

ITEA VMAP – A Taxonomy for 3D CAE

A new Interface Standard for Integrated
Virtual Material Modelling in Manufacturing Industry

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ITEA VMAP

A Taxonomy for 3D CAE Modelling

ITEA VMAP - A new Interface Standard for Integrated Virtual Material Modelling in Manufacturing Industry

- ITEA 3 Call 3
 - <https://itea3.org/project/vmap.html>
 - September 2017 – September 2020
 - 29 Partners
 - 6 Countries
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Virtual Workflows in Manufacturing

- FEA (finite element based) solutions to model single manufacturing steps
- Integrated simulation workflows based on single-step FEAs to represent the whole manufacturing cycle and product process
- Various material classes
 - Plastics in injection moulding and blow-forming processes
 - Composites using RTM processes
 - Multi-step metal stamping processes
 - Additive manufacturing in plastic

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What is the intended purpose?

Establishing an International Standard for Data Exchange in CAE

- Standardized interface specification for the exchange of simulation results and local material properties in FEA based simulation workflows
- Applicable for various material and manufacturing domains
- Vendor neutral interface concept
- Expected benefits
 - Industrial end users shall be enabled to combine various FEA tools in a complex simulation workflow without any (major) interface problem
 - Commercial software vendors can save development time when focusing on an open interface standard

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Our representation level

Continuum Models in 3D

- VMAP focusses on (FEA based) continuum models
- Future extensions may also deal with meshless models and discrete particles

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Our representation concepts

Major classes in VMAP's continuum world are:

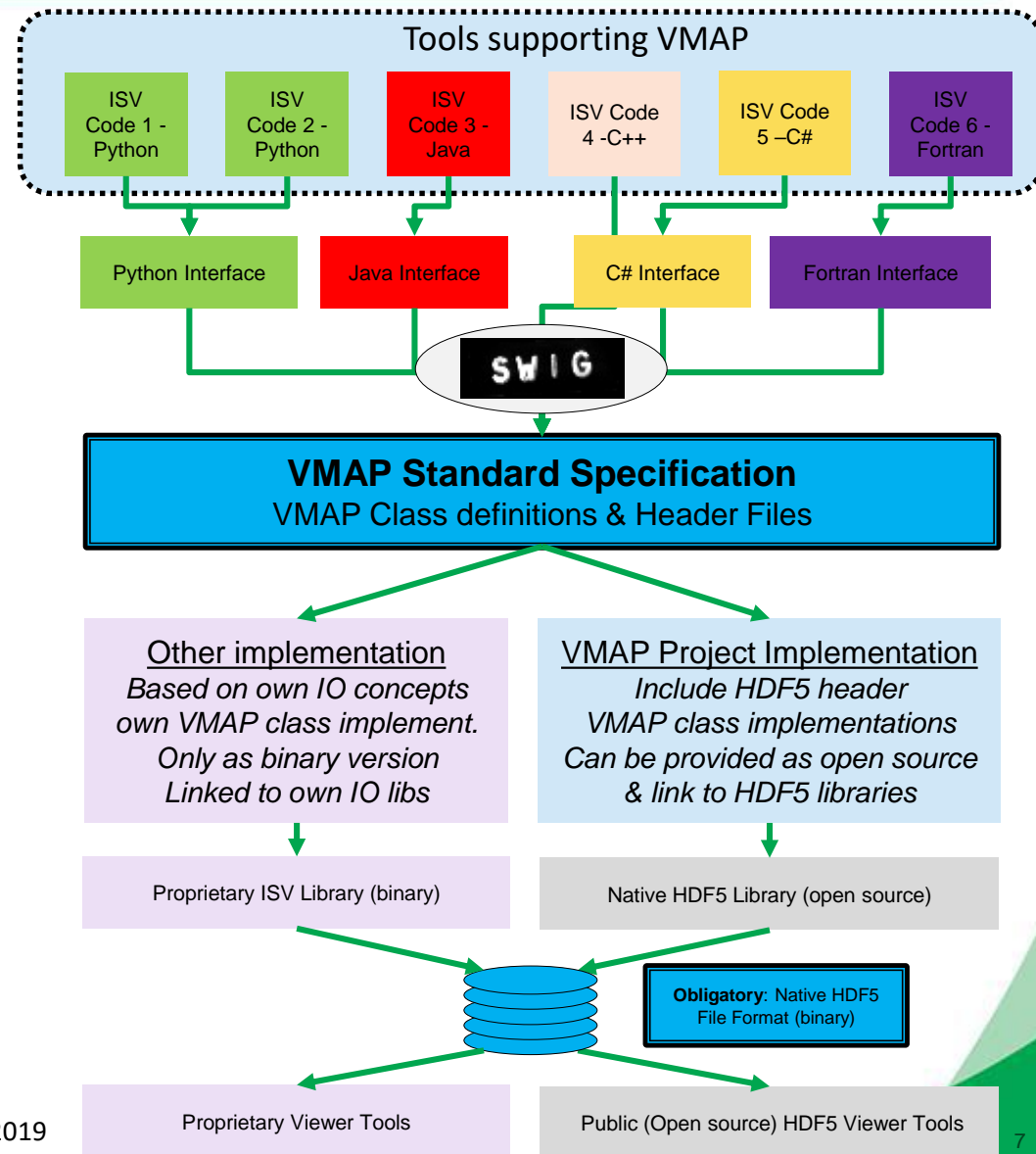
- Geometry definition
 - Coordinates and element definitions
 - Meshes or mesh hierarchies
- Local properties
 - Mostly defined as attributes per node or element instance
 - Numerical integration rules
 - Material properties
- Results
 - Results (temperature, stress, forces, ...) can be defined per node, element or integration point
 - Global / meta information – e.g. total energy

