



Reproducible Load Tests for Android Systems with Trace-based Benchmarks

The Sixth International Workshop on
Load Testing and Benchmarking of Software Systems

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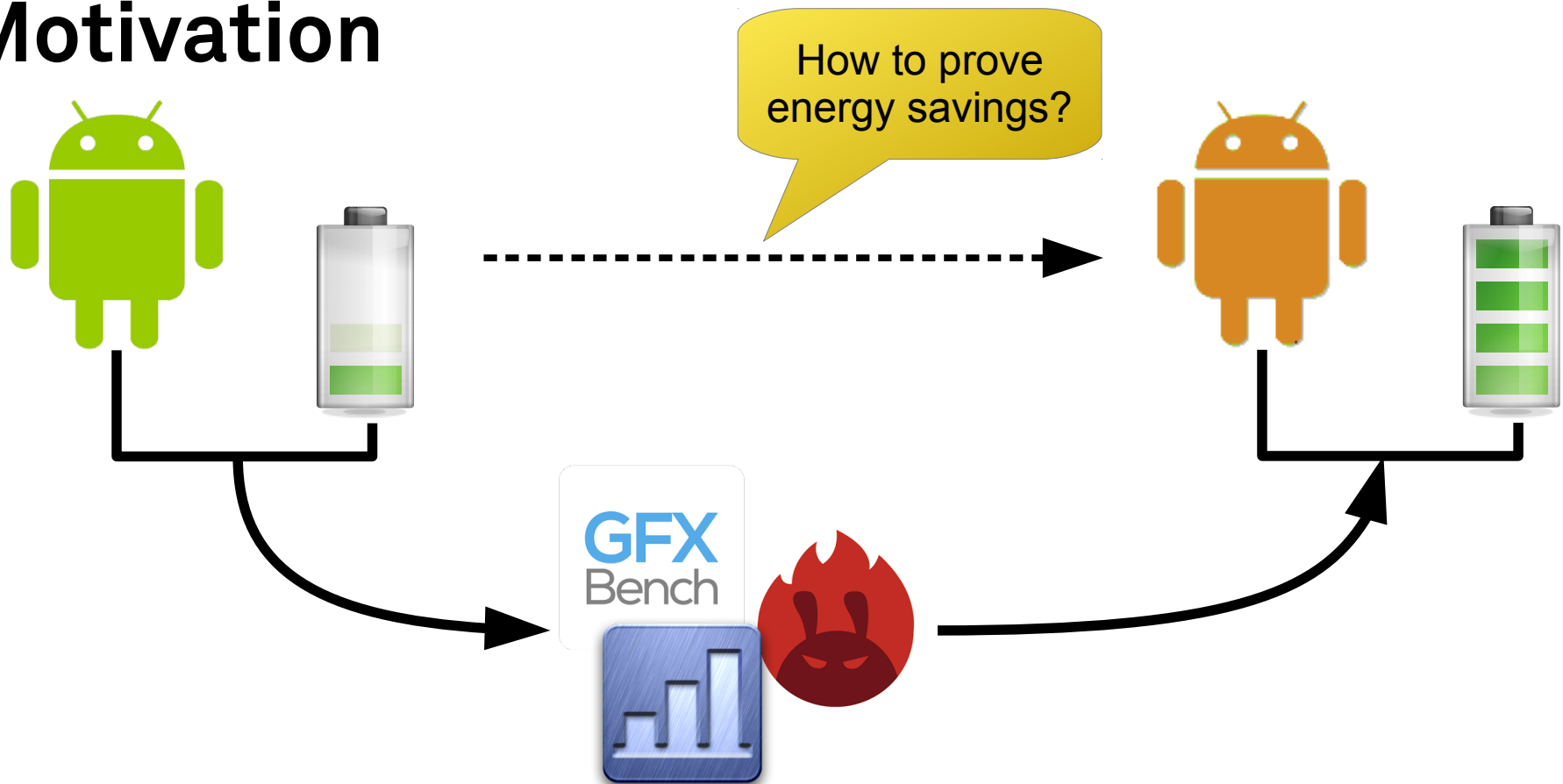
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Motivation

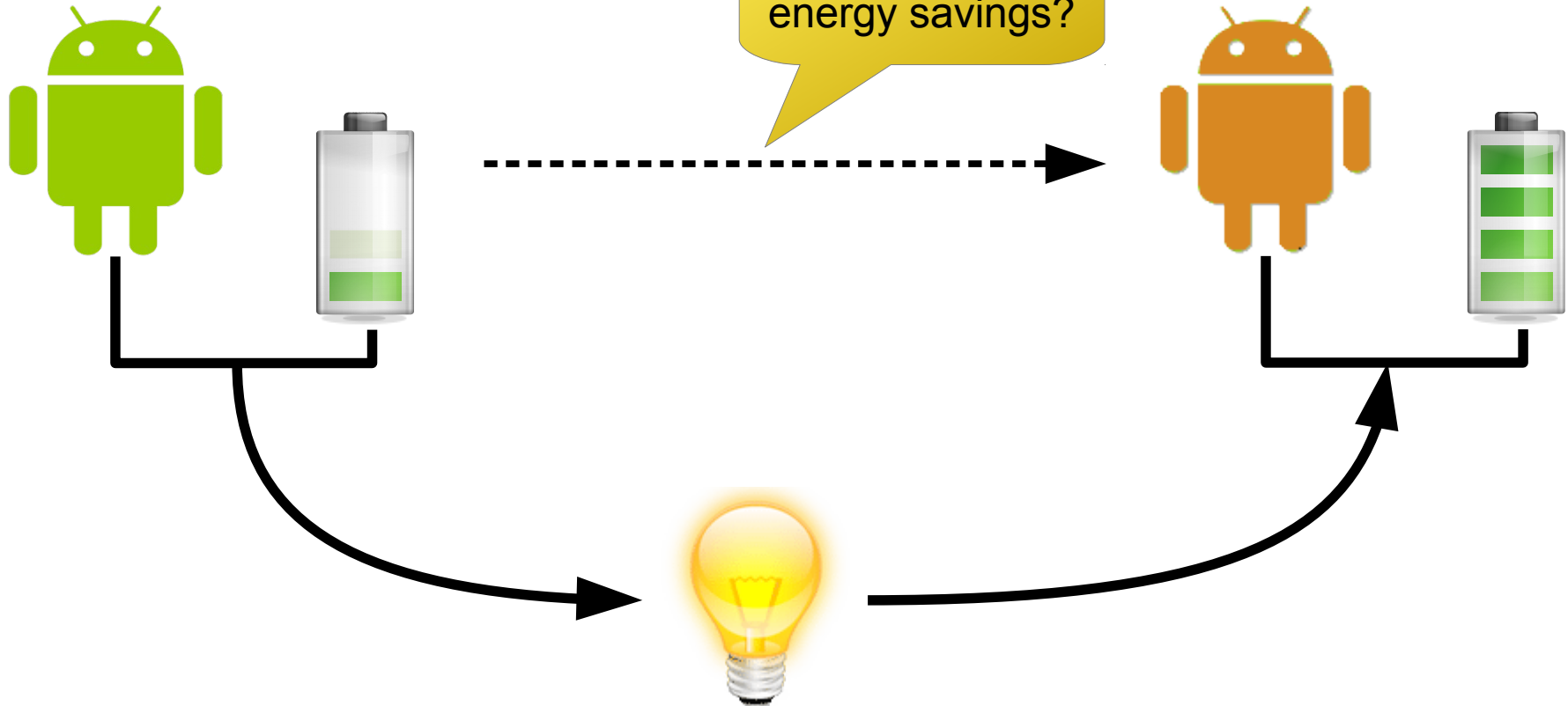


- Measure max. performance of subsystems
- Do not cover Android-specific parts
- Do not represent a user's behavior

