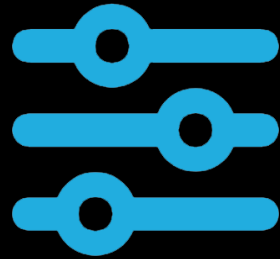# "I do (not) need that Feature!"
Understanding Users' Awareness and Control of Privacy Permissions on Android Smartphones

Sarah Prange, Pascal Knierim, Gabriel Knoll, Felix Dietz, Alexander De Luca, and Florian Alt
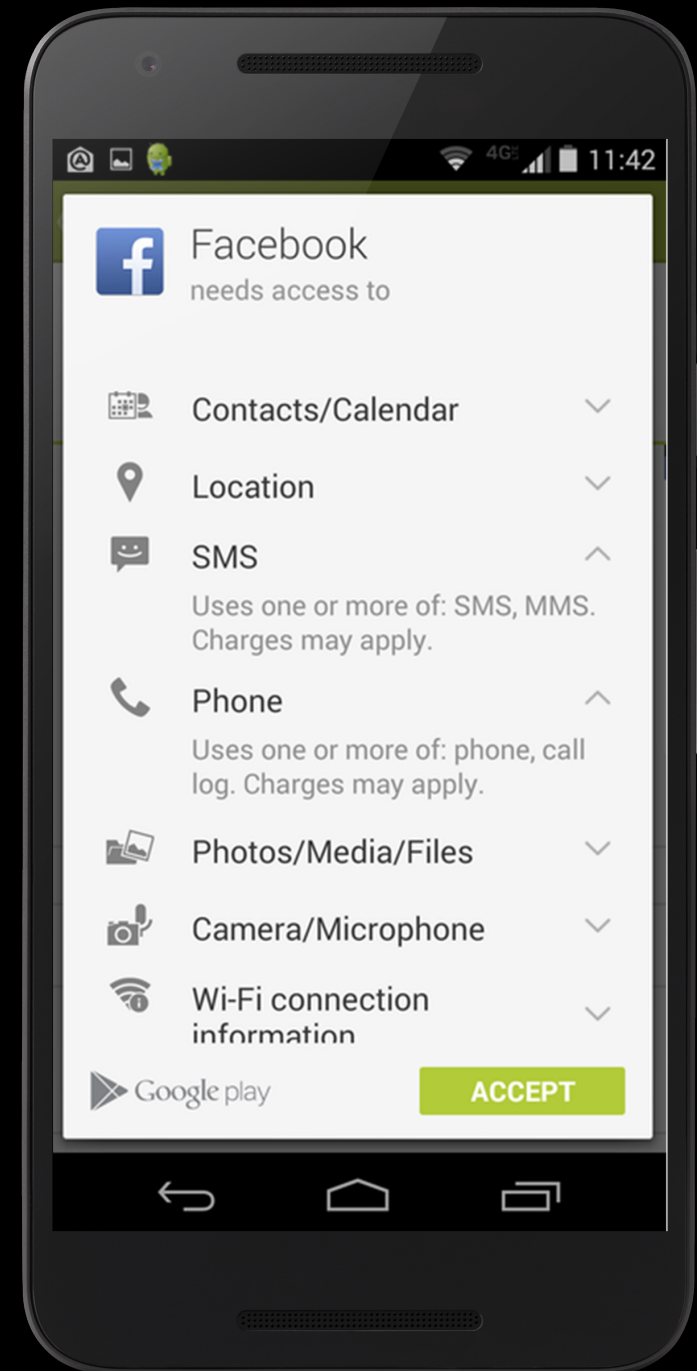
Motivation

