Green Lab

Ivano malavolta
i.malavolta@vu.nl
The Green Lab

A MASTER COURSE

Students measure real software products

A PLATFORM

Our infrastructure for experimenting on software
● energy efficiency
● performance
● ...

A COLLABORATION PLATFORM

Industry-driven experiments

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Watts up Pro

- Hardware Watt meter
- Measures instantaneous power
  - Logs it via USB1
  - Via Python or C utilities
- 60 Hz frequency
- Highly used in the literature\(^2\)

1. [https://github.com/yyongpil/wattsup](https://github.com/yyongpil/wattsup)
2. [https://scholar.google.it/scholar?q=%22Watts+up%3F+Pro%22&hl=it&as_sdt=0,5](https://scholar.google.it/scholar?q=%22Watts+up%3F+Pro%22&hl=it&as_sdt=0,5)

Image from: [https://doi.org/10.1016/j.jss.2018.07.077](https://doi.org/10.1016/j.jss.2018.07.077)
Smartphone Test Farm (STF)

- Debug/control several mobile devices remotely
- Web-based UI
- Real-time screen view
- Execute remote shell commands
- Manage device inventory

https://github.com/DeviceFarmer/stf
Experiments on Android/web apps

https://github.com/S2-group/android-runner

- **Automation**: No interaction from the researcher
- **Incremental experiments**: Pause/resume mechanism
- **Usability**: Experiments defined in descriptively
- **Customizability**: You can add your own business logic or automated testing tool
- **Profiler independence**: Support for both HW/SW profilers, even in parallel
- **Experiments replicability**: Easily execute an already-performed experiment
Android Runner as a learning platform

- **Green Lab**
  - Green Lab = Master course on empirical software engineering for energy efficient software
  - Students use Android Runner as black-box tool for their own experiments

- Community of learners
- Discover and fix bugs
- Android Runner always up to date
- Learn the basics of OSS development

- Final projects
  - Students go deeper on run-time profiling
    - Plugins for new profilers
    - Improve Android Runner

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Example of experiment on Web apps on Android
Experiments on Robotics

Energy measures

Robot Operating System
We have a technological dilemma about $X$.

We are interested in how $X$ impacts/improves/clarifies $Y$.

In-house VS on-premises experiment

Clarifications and refinements

Final report

Results discussion

Informed decision making

Brainstorming sessions

Preliminary experiment design

Finalization of experiment design

Experiment execution

Collaboration model with companies
Contacts

Design/conduct experiments on your software?

Technological dilemmas?

Mining software repositories?

Group website
http://s2group.cs.vu.nl

Email
i.malavolta@vu.nl