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

An ITEA 3 Call 3 collaboration project: 16010 VMAP

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<th>Project report</th>
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<tr>
<td><strong>Title</strong></td>
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Dissemination Level

<table>
<thead>
<tr>
<th>PU</th>
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<tr>
<td>PP</td>
<td>Restricted to other programme participants within ITEA</td>
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<td>RE</td>
<td>Restricted to a group specified by the VMAP consortium</td>
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<td>CO</td>
<td>Confidential, only for members of the VMAP consortium</td>
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Executive summary

Publications are an important part of the dissemination activity within the first year of the VMAP project (WP6.2). This is considered the best methodology of creating external interest in the project.

This report details the publications made by the VMAP project during the first year.

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Document status

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<th>Revision Number</th>
<th>Date</th>
<th>Author/Partner</th>
<th>Main changes</th>
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<tr>
<td>01</td>
<td>20/09/2018</td>
<td>Gino Duffett</td>
<td>New document</td>
</tr>
<tr>
<td>02</td>
<td>27/09/2018</td>
<td>Gino Duffett</td>
<td>Images added</td>
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<tr>
<td>03</td>
<td>28/09/2018</td>
<td>Gino Duffett</td>
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### Project acronyms

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<tr>
<td>CAE</td>
<td>Computer Aided Engineering</td>
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<tr>
<td>NAFEMS</td>
<td>NAFEMS is the International Association for the Engineering Modelling, Analysis and Simulation Community</td>
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<td>EMMC</td>
<td>European Materials Modelling Council</td>
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<td>MD</td>
<td>Molecular Dynamics</td>
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<tr>
<td>CFD</td>
<td>Computational Fluid Dynamics</td>
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<tr>
<td>FEM</td>
<td>Finite Element Method</td>
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<tr>
<td>CFRP</td>
<td>Carbon Fibre Reinforced Plastics</td>
</tr>
<tr>
<td>RTM</td>
<td>Resin Transfer Moulding</td>
</tr>
<tr>
<td>RVE</td>
<td>Representative Volume Element</td>
</tr>
<tr>
<td>CCMRD</td>
<td>The Canadian Composites Manufacturing R&amp;D Inc.</td>
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<tr>
<td>SFRT</td>
<td>Short Fibre Thermoplastics</td>
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<tr>
<td>LFRT</td>
<td>Long Fibre Thermoplastics</td>
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1. Introduction

Publications are an important part of the dissemination activity within the first year of the VMAP project (WP6.2). This is considered the best methodology of creating external interest in the project.

Different publicity methods were considered during this first year of the VMAP project: project leaflet, articles, adverts, conference presentations included in the proceedings and a conference banner. These are described in this report.
# 2. VMAP publications

The following sections describe the publications made during the first year of the VMAP project.

## 2.1. Project leaflet

An initial project leaflet was created by ITEA and this was used initially. However, the project partners changed and it was also felt that an individual leaflet was required. This leaflet was created by NAFEMS.

### Original ITEA leaflet (2 sides):

A large number of these leaