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Project Profile

AISSI

Autonomous, integrated scheduling for semiconductor manufacturing

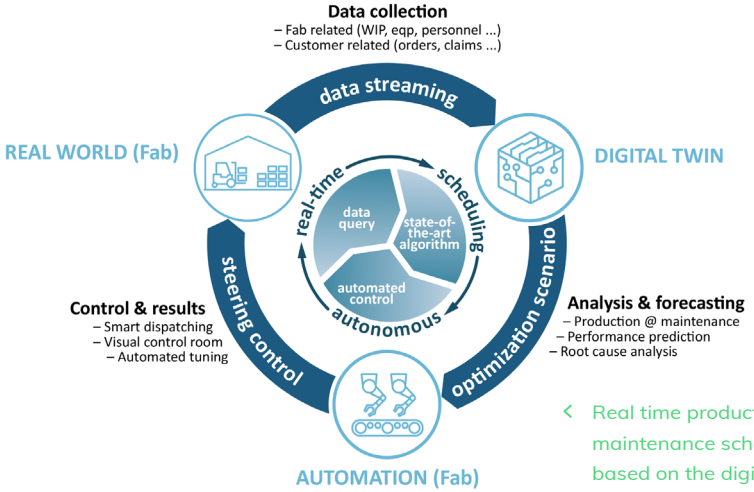
Digitalisation increases demand for microchips, shorter product lifecycles and a wider variety of customer-specific devices. Therefore, the Joint AI Call 2020 project AISSI (Autonomous Integrated Scheduling in Semiconductor Industry) will develop AI-based approaches to autonomous production and maintenance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

Addressing the challenge

European governments recently released the chips act, which aims to increase the bloc's share of global chips output to 20% by 2030. The target is even more ambitious since there is the expectation that the chip demand will double by 2030. Chips are an essential building block in a digitised world that fuels the production of a modern digital economy. Recent shortages of semiconductors showed the importance of having reliable suppliers to meet the demand from customers for higher turnarounds and 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. To meet the ambitious target by 2030, the existing and newly built factories can outperform competitors with an improved scheduling strategy that secures a highly optimised equipment utilisation.

Proposed solutions

AISSI is proposing an innovative scheduling system that uses a revolutionary strategy by harvesting the power of data and innovative digital solutions through AI system orchestration. The project relies on a few pillars, namely expert-based data collection, digital twins creation, factory representation solutions, AI agent development, and a robust infrastructure platform. The first pillar, data collection, is transforming and filtering the data based on expert knowledge, following the principle of trustable and explainable AI. In the second pillar, digital twins for analysis and forecasting, including production and maintenance monitoring, performance prediction, and root cause analysis, are developed based on expert applicable data. The third pillar, namely factory representation, a graph-based solution is designed to represent different states of the digital twin or the real fab. These factory states are needed and used in the fourth pillar, which, together with the factory-specific policies, are used to train the AI Agent. Finally, a robust IT infrastructure platform will orchestrate the exchange between these pillars to steer production.



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

Projected results and impact

The implications of having an AI Agent to steer the production will mark a new paradigm, in which the AI Agents will become state of the art in scheduling complex manufacturing sites like semiconductor plants. To gain an advantage over the competitors, European manufacturers must ensure this technology well in advance and show tangible final results in chip throughput. By developing these algorithm solutions, software agents, and software data platforms tailored to complex production, AISSI will provide a standardised approach for implementing 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.

Project partners

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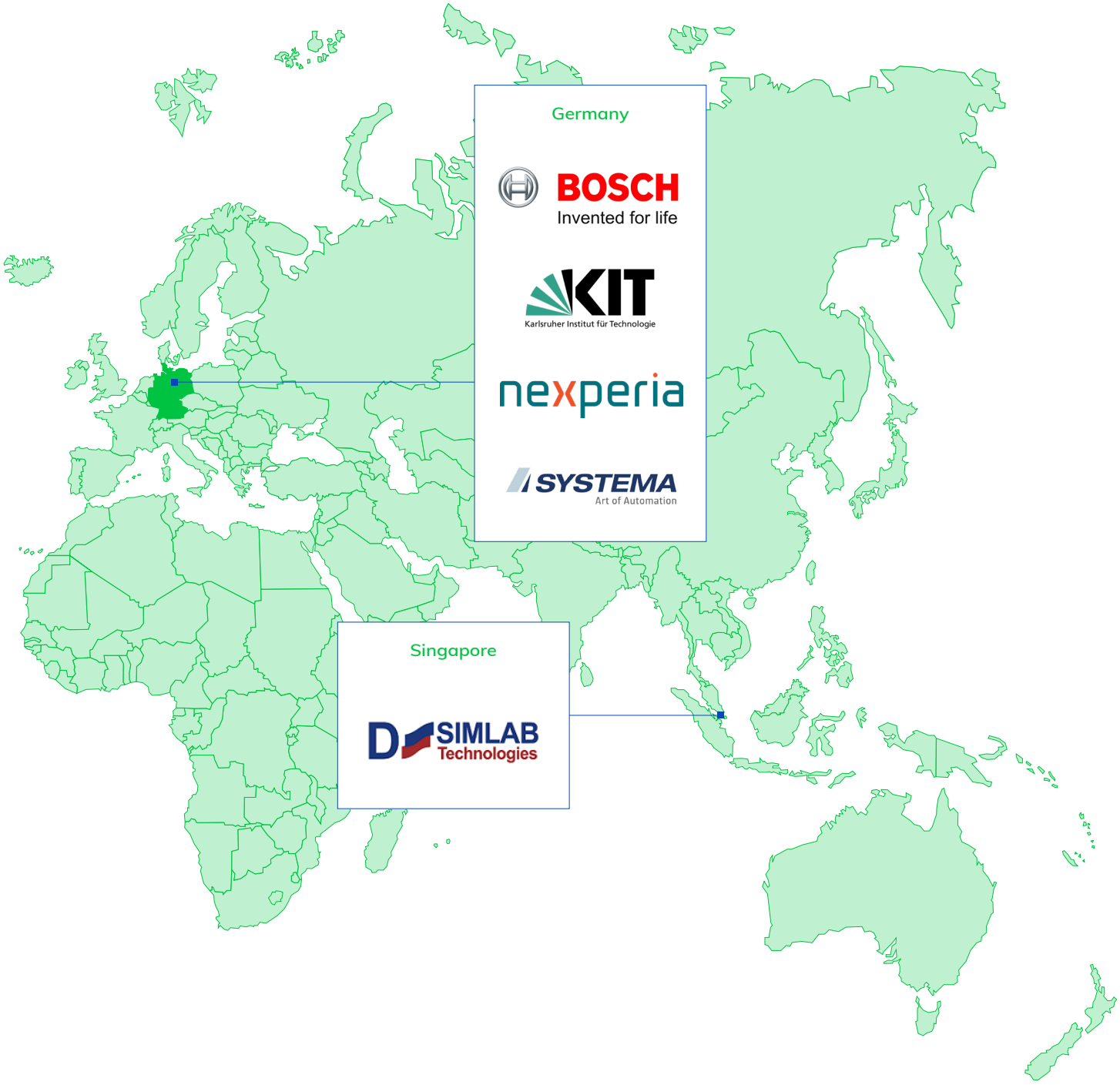

Project start
June 2021

Project end
May 2024

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