Privacy Control Mechanisms

Usability

Automation

Privacy Permissions in Android
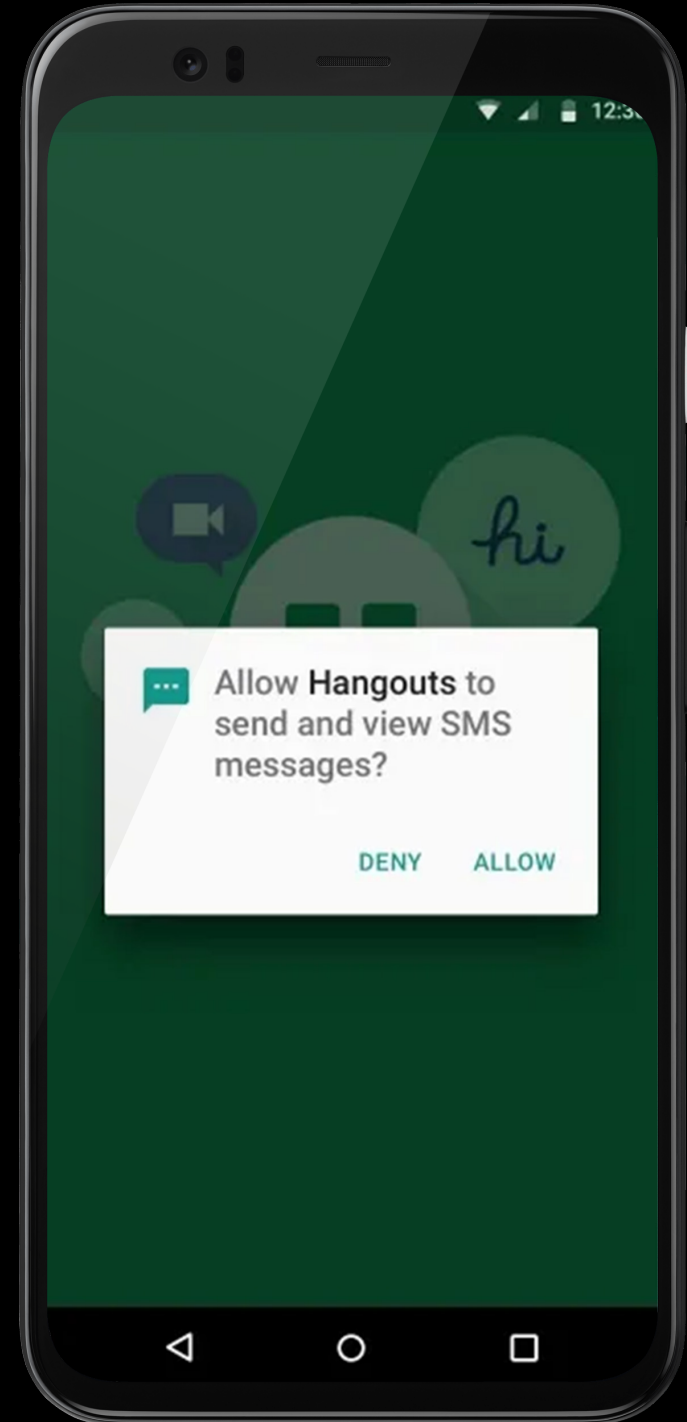## Prior Android 6

- App developers decide what permissions to request.

- Often more permissions were requested than necessary.