Icons taken from Google (Play Store) + Wikimedia



Motivation

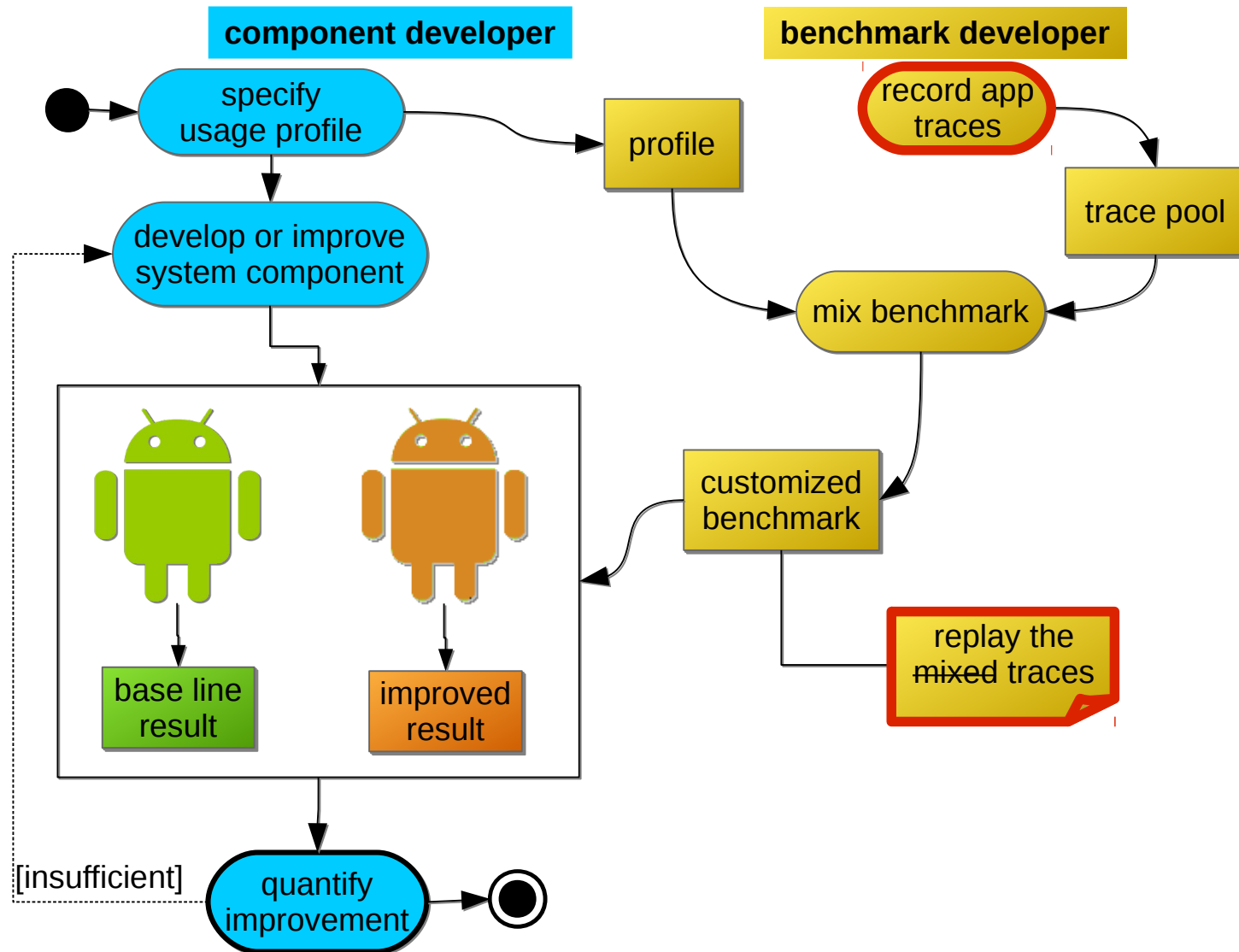


- Benchmark Generator
- Records an app's resource usage during normal use
- Covers most parts of Android

Icons taken from Google (Play Store) + Wikimedia



Scope of this Work





Outline

- ✓ Motivation
- Trace Recording
- Trace Replay
- Evaluation
- Summary



Trace Recording

- Usual resources
 - CPU ⚠️
 - Network IO → SystemTap ✓
 - File IO → SystemTap ✓
 - GPU ✗
 - Peripherals, e.g., NFC or BT ✗
- Android-specific Resources
 - Application's lifecycle ✓
 - Location Manager ⚠️
 - Wake Locks ✓
 - Android Services ✓
 - Download Manager
 - Media Player



