



/e/OS

a privacy-centric OS for your phone

Michael Davis

# Why install a custom ROM on your phone?

- Prolong the life of the handset after the manufacturer stops providing software updates
  - Reduce electronic waste, save money
  - Stay up-to-date with latest software features and security patches
- Exert control over the software installed on the handset
  - No unwanted pre-installed apps with special privileges
  - Improve battery life, reduce data usage
  - Reduce unwanted surveillance

# What data is your phone sharing, and with whom?

## Android Mobile OS Snooping By Samsung, Xiaomi, Huawei and Realme Handsets

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**Abstract**—The privacy of mobile apps has been extensively studied, but much less attention has been paid to the privacy of the mobile OS itself. A mobile OS may communicate with servers to check for updates, send telemetry and so on. We undertake an in-depth analysis of the data sent by six variants of the Android OS, namely those developed by Samsung, Xiaomi, Huawei, Realme, LineageOS and /e/OS. We find that even when minimally configured and the handset is idle these vendor-customized Android variants transmit substantial amounts of information to the OS developer and also to third-parties (Google, Microsoft, LinkedIn, Facebook etc) that have pre-installed system apps. While occasional communication with OS servers is to be expected, the observed data transmission goes well beyond this and raises a number of privacy concerns. There is no opt out from this data collection.

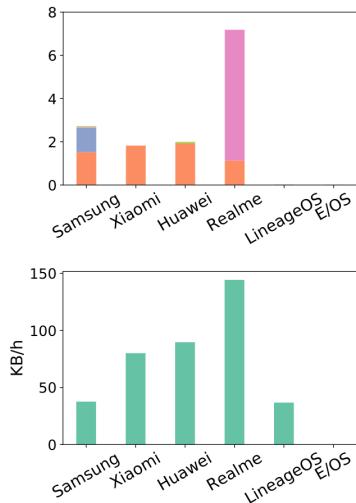
### I. INTRODUCTION

The analysis of whether mobile apps disclose sensitive information to their associated back-end servers has been the focus of much research [1], [2], [3], [4], [5], especially with a view to risks such as user de-anonymization, location tracking, behaviour profiling, and cross-linking of data by different stakeholders in the device/software supply chain. In contrast, the disclosure of information at operating system level has re-

It is worth noting that much of the functionality of the Android OS<sup>3</sup> is provided by so-called system apps. These are privileged pre-installed apps that the OS developer bundles with the OS. System apps cannot be deleted (they are installed on a protected read-only disk partition) and can be granted enhanced rights/permissions not available to ordinary apps such as those that a user might install. It is common for Android to include pre-installed third-party system apps, i.e. apps not written by the OS developer. One example is the so-called GApps package of Google apps (which includes Google Play Services, Google Play store, Google Maps, Youtube etc). Other examples include pre-installed system apps from Microsoft, LinkedIn, Facebook and so on.

We intercept and analyse the data traffic sent by the Android OS, including by pre-installed system apps, in a range of scenarios. We focus on defining simple scenarios that can be applied uniformly to the handsets studied (so allowing direct comparisons) and that generate reproducible behaviour. We assume a privacy-conscious but busy/non-technical user, who when asked does not select options that share data but otherwise leaves handset settings at their default value. This means that the user has opted out of diagnostics/user experience improvement data collection and has not logged in

google    mobileOS    microsoft  
heytap    avast    others



# What is /e/?

/e/ is a “de-Googled” mobile operating system and mobile ecosystem

- /e/OS is a fork of LineageOS
- Does not use or require OpenGapps; [microG](#) replaces Google services
- [/e/ App Installer](#) replaces Google Play Store
- Connectivity checks, DNS, NTP, etc. do not use Google servers; [/e/ meta-search engine](#) (based on searchx) replaces Google search
- [ecloud](#) (based on Nextcloud) provides storage for mail, calendar, files, backup, etc. (with option to self-host)