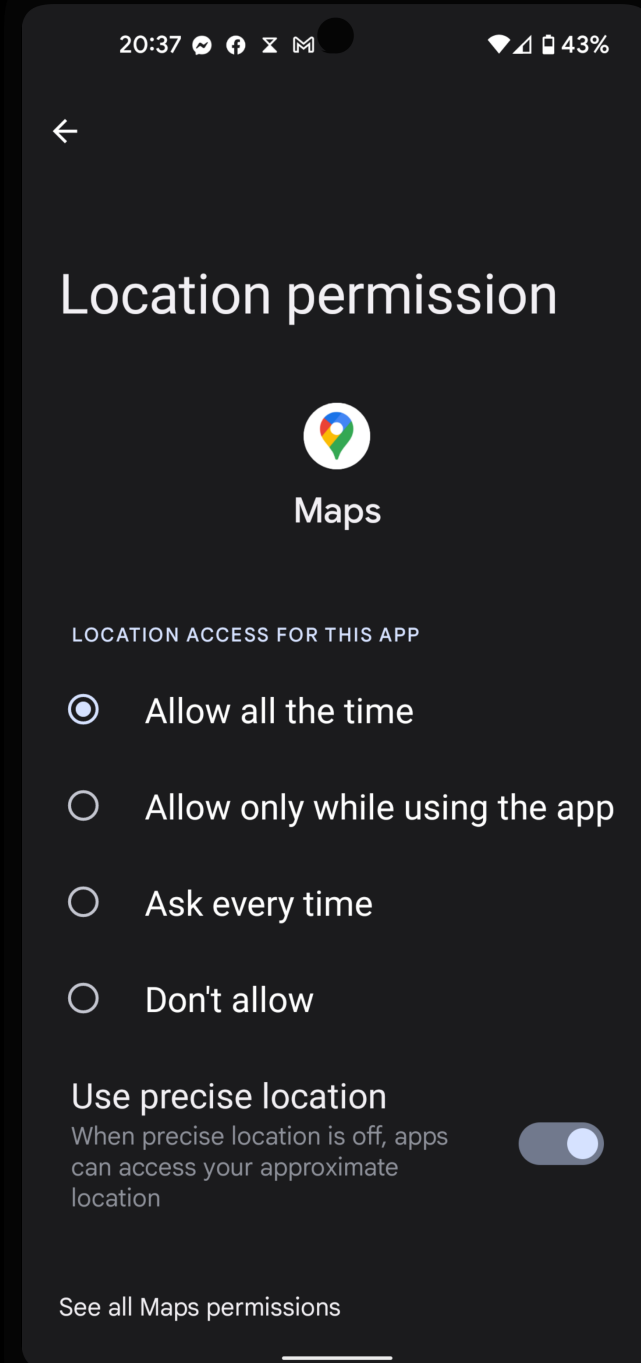# Privacy Permissions in Android
Android 6

- Introduction of runtime permissions.

- Users benefit from contextual information

Privacy Permissions in Android
Android 11

- Introduction of one-time permission.
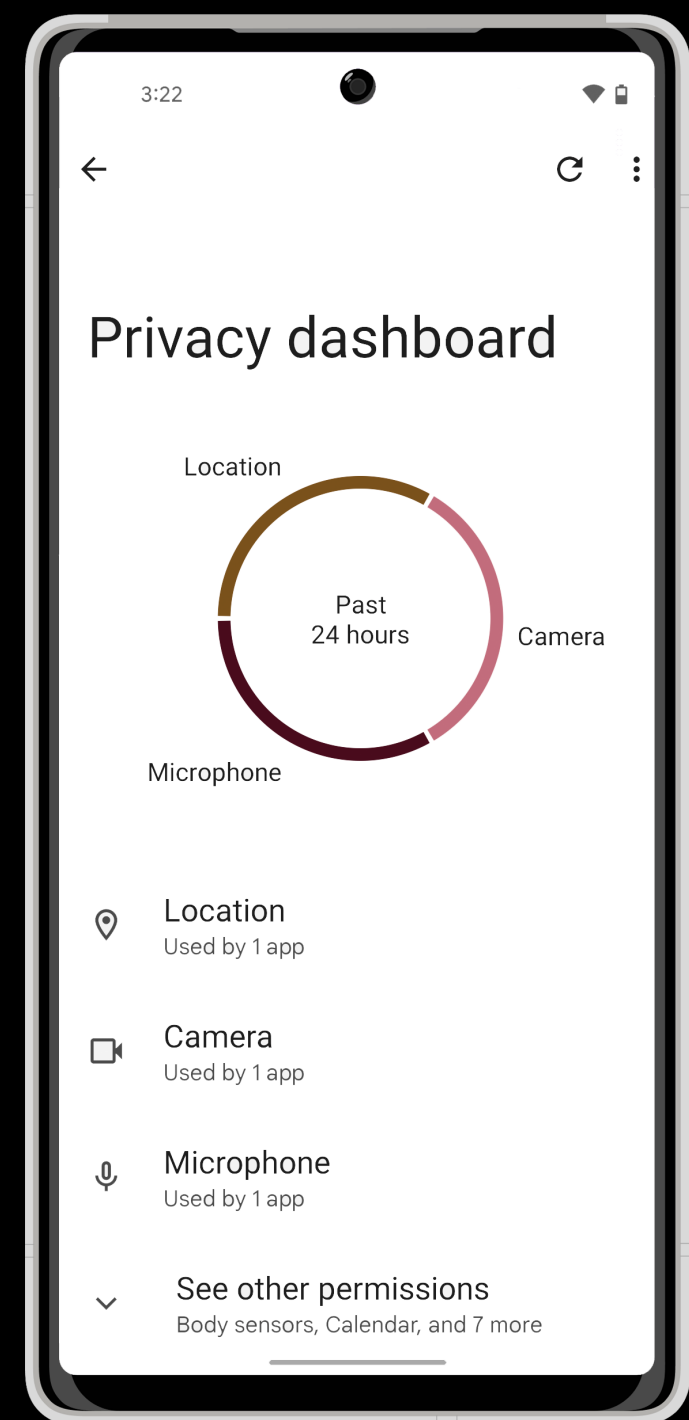
- Android automatically revokes permissions of unused apps.

