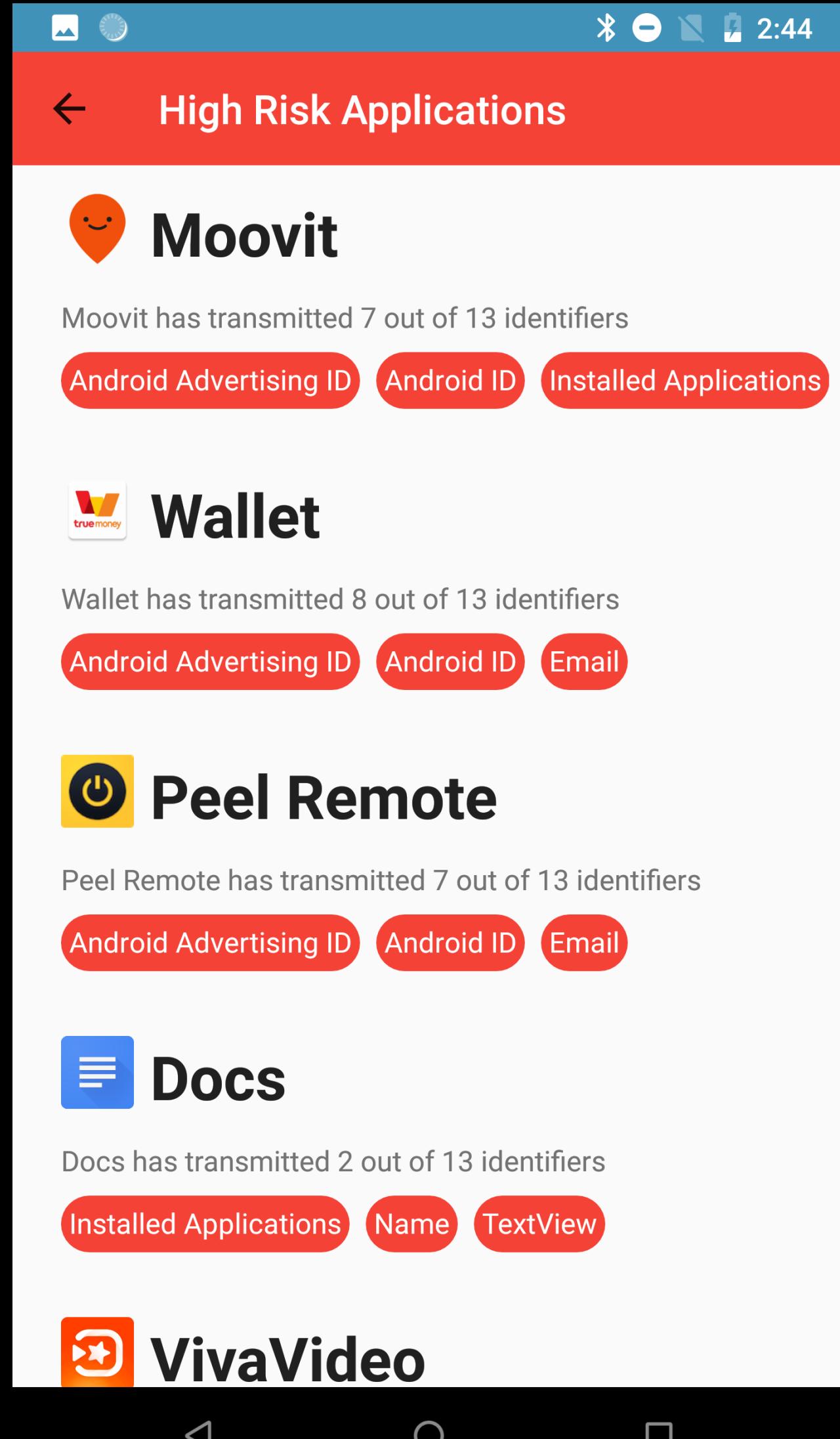


Kotlin

Targeting 95% of all devices

Sample Dataset

Implementation

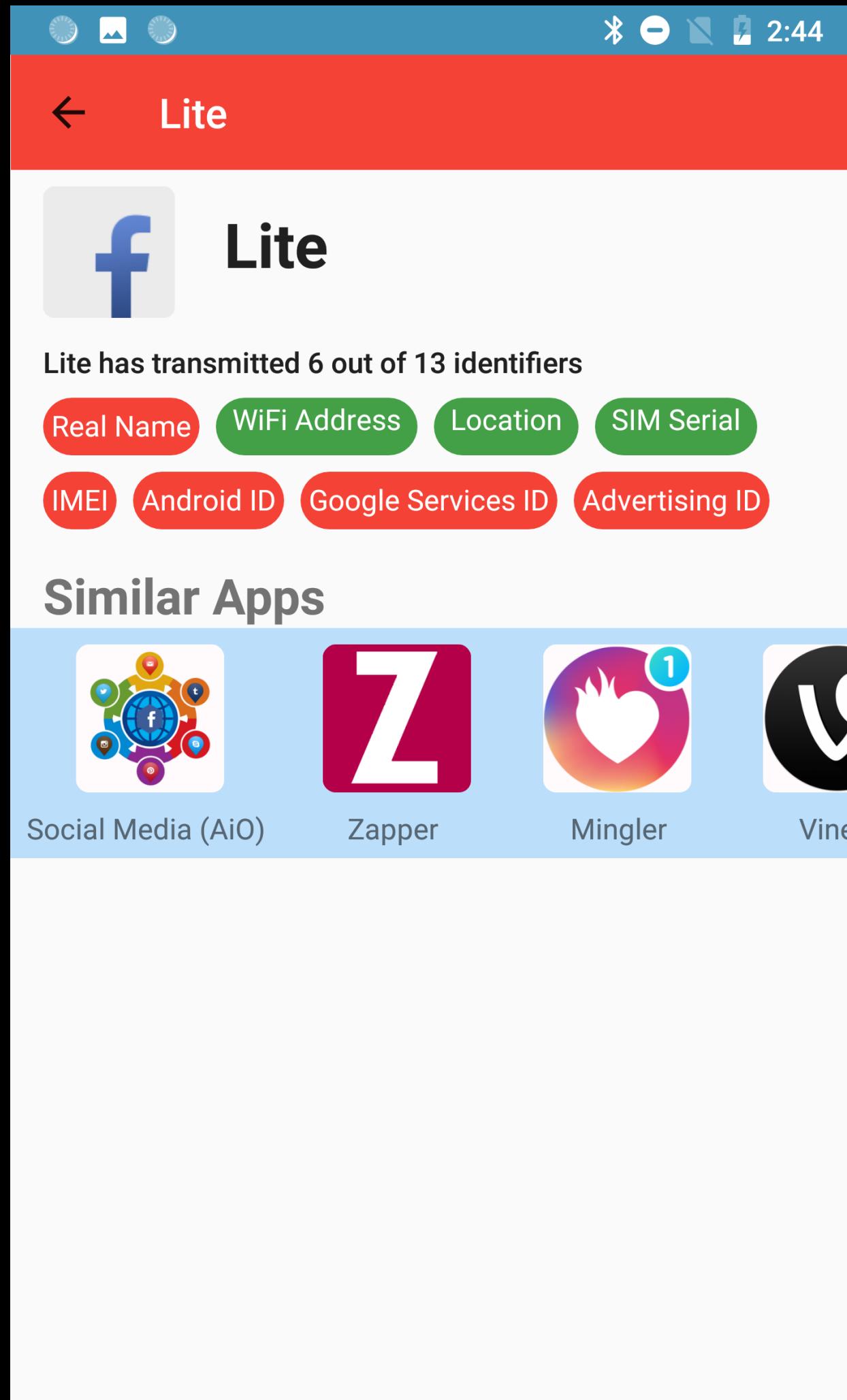


Kotlin

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Kotlin

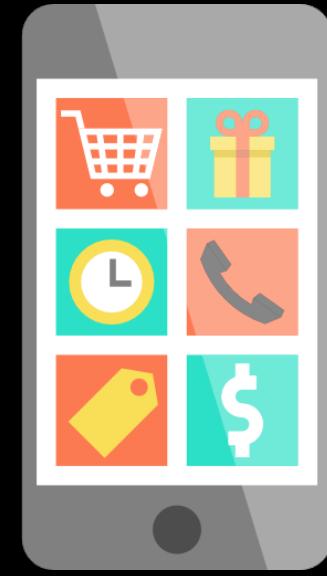
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Sample Dataset

