ITEA VMAP – A Taxonomy for 3D CAE

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

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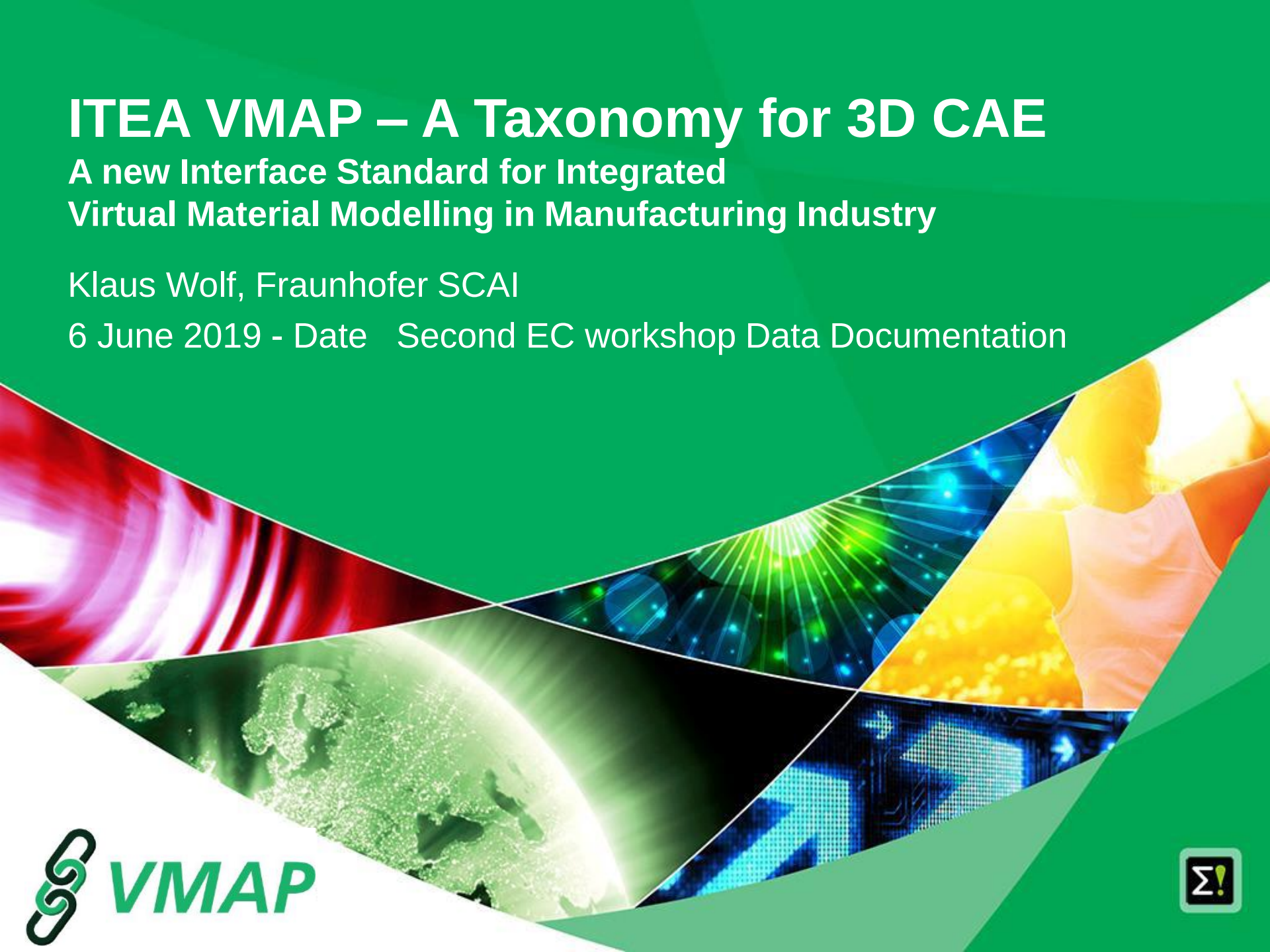

