ITEA 4

Project Profile

VMAP analytics

A common standard for digital twins

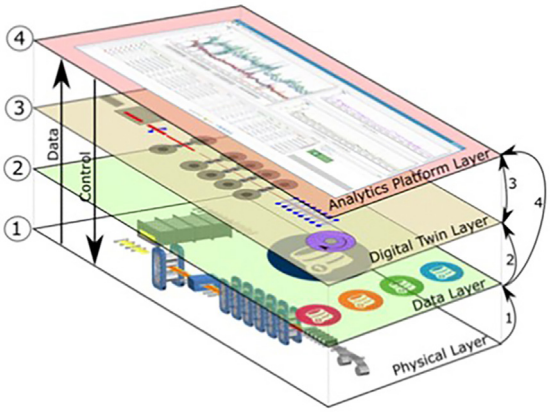
To realise smart digital twins for material and manufacturing design tasks, the ITEA project VMAP analytics (Smart Analytics for Multi-Scale Material and Manufacturing) will extend the existing VMAP standard with physics based models, sensor & measurement data and information from production machines, leading to shorter development times and improved product and process quality.

Addressing the challenge

Process and product improvements are often realised by analysing data from posterior sources, such as sensor data. As there is currently no common interface standard for digital twins in material and process engineering, untapped potential exists for a combined approach whereby posterior data enriches digital twins. However, various challenges make integration difficult, including incompatibility between data formats, missing data interface standards and a lack of common ontologies. The next step in manufacturing digitisation therefore lies in interoperability through the standardisation of information and formats.

Proposed solutions

Building on the vendor-neutral VMAP standard for Computer Aided Engineering (CAE), the VMAP analytics interface standard will accommodate physics based models, sensor & measurement data and information from production machines. This will allow software tools and machines to provide data for digital twins. By combining this with an open ontology framework for materials and manufacturing design tasks, the project will enable analytics and machine learning/artificial intelligence (AI) solutions to be applied to the data, leading to higher product quality and more efficient manufacturing processes. In doing so, VMAP analytics will demonstrate cross-domain commonalties on the need for greater standardisation and interoperability through four use-cases: (1) furnace control optimisation of reheating furnace (2) strip profile control in hot rolling (3) optimisation of degassing in steel melting and (4) digital twin based fluid structure interaction (FSI) testing of high-density polyethylene (HDPE) parts. The resulting best practices will be used to enrich the VMAP Standards Community (VMAP SC), a non-profit legal entity created by the earlier project.



Four layers of conceptual view.

Projected results and impact

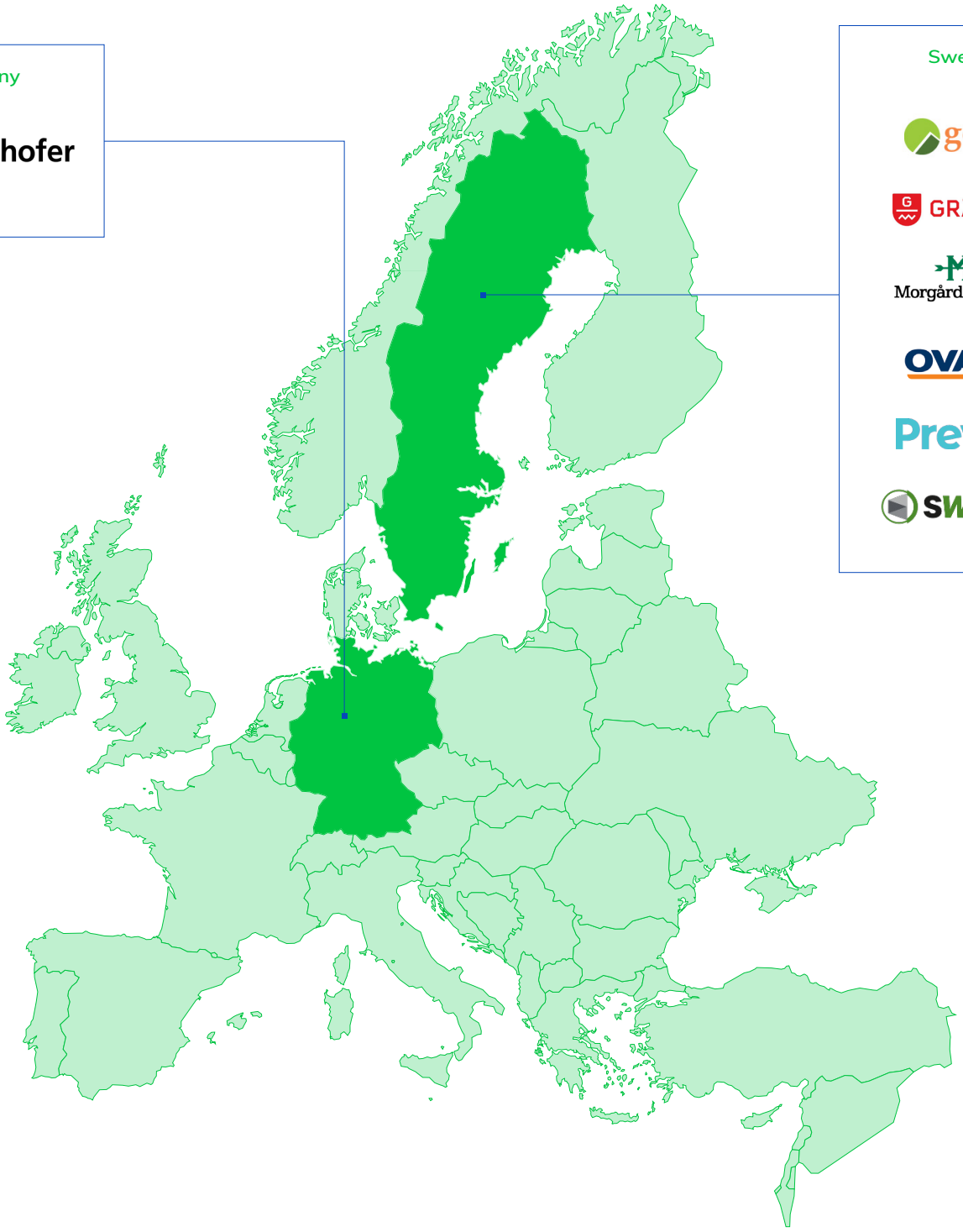
Digitalisation is vital to any materials and manufacturing company that wishes to maintain and advance its market position. Whereas this market is currently occupied by a few large players with software for different applications and sectors (roughly 78% of which is mono-functional), the extended VMAP interface standard aims to cover 80-90% of data items from digital twins, sensors, experiments and production machines per subdomain. Likewise, the open ontology will cover 90% of items, definitions and relations for use within smart digital twins for materials and manufacturing tasks, enabling a huge amount of data homogenisation. The benefits of this approach include faster, more precise solutions through the live monitoring of component placement machines, increased production efficiency through performance analysis & traceability and improved product and process quality through statistical analysis of the source of problems. By establishing a continuous development environment supported by AI and machine learning modules, VMAP analytics will allow companies to enter and expand a global digital twin market expected to be worth USD 26.07 billion by 2025 at a compound annual growth rate of 38.2%.

Project partners

VMAP analytics
19007

Germany

Fraunhofer



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GRÄNGES

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Project start
November 2020

Project end
April 2024

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