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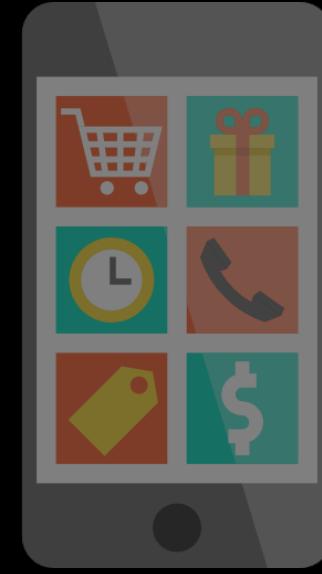


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Discussion

Evaluation

Evaluation

- 5 marks Clear and concise information, with a relevant action
- 10 marks A usable interface*
- 10 marks The list contains no applications that the user does not have installed
- 10 marks The applications offences are clearly marked

35 marks total

* if the applications crashes, it results in a 0 for that mark

Mark over 30 required for success

Simulated vs Final

Simulated vs Final

Performed **during** development

Performed **after** development

Simulated vs Final

Performed **during** development

Run on software emulated device

Performed **after** development

Run on Google Nexus 6P

Simulated vs Final

Performed **during** development

Run on software emulated device

Emphasis on functionality

Performed **after** development

Run on Google Nexus 6P

Carried out 3 times

Trial	Applications Installed	(a)	(b)	(c)	(d)	Overall
1	2	2	5	10	10	27
2	2	2	6	10	10	28
3	10	3	8	10	10	31
4	20	2	9	10	10	31
5	15	3	10	10	10	33

5 marks (a) Clear and concise information, with a relevant action

10 marks (b) A usable interface*

10 marks (c) The list contains no applications that the user does not have installed

10 marks (d) The applications offences are clearly marked

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10 marks (c) The list contains no applications that the user does not have installed

10 marks (d) The applications offences are clearly marked

Finished with 33 out of 35 marks

Results are successful

Not ready for release

Not ready for release

Iteration on the user interface

Not ready for release

Iteration on the user interface

Including suitable alternatives

Not ready for release

Iteration on the user interface

Including suitable alternatives

Large scale user study

Not ready for release

Iteration on the user interface

Including suitable alternatives

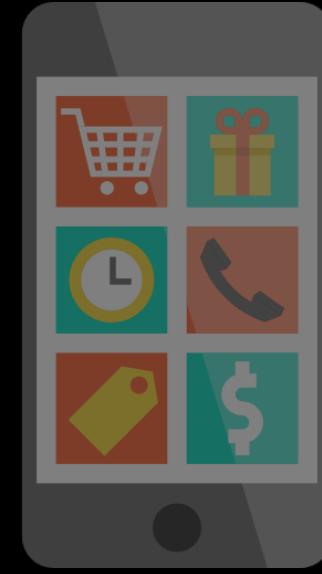
Large scale user study

Linking with AppCensus API

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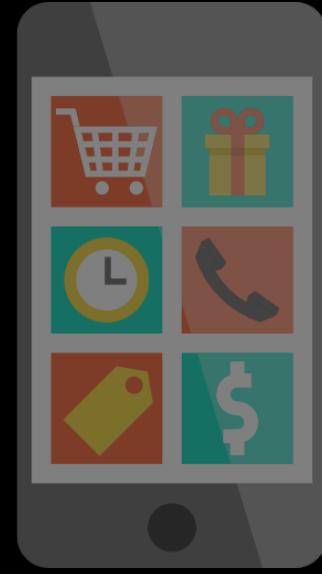


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Questions?

Thank you!

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