- Apps can request permissions again the next time they are used.

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Privacy Permissions in Android
Android 12

- Privacy Dashboard gives users an overview of granted permissions.

- The auto-revoke feature removes permissions for unused apps.

Privacy Awareness and Control

Foto by Matthew Henry on Unsplash

Research Questions

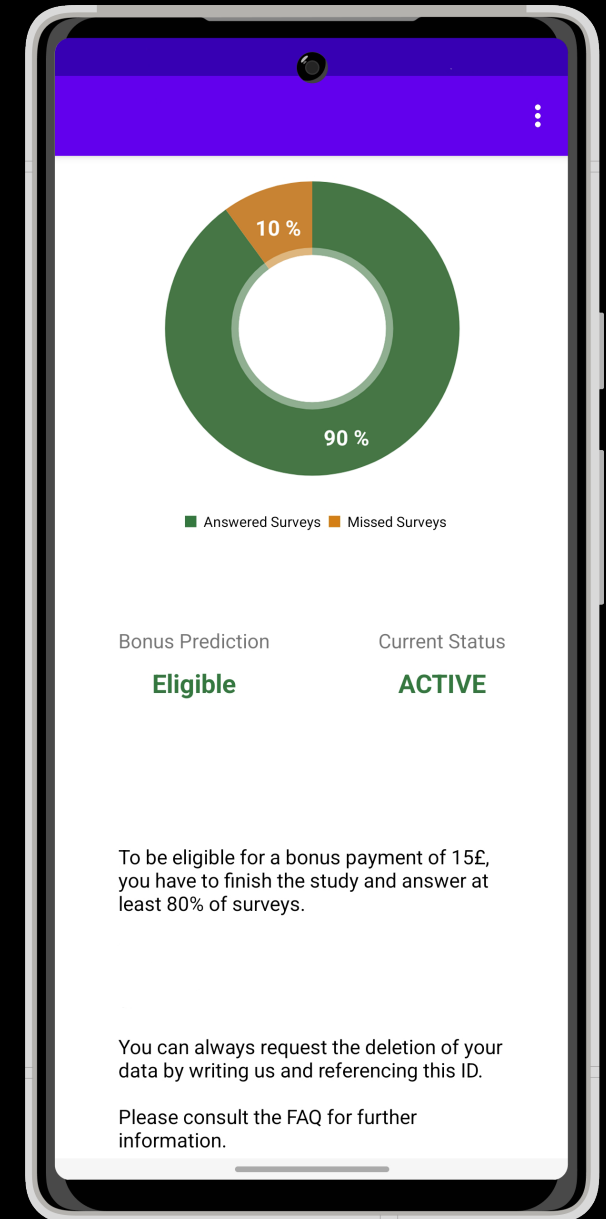- **RQ1: Awareness**

Are users aware of

  - privacy permissions granted to installed apps?
  - current interfaces to manage permissions?

- **RQ2: Control**

How often, when, and why do users grant, deny, and revoke privacy permissions?