Icons taken from Google + SystemTap



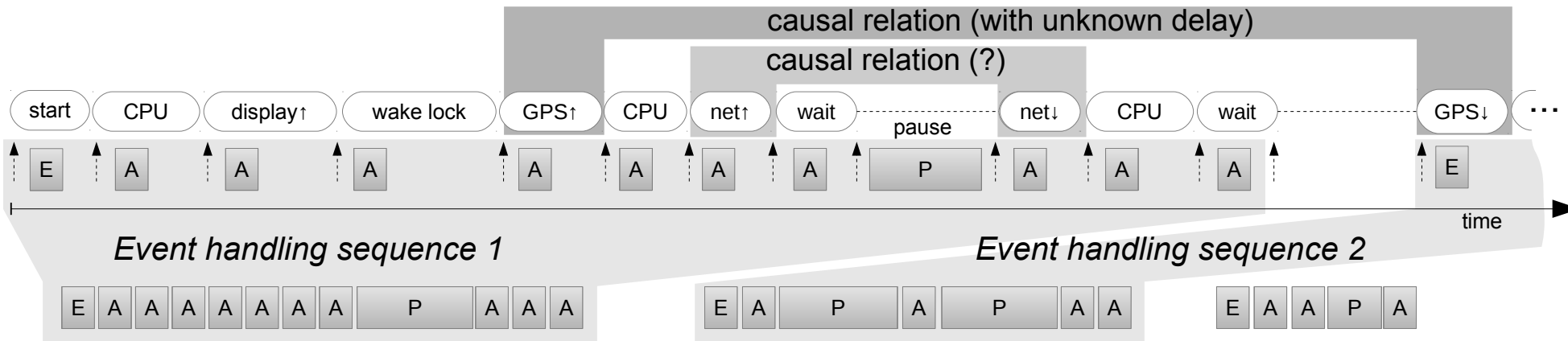
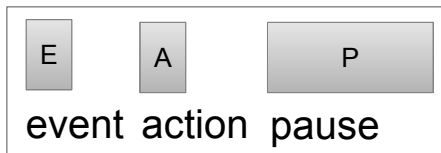
Trace Replay 1/2

- Setup
 - Android application without any special permissions
 - Own remote host for network communication
- Preprocessing
 - Create dummy files on internal and external storage
 - Merge and sort events from different files into one file





Trace Replay 2/2





Evaluation - Setup



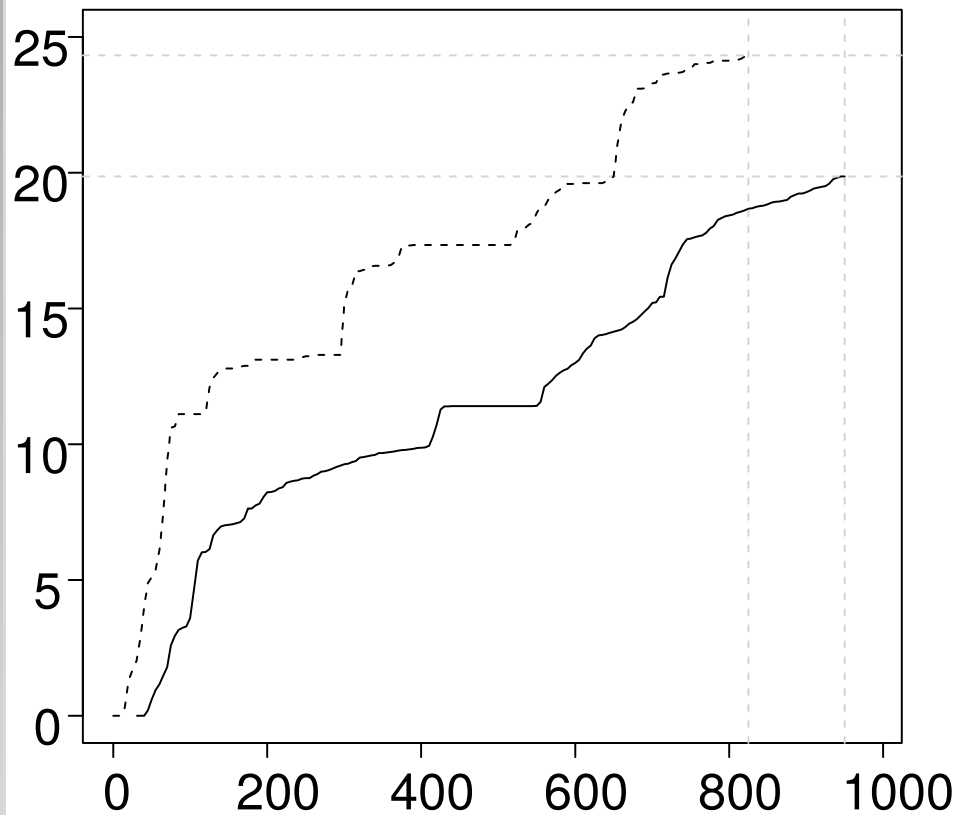
- Recorded *Google Maps* for 15 minutes
 - 6.5 min: View streets, and browser arbitrary streets
 - 2 min: Inactivity, closed app, and display turned off
 - 6.5 min: View streets, and browser arbitrary streets
- Replayed the trace, and recorded it again

