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Project Profile

AISSI

Autonomous, integrated scheduling for semiconductor manufacturing

Digitalisation increases demand for microchips, shorter product lifecycles and a wider variety of customer-specific devices. Therefore, the Joint AI Call 2020 project AISSI (Autonomous Integrated Scheduling in Semiconductor Industry) will develop AI-based approaches to autonomous production and maintenance scheduling to improve semiconductor quality, efficiency and cost-effectiveness.

Addressing the challenge

Europe's semiconductor industry faces several challenges. As more markets require (high-performing) microchips and shorter product lifecycles, more high-mix, low-volume (HMLV) factories are needed to meet demand. This is coupled with additional demand from customers for higher turnarounds, better quality and increased competition due to the market's overall growth. Europe cannot compete with the US and Asia in production and economies of scale. The most effective way to outperform competitors is thus an improved scheduling strategy, but variance control, integration and real-time big data handling remain difficult.

Proposed solutions

AISSI aims to meet these challenges by creating intelligent solutions to perform autonomous decision-making and trigger real-time actions according to factory conditions. According to Figure 1, these will be combined into a system in which different AI algorithms enable a three-step cycle of improvement.

Firstly, data collection will distinguish between fab and customer data, which may be enriched and merged in real-time with an intelligent data transformation platform. Secondly, this data will be used to develop digital twins for analysis and forecasting, including production and maintenance monitoring, performance prediction and root cause analysis. Finally, the results will be used to integrate the digital twin into fab automation in order to steer production. This involves the creation of smart dispatching algorithms, optimisation triggers to be visualised in a control room or interface and deep learning algorithms to automatically propose and adjust parameter settings.

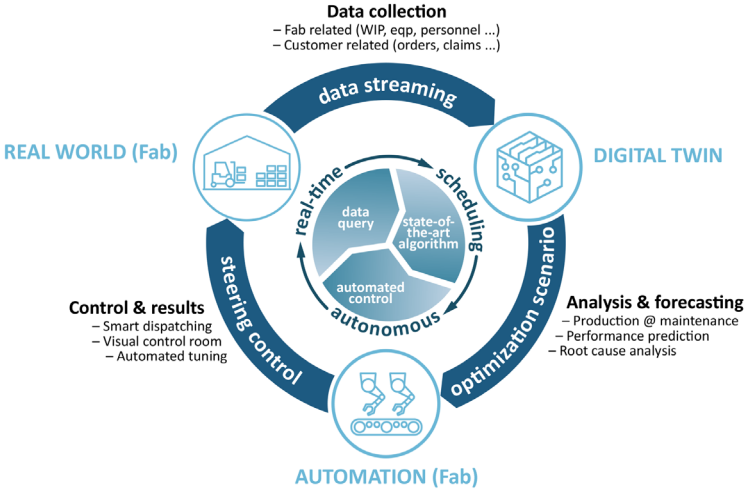


Figure 1. Real time production and maintenance scheduler framework based on the digital twin and automation technology.

This system of holistic information processing will support greater real-time capabilities and information consistency during manufacturing and a plug-in capacity for the deployment of new AI methods.

Projected results and impact

By developing both algorithms and software agents that are tailored to complex production, AISSI will provide a standardised approach for implementing AI solutions in operational environments. In doing so, it will bring many innovative technologies to higher technology readiness levels, including digital twins for complex manufacturing systems in semiconductor environments (TRL 8), augmented scheduling demonstrators (TRL 7), a neural network and simulation hybrid (TRL 6) and a scheduling engine (TRL 6). The exploitation of these technologies will help manufacturers to plan, produce and react to unprecedented demand, thereby strengthening the global market position of Europe's semiconductor industry.

Additionally, AISSI will offer digital SMEs access to extensive research testbeds to validate their solutions and potential paths to large-scale commercialisation, allowing them to generate new business cases in a semiconductor market worth approximately USD 543 billion in 2022.