Apparatus

- Android Application

- Automatic Logging

- Experience Sampling Method

- Participant Study Overview & FAQ

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Data Collection

Automated Data Logging
- Device Information
- Installed Applications
- Permissions

- 2-hour Interval:
  - permission changes

Self-Reporting
- Initial questionnaire
- Midterm questionnaire
- Final questionnaire

- Experience Sampling (ESM)
  - daily - awareness
  - update - control

Procedure
Field Study

first week

Setup
app installation
initial questionnaire

→

Experience Sampling
daily on granted permissions (RQ1: awareness)
on permission change (RQ2: control)

→

second week

Midterm
midterm questionnaire

→

Experience Sampling
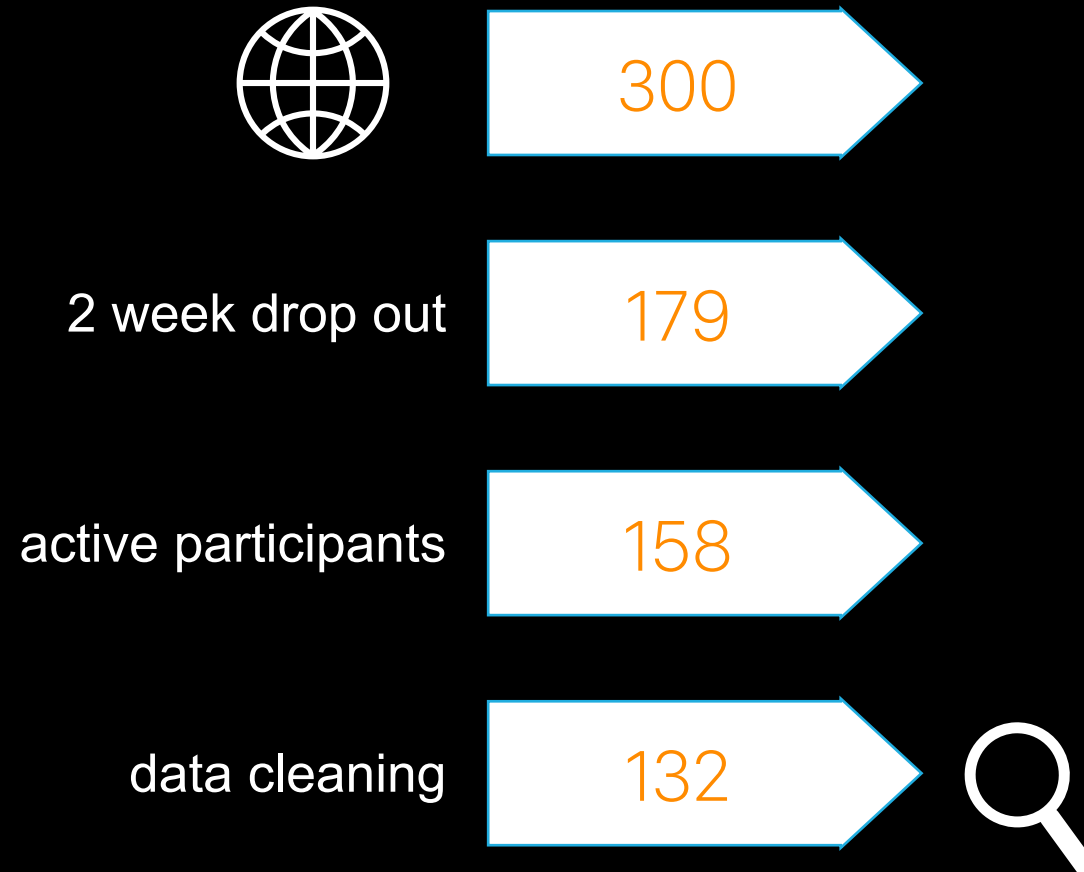daily on granted permissions (RQ1: awareness)
on permission change (RQ2: control)

→

Final
final questionnaire

Participant Sample

	300
2 week drop out	179
active participants	158
data cleaning	132

Demographic Information

- 18 – 54 years old (Mean 26.45)
- 65 identified as women (63 men, 4 non-binary)

- 66 participants with newer Android versions (>10)
- 15 to 202 apps initially installed (Mean 99.42)
- wish for awareness for
  - camera, location, microphone

- 125 participants knew about revocations, and 92 did revoke permissions before
- 108 participants engaged with the Permission Manager before
- 7 (out of 12) participants were aware of the Privacy Dashboard

RESULTS

Results

- "Does app x currently have access to permission y?"
- permissions were mostly assessed correctly, but:
  - many cases in which participants indicated they do not know
- No remarkable difference between Android versions.