Icon taken from Google Playstore

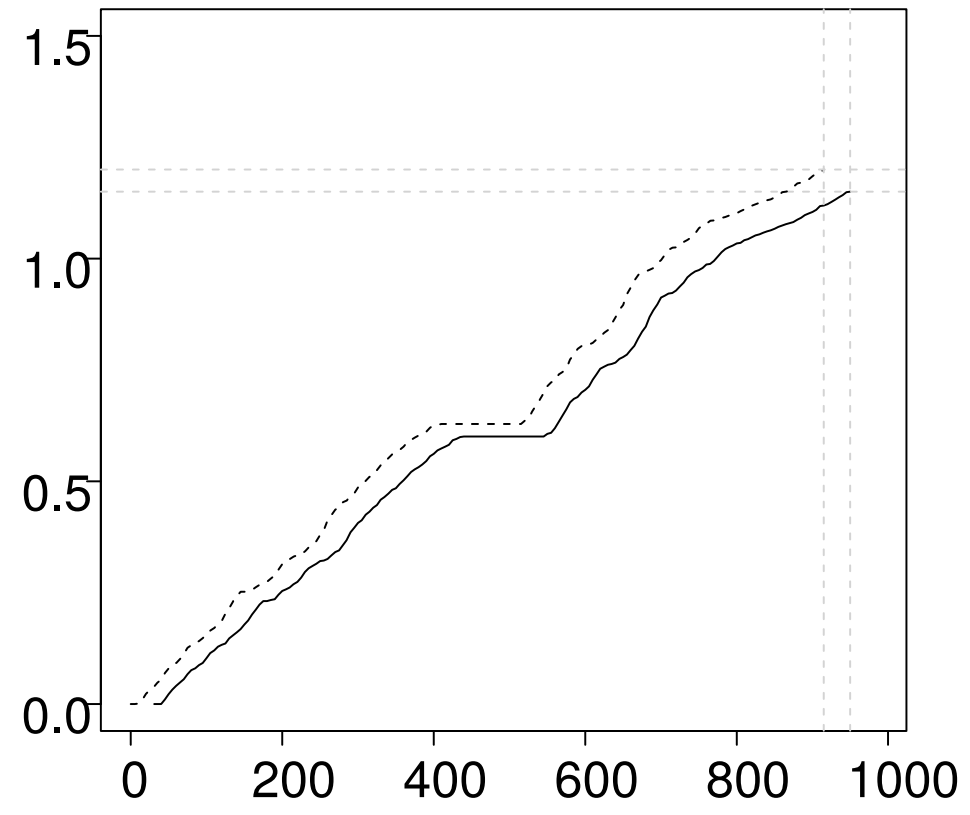


Evaluation - Results 1

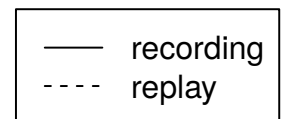
Received Data (MB)



Send Data (MB)



