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Project Profile

MONA LISA

Hardware-software co-design across CPS lifecycles

By integrating hardware-software co-design across the lifecycle of cyber-physical systems (CPS), the ITEA project MONA LISA (Monitoring & Analytics for the Whole Lifecycle, from Concept to System Models, Hardware & Software) will improve diagnostics and validation across different environments.

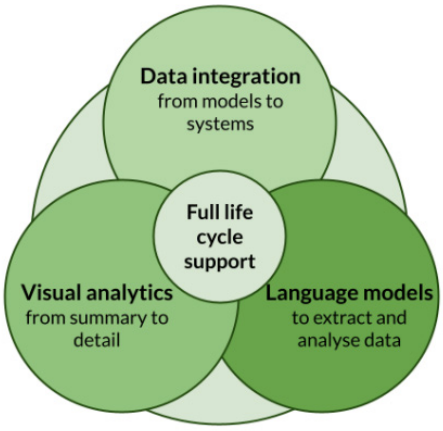
Addressing the challenge

CPS must be trustworthy, which requires explainability. However, their development is fragmented, focusing first on overall functionality, then on hardware and software, and then on integration. Across the system development lifecycle, this results in lost knowledge and unnecessary complexity, leading to extra effort, longer time to market and increased costs. Industry would instead benefit from a seamless flow across tools so that information from models connects directly to hardware and software behaviour.

Proposed solutions

To cover the entire lifecycle, MONA LISA will develop integrated system descriptions and analytics methods from design to production, thereby connecting and improving existing tools. The key element will be a visual analytics toolset to analyse and visualise the behaviour of models, hardware and software using data generated in the development and production of complex CPS. Model reengineering tools will also recover implicit and undocumented knowledge and provide abstraction from large quantities of trace and log data. By focusing on behaviour, the project will overcome the difficulty of comparing models with their software implementation or final system while making its innovations applicable to both proprietary and open-source software. Likewise, MONA LISA will visualise dynamic behaviour rather than static structure, providing a common basis for engineers who specialise in different areas to reason about the same problems. Finally, natural-language interfaces based on large language models and chatbots will bridge artifacts in different, often unstructured data formats and serve as a user-friendly interface for interacting with data visualisation.

This will make for a more efficient system development process, through which the project predicts a 30% faster release cycle. Simultaneously, models will be maintained and systems will be monitored in a more uniform manner, resulting in an up to 60% reduction in unscheduled system downtime or degradation. These are just a few benefits of full uptake of MONA LISA, which also intends to improve data accessibility, lower data labelling costs, reduce false anomaly detection and increase user satisfaction. In the process, contributions will be to open-source projects for visualising hardware and software trace data on a common, open toolset, while the new toolsets will be brought to market to provide advanced solutions not available today. This will help ensure the growth of a MONA LISA community that can apply the knowledge from this project to new generations of CPS.



Key innovations of MONA LISA

Projected results and impact

With MONA LISA, the consortium aims to achieve synergy between model design, analytics for design simulations, run time, visualisation, and explainability. An integrated system analysis will provide safety in monitoring and predictive analytics, allowing experts to validate behaviours in different settings and environments and thereby improve both internal diagnostics and product data gathering and usage.

Project partners

MONA LISA
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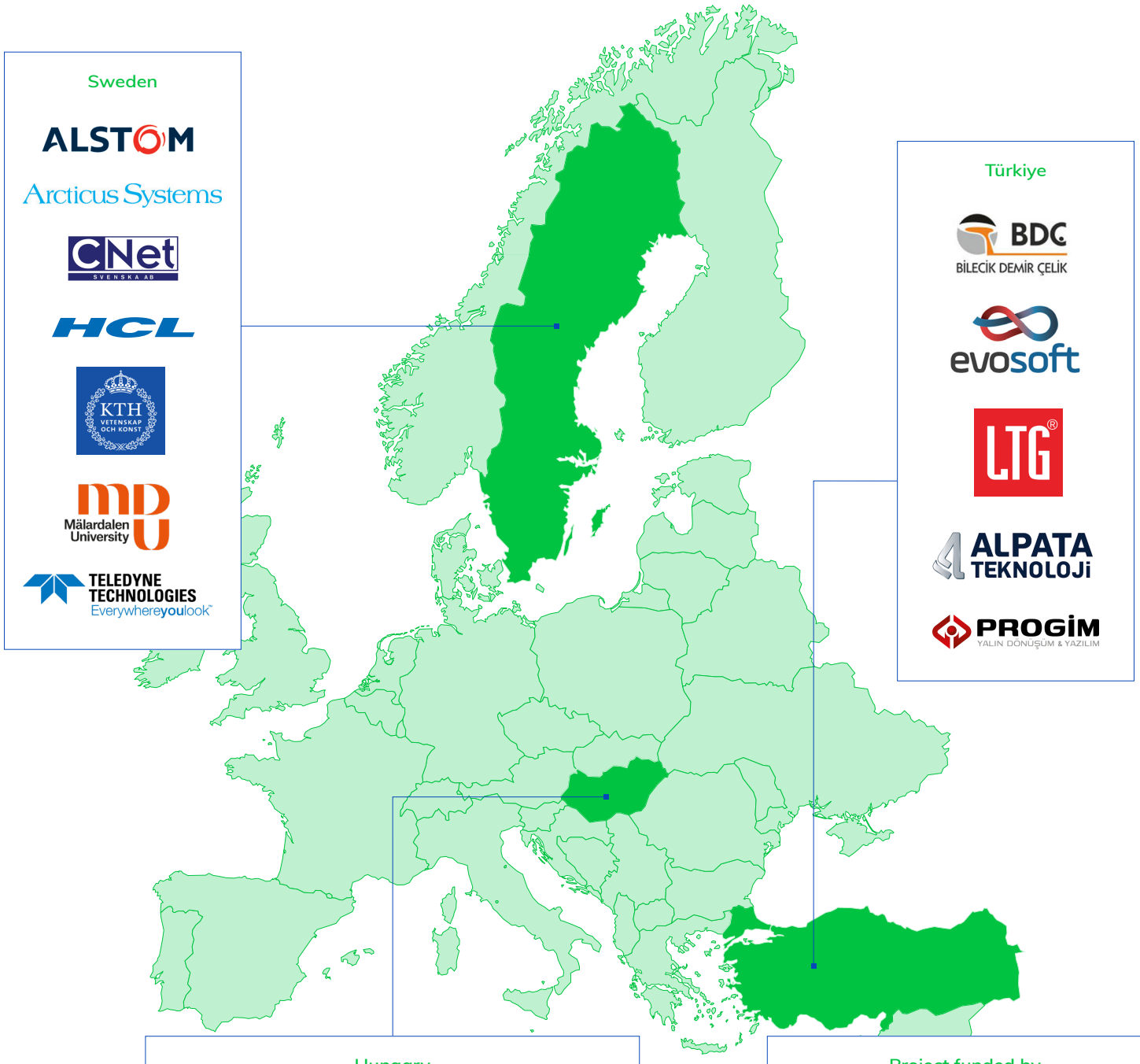

Project start
October 2024

Project end
September 2027

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Project website
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