# e What's in /e/OS?

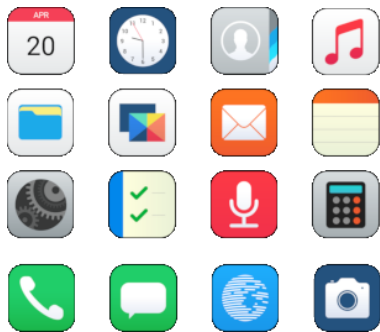
**microG**: FOSS re-implementation of Google's proprietary Android user space apps and libraries

- **Service Core**: replaces Google Play Services and Google Maps Android API v2
- **Maps API v1**: replaces Google Maps API v1 (*deprecated*)
- **Services Framework Proxy**: allows apps developed for Google Cloud to Device Messaging (C2DM) to use the cloud messaging service included with GmsCore
- **Unified Network Location Provider**: provides WiFi and cell tower-based geolocation to apps that use Google's network location provider.
  - Uses Mozilla Location Services to resolve user location and Nominatim (OpenStreetMap) for reverse geocoding.

# e What's in /e/OS?

  
Bliss  
Launcher

+



Productivity Apps  
(custom builds of  
FOSS applications)

+



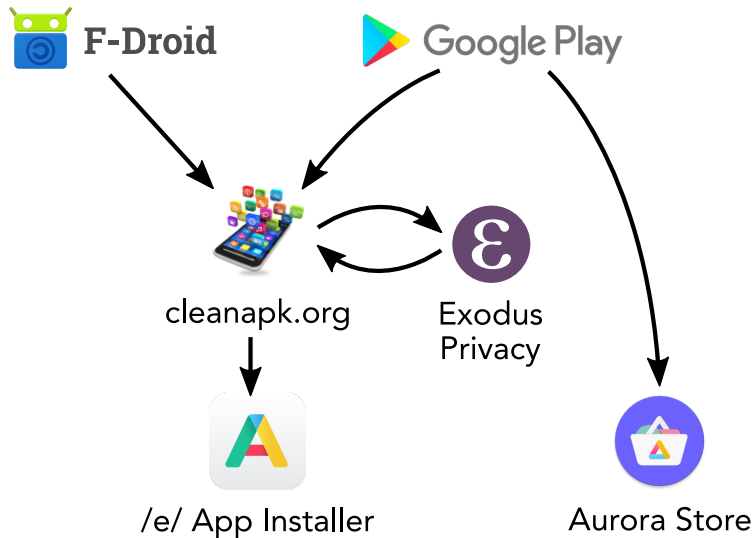
Magic  
Earth  
(non-free  
mapping  
app)

+



/e/ App  
Installer

# e App Installer



# My experience

## What Works?

- All FOSS apps and almost all non-free apps
- Essential apps with no alternative (bank authentication, indoor cycle trainer, etc.)
- Paid-for apps from Google Play Store (French-English dictionary)

## What Doesn't Work?

- Buggy widgets in Bliss Launcher. Installed KISS Launcher instead.
- Text-to-Speech emulation sounds robotic and did not work with *Zombies, Run!* Replaced it with [Ivona TTS](#) (non-free).
- Revolut version  $\geq 8.30$  does not work (Google SafetyNet issue?) Rolled back to 8.29.
- Centr Fitness: can't log in. But all content available on website so not a deal-breaker.



# e How to get /e/

- Easiest Way: buy a Murena Phone with /e/ pre-installed
- Easy Way: use Easy Installer
- Hard(er) Way: download a ROM, fiddle with TWRP, USB debugging and adb (same as LineageOS)



# References

- [Android Mobile OS Snooping By Samsung, Xiaomi, Huawei and Realme Handsets](#), Haoyu Liu, Paul Patras, Douglas J. Leith, October 2021
- [Made to Measure](#), an experiment to reconstruct a person's life and identity using only their Google searches, 2021
- [The Age of Surveillance Capitalism—the fight for a human future at the new frontier of power](#), Shoshana Zuboff, 2019
- [e Foundation](#)
- [CleanAPK](#)
- [Exodus Privacy](#)



[home.cern](http://home.cern)