VMAP

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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Application Domain

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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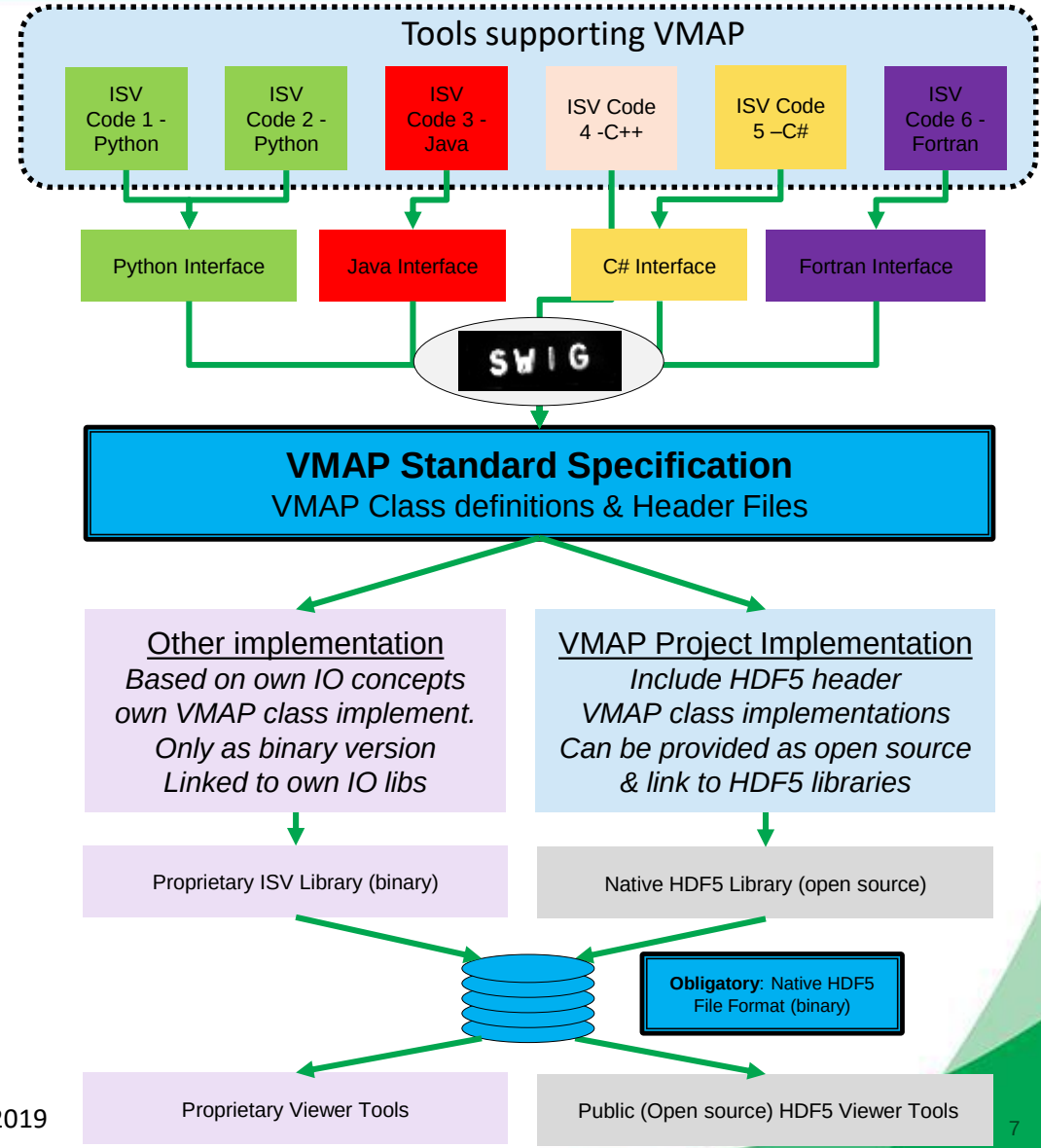
Software levels

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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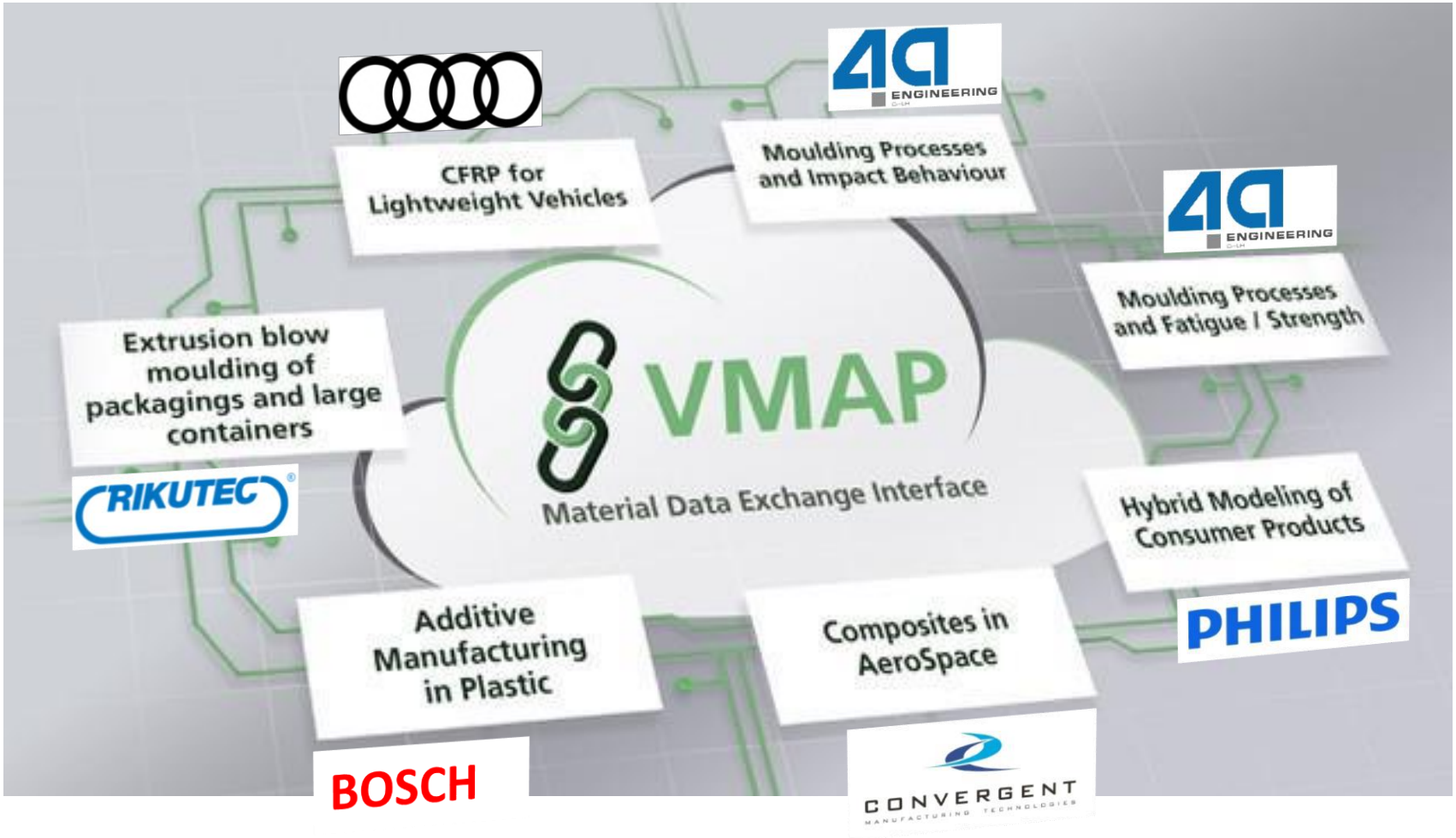
Industrial use cases



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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/