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Software levels

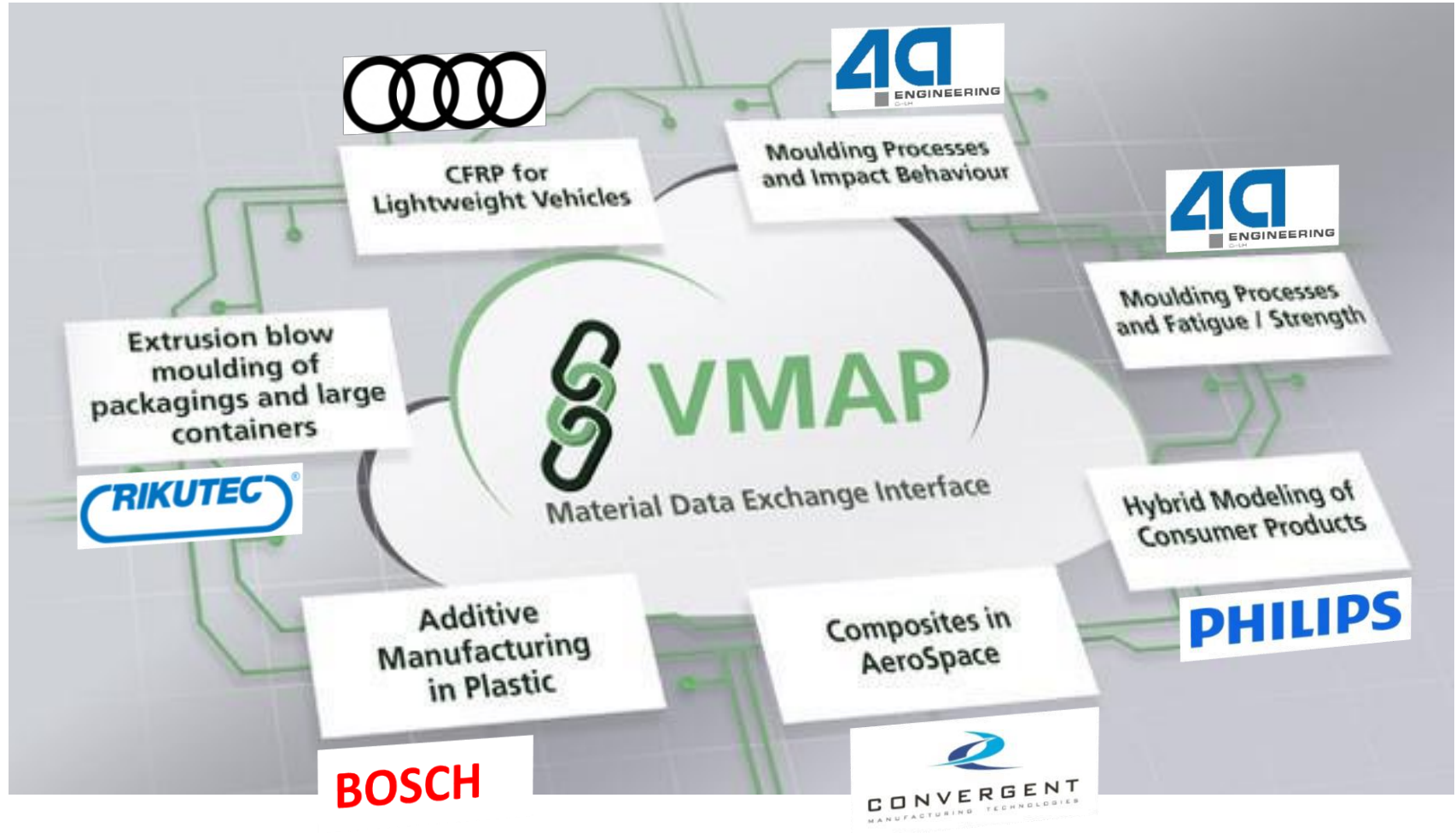
The VMAP interface will consist of:

- A set of class definitions and header files
- A specification of the underlying storage format
- A reference implementation will be realised in C++



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Industrial use cases



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Overlaps with other taxonomies?

Overlaps

- So far VMAP is limited to continuum mechanics processes
- Extensions towards micro-mechanics and integration of fine-grain models through multi-scale coupling should be the next steps

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<http://vmap.eu.com/>



HOME

VMAP – Virtual Material Modelling in Manufacturing

The ITEA VMAP project aims to gain a common understanding of, and interoperable definitions for, virtual material models in CAE.

Using industrial use cases from major material domains and with representative manufacturing processes, new concepts will be created for a universal material exchange interface for virtual engineering workflows.

ADDRESSING THE CHALLENGE

The lack of software standards in virtual engineering workflows and incompatible interfaces for the transfer of virtual material information not only cause additional costs and complex manual adaptation but also lead to inflexible IT solutions, loss of information and significant delays in the overall design process. The standardisation of material interfaces in CAE is therefore vital for all industry segments where material behaviour is central to product and process design.