Permission State	Participants' Answer		
	Yes	No	I don't know
Granted	1052 (49%) old: 54%, new 44%	455 (21%) old: 22%, new: 21%	646 (30%) old: 24%, new: 35%
Denied	685 (31%) old: 31%, new: 30%	760 (34%) old: 22%, new 22%	797 (36%) old: 24%, new: 38%

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Results
RQ2: Controlling Permissions

- 2,866 permission updates (1,802 revocations)
- most often revoked:
  - access to external storage, location, camera, and microphone
- bulk permission updates:
  - more than one app and/or permission updated

Reasons for Granting Permissions		Reasons for Revoking Permissions	
I wanted to enable a feature.	227	357	I didn't need the feature.
		212	I was concerned about my privacy.
The app asked for it.	117		
I didn't think about it.	106	135	I didn't think about it.
		88	I was concerned about the security of my device.
Other	18	22	Other
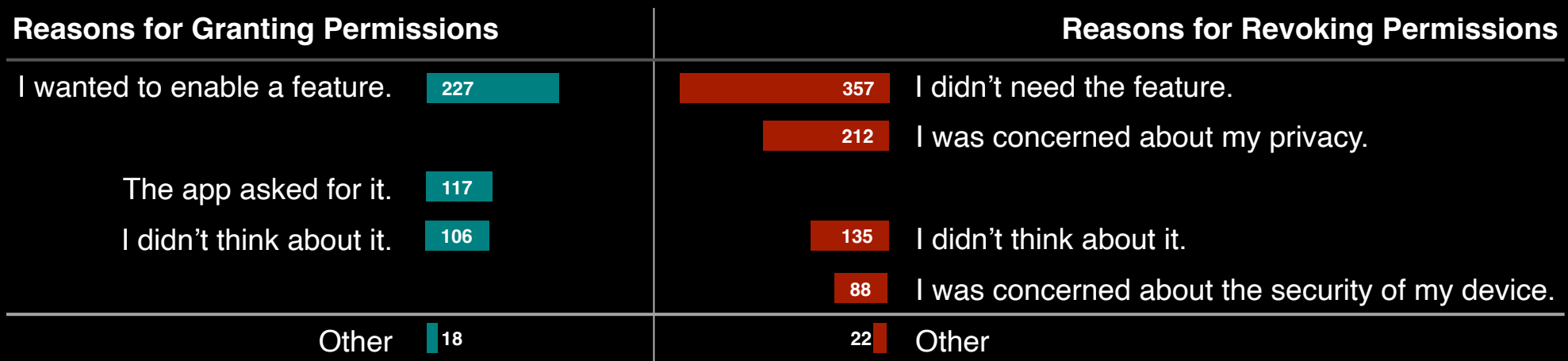
Discussion

- Awareness is alarmingly low
  - 21% unknowingly granted
  - Required for meaningful decisions

Discussion

- Awareness is alarmingly low
- Number of installed Apps is high
    - Many unused Apps
    - Automatic revocation versus recurring requests

Discussion

- Awareness is alarmingly low
- Number of installed Apps is high
- Revocations are intentional
  - Minimal on frequently used apps
  - App usage-specific permissions

Discussion

- Awareness is alarmingly low
- Number of installed Apps is high
- Revocations are intentional
- Utilize proactive support
  - Location, Camera, and Microphone
  - Essential vs. Non-essential

Discussion

- Awareness is alarmingly low
- Number of installed Apps is high
- Revocations are intentional
- Utilize proactive support
- Bulk revocations executed
  - Opportune moment
  - Create awareness

"I do (not) need that Feature!" Understanding Users' Awareness and Control of Privacy Permissions on Android Smartphones

Take-Home-Message

- Awareness is alarmingly low
- Number of installed Apps is high
- Revocations are intentional

- Bulk revocations executed
- Utilize proactive support