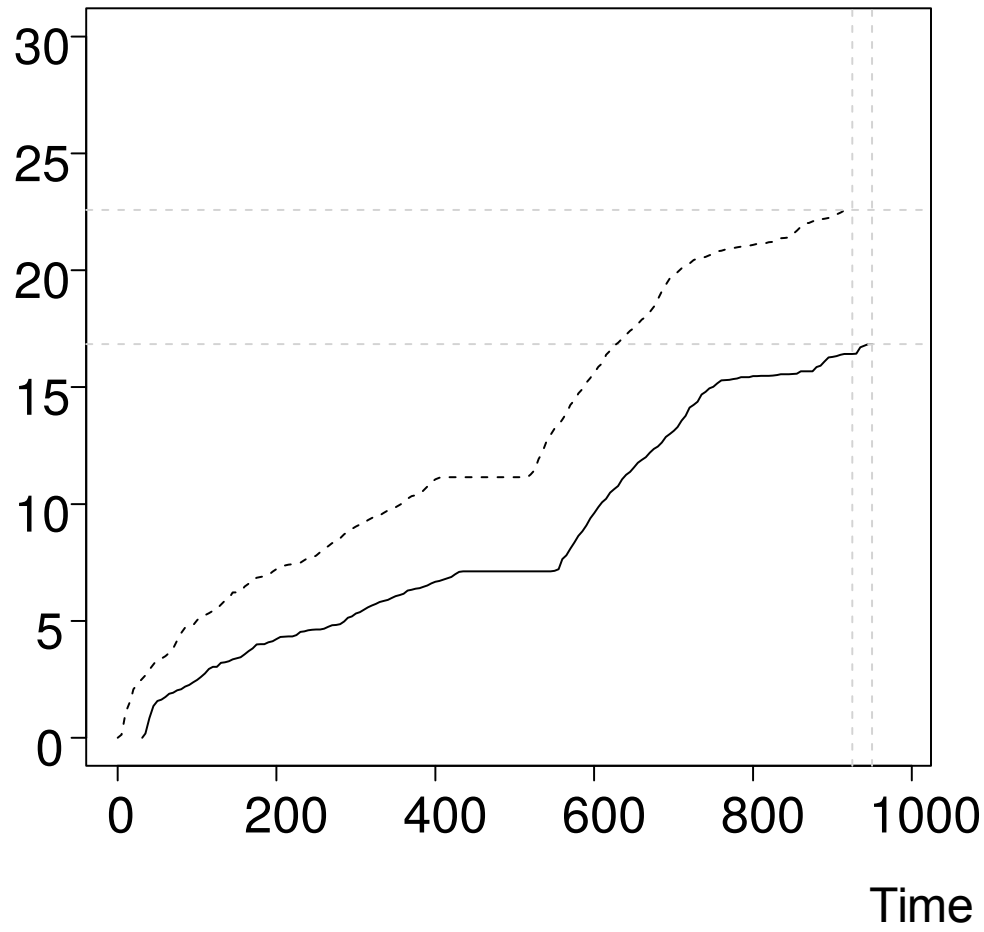
Time (secs)



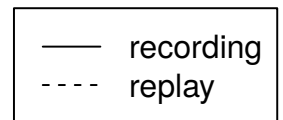
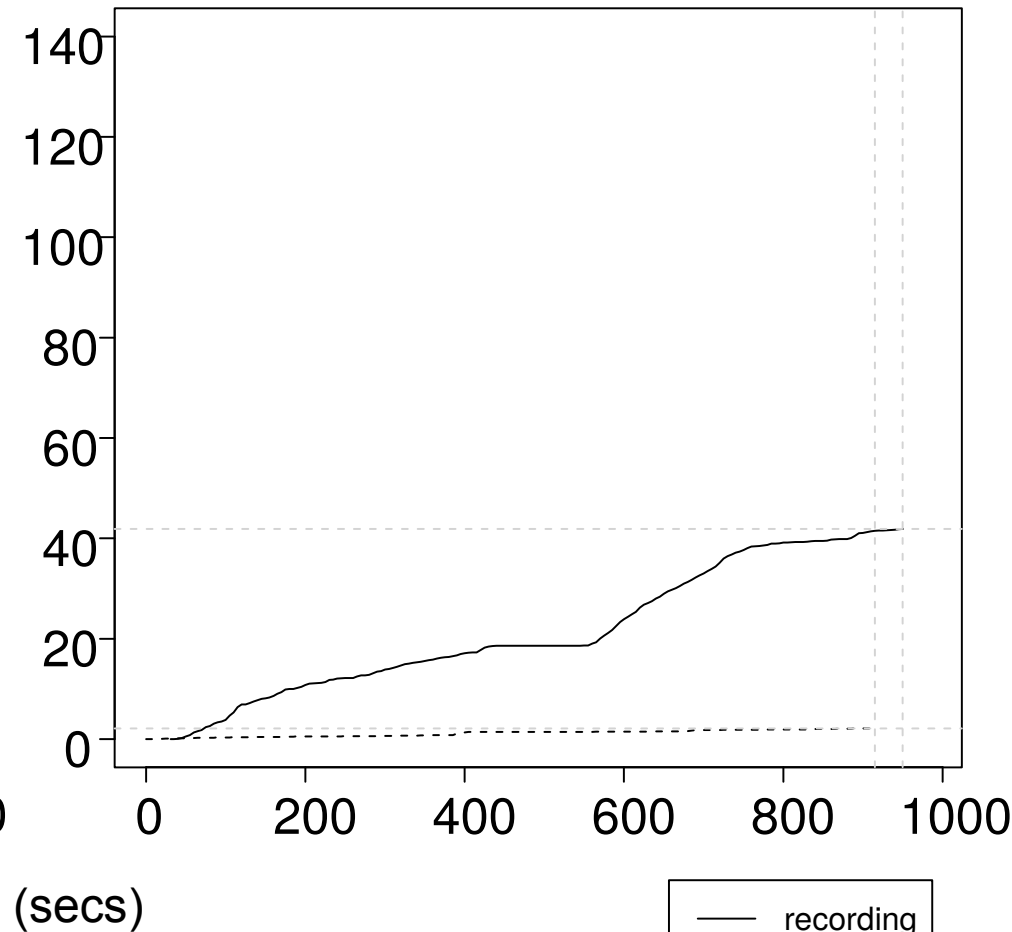


