ITEA 4

Project Profile

# MAST

## Managing both technical and environmental sustainability

**The ITEA project MAST (Managing Sustainability Trade-offs) focuses on the impact of software execution on the energy consumption of entire software-intensive systems, for which it will develop methods and tools to address complex trade-offs between the technical and environmental aspects of sustainability.**

### Addressing the challenge

By 2040, ICT is expected to account for 14% of the world's carbon footprint. Software-intensive systems, especially in cloud-based computing and cyber-physical systems, must therefore become more sustainable regarding both power consumption and carbon footprint. At the same time, ease of code changes progressively deteriorates. However, these aspects often conflict: optimising source code to reduce power consumption may result in excessive complexity, unnecessary dependencies and design rule violations, whereas neatly-structured systems with high cohesion and low coupling are rarely power-efficient. Unfortunately, technical and environmental sustainability are mostly tackled in isolation.

### Proposed solutions

MAST envisions a joint approach to sustainability via a variety of tools and methods. For problem analysis, technologies like source code analysis, software repository mining and software instrumentation will measure a system's respective technical and environmental sustainability. On this basis, approaches like refactoring will be used to propose optimisation solutions to engineers, who will decide how to act. This avoids a top-down mechanism that is hard to adopt in practice, thereby providing flexibility to engineers as they have the best knowledge of their systems. For trade-off management, trade-off points will be identified for different combinations of parameters and the development teams will be informed of the impact of each solution on both aspects of sustainability. Compatible combinations of solutions that address each aspect will also be suggested. Finally, communication and reporting will be enabled by providing the development team, customers and other stakeholders with traceable, auditable information on software sustainability. This will take the form of dashboards that are updated in real time, allowing for visualisation and continuous monitoring of the problem analysis, optimisation solutions and trade-offs.

### Projected results and impact

As the first approach to combine the two aspects of sustainability into a single dashboard that provides clear, actionable information, MAST will provide win-win solutions for stakeholders that have conflicting concerns (such as system developers and their customers). In doing so, the project expects to reduce technical debt (e.g. coding violations or design/code smells) and increase development speed by 20-30% while reducing the scrap-and-rework ratio by 50%. This will save significant costs on software maintenance/evolution. In addition, MAST anticipates a reduction of energy consumption and corresponding carbon footprint by 15-20% for green cyber-physical systems and 20-30% for green computing. Such transparency about reduced carbon footprints also addresses employee and customer sustainability concerns – critical to gaining and retaining employees and to improving a company's sales position. MAST therefore is positioned at the intersection of technical and environmental sustainability and stands to benefit both businesses and society as a whole.

Sustainable printing is one of the three use cases in MAST

# Project partners

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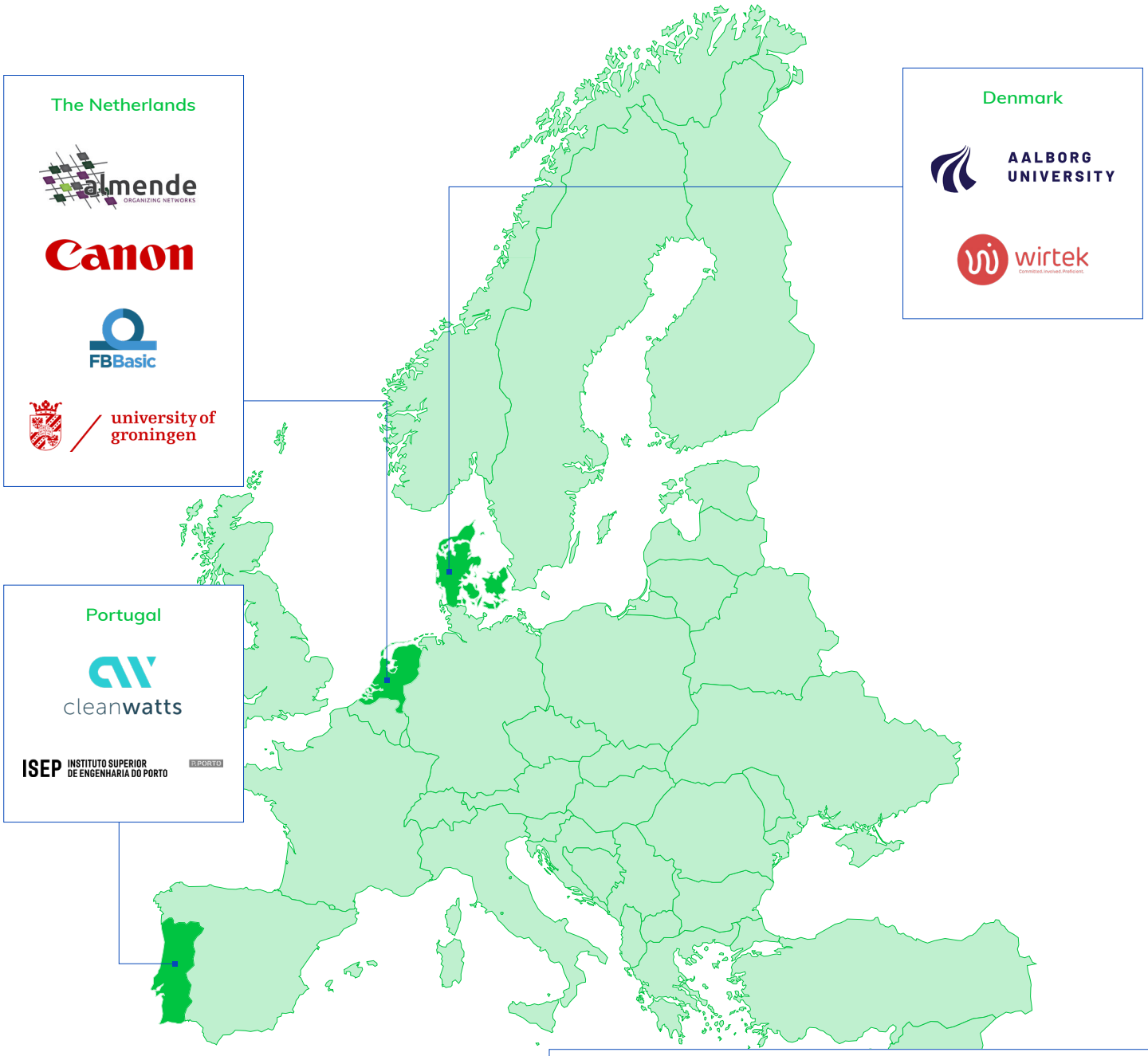


**Project start**
January 2025

**Project end**
December 2027

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**Project website**
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ITEA is the Eureka RD&I Cluster on software innovation, enabling a large international community of large industry, SMEs, start-ups, academia and customer organisations, to collaborate in funded projects that turn innovative ideas into new businesses, jobs, economic growth and benefits for society. ITEA is part of the Eureka Clusters Programme (ECP).

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