Measurement
VISIIRI workshop 10.10.
zoom

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Elinkeino-, liikenne- ja ympäristökeskus

Introduction

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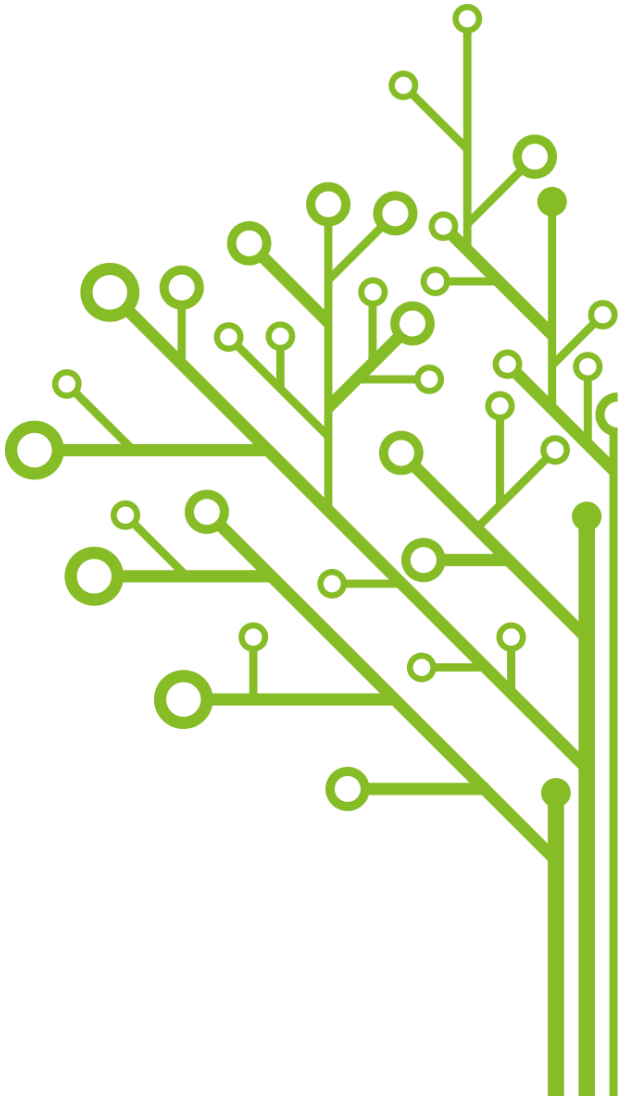
Why measure the power consumption of software?

1. Reducing environmental impact → Sustainable development goals
2. Economic savings on production system (and other software quality improvements)
3. Meeting future energy regulation and standards
   - How, for example, a software update affects device performance **(EU) 2024/1781**
4. Answering increasing consumer expectations



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Power Measurement Workbench

- Power Goblin
  - Measuring software for monitoring power usage
  - Raspberry Pi, PC
- Measurement method
  - Based on MitViDi standard

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Power Measurement Tools

- Software-Based Power Measurement Tools
  - Tools that simulate or estimate power usage indirectly based on software-level metrics like CPU usage, task scheduling, and energy models
    - *PowerTOP, Windows Performance Analyzer*
- External hardware-Based Power Measurement Tools:
  - Physical devices that directly measure the power consumed by hardware components (e.g. CPU, GPU)
    - *Monsoon Power Monitor, JouleScope*
- Many tools use *internal hardware interfaces* to measure and model power consumption:
  - Directly from hardware components, but limited to specific parts of the hardware
    - *Intel RAPL, ARM Energy Probe*

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What categories can be measured?

Web Systems

- Open source CMS
  - WordPress, Drupal etc.
- CRM systems
  - Salesforce, HubSpot etc.
- Office Environments
  - NextCloud, Seafile etc.

Component Level

- Load balancing
- Virtual machines
  - Oracle HotSpot
  - Eclipse OpenJ9
  - GraalVM
  - etc.

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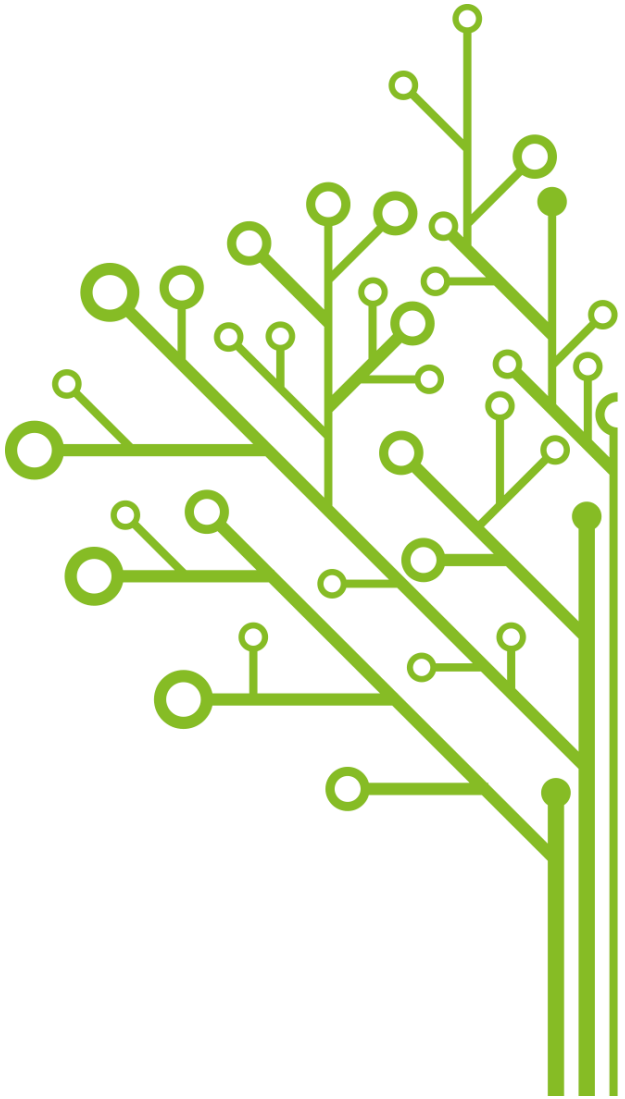
Measurement Targets

- Software Metrics
  - Relative Consumption
  - Absolute Consumption (based on literature)
  - Scaling Factors (e.g., Raspberry Pi → PC)
- Benchmarking
  - Comparison of Energy Efficiency between Software and Hardware
  - Standardization and Comparison of Measurement Results
  - Categorical Benchmark Modeling



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Workshop Guidelines

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Workshop Questions

1. What software systems/components should be measured for the benchmark database?
   - What specific details about the measurement target should be recorded in the database?
2. Which measurement tools should be used for the measurements?
   - How can the comparability of the measurement be ensured?
3. Are the participants interested in offering their systems for measurement and/or providing measurement tools for use?
   - Support for installation and setup is most probably needed

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Thank you,

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