

# VMAP

## Enhancing interoperability in virtual engineering workflows



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A wide range of computer-aided engineering (CAE) software tools already enables virtual material and product design, virtual manufacturing and machining process parameterisation, and virtual product testing of high-tech materials. However, these tools are rarely interoperable and contain multiple native formats for storing the CAE data to be transferred between simulation codes, such as geometrical discretisation, simulation results and metadata. The ability to carry forward result data from one simulation step to another in a CAE software workflow has therefore always been dependent on customised data transfer solutions, which require a huge effort in terms of time and money.

The goal of the ITEA project VMAP, which ran from September 2017 until October 2021 with 29 industrial and academic partners from Austria, Belgium, Canada, Germany, the Netherlands and Switzerland, was to gain common understanding and interoperable definitions for the modelling of materials and manufacturing processes and to generate universal concepts and open software interface specifications for the exchange of simulation results information in CAE workflows.

## Impact highlights

- > The VMAP project has created the world's first CAE workflow interface standard for integrating multi-disciplinary and multi-software simulation processes in the manufacturing industry. This standard is vendor-neutral, cost-free and completely open. The first public version of the standard was announced by the VMAP project in January 2020, before the end of the project.
- > As a result of VMAP, Philips boosted the innovation speed of highly complex parts by almost 50%.
- > The time spent on strength assessments in the moulding of plastic parts by RIKUTEC Richter Kunststofftechnik in Germany has been reduced by 42%.
- > The set-up time for virtual process chains for lightweight automotive components with composites within a prominent German car manufacturer fell by 40%.
- > The VMAP Standards Community e.V. (VMAP SC) was created in December 2022 by 16 founding members and it currently contains more than 150 entities, including large players such as Bosch and Philips, and has good links with other standardisation groups such as Modelica/FMI, the European Material Modelling council and the ISO STEP 242 community.

## Project results

The VMAP project has created the world's first CAE workflow interface standard for integrating multi-disciplinary and multi-software simulation processes in the manufacturing industry and its major result is simple: setting up and adapting workflows in computer-aided engineering is now quicker, easier and more cost-effective than ever before. Thanks to the VMAP results, innovation speed can be increased up to 50%, the time spent on quality assessments can be reduced by more than 40% and the time needed for setting up virtual process chains can be reduced by 40%. In addition, VMAP significantly contributes to automation in highly interdisciplinary design processes as it seamlessly integrates into the respective tool chains. By eliminating the need for customised solutions, delays caused by human errors are also greatly reduced.

These examples clearly show that the introduction and use of format and interface standards increases software interoperability. Consequently, VMAP leads to significant savings in the creation and adaptation of process flows in virtual engineering. These reduced time expenditures

and the increased flexibility in virtual design can therefore help to increase the innovative strength of a company even in the short term.

The VMAP IO Library, which is provided free of charge, also enables software owners to adapt their own codes to this new standard with little effort and thus make them compatible with a growing number of other simulation tools.

## Exploitation

As a standard is only as strong as its users, the VMAP Standards Community e.V. (VMAP SC) was created in December 2022 by 16 founding members, including several partners that were attracted from outside of the consortium, with the purpose of disseminating the VMAP standard, further developing it and ensuring and maintaining a uniform interface development library. It currently contains more than 150 entities.

The current standardisation activities of the VMAP SC focus on the extension to support complete calculation models in the standard so that input parameters

and load cases for simulation models will soon be able to be stored neutrally and uniformly for as many simulation tools as possible.

Another focus is the consideration of real data from sensors and measurements, which are needed for the evaluation and validation of the virtual calculation models. More information about this can be found in the follow-up ITEA project VMAP analytics.

VMAP is the first-ever CAE workflow interface standard. One of its biggest strengths is therefore its rich potential, which the community seeks to exploit by extending the standard into technical domains beyond simulation for manufacturing parts. VMAP thus represents the tip of the iceberg: as the number of organisations involved in the community increases, so too will the number of engineering domains which can benefit from the faster processes and lower costs of CAE interoperability. ITEA is supporting the further development of this standard (through follow-up ITEA projects) to create a new 'string of pearls' – successes that have laid the foundations for ITEA to be just as, if not more, successful in the future in a number of key domains.

# VMAP

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### PROJECT LEADER

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### PROJECT START

September 2017

### PROJECT END

October 2020

### PROJECT WEBSITE

<https://itea4.org/project/vmap.html>

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