Project partners

AISSI
20212

Singapore

SIMLAB Technologies

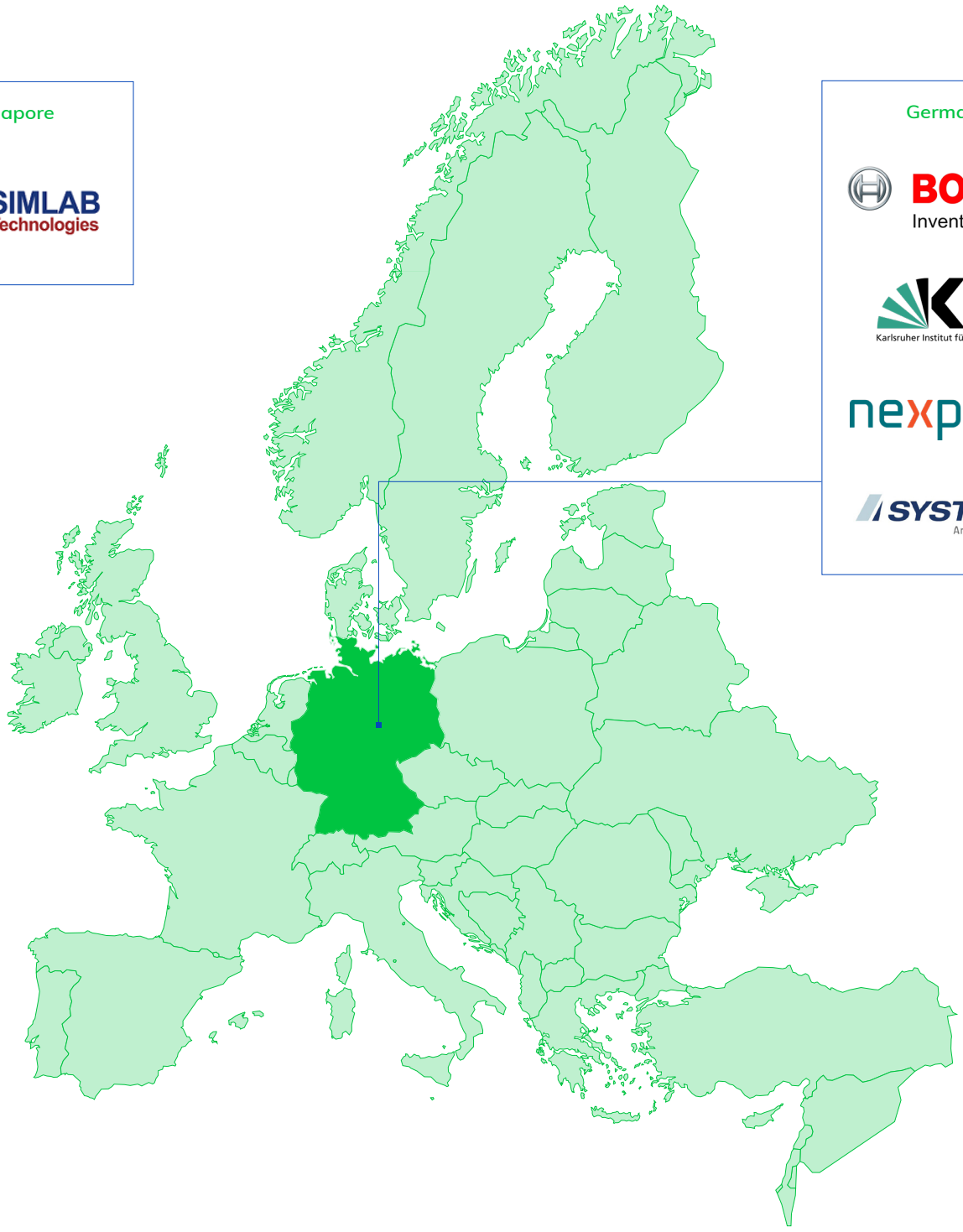
Germany

BOSCH
Invented for life

KIT
Karlsruher Institut für Technologie

nexperia

SYSTEMA
Art of Automation



Project start
June 2021

Project end
May 2024

Project leader
Andrej Gisbrecht, Robert Bosch

Project email
andrej.gisbrecht@de.bosch.com

Project website
https://aissi-project.com/en/

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