Evaluation - Results 2

Read Data (MB)



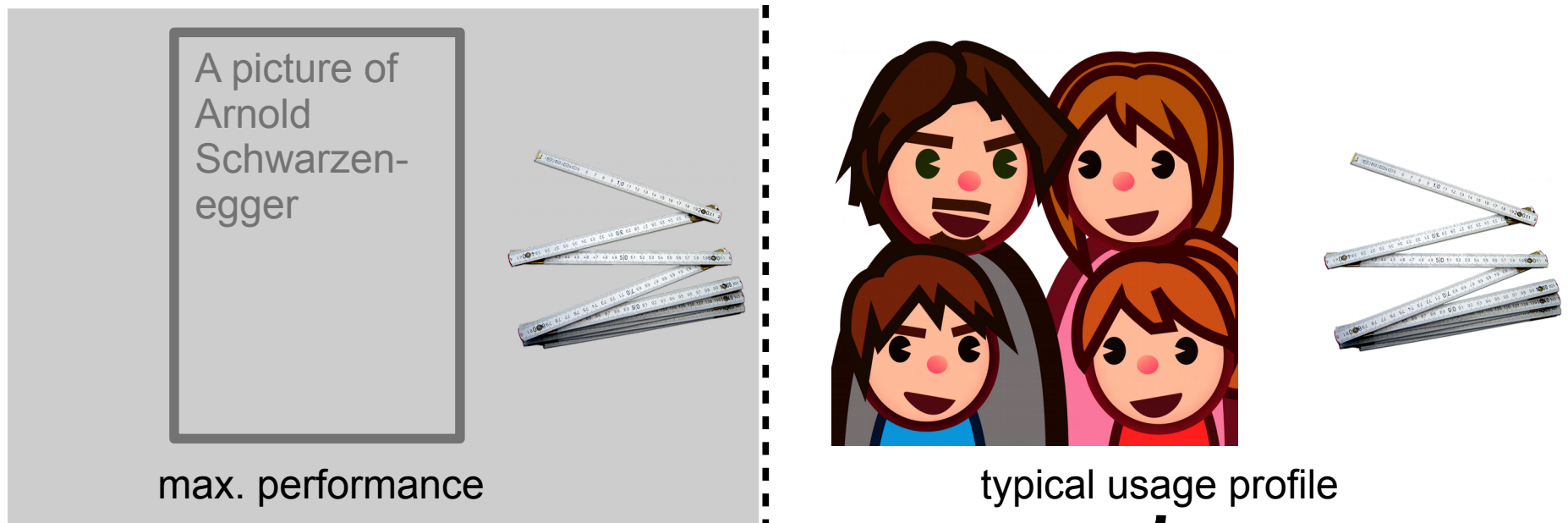
Written Data (MB)





Summary

- Benchmarks are needed ...
 - for improving the energy efficiency of Android for developers / researchers



Record apps during daily use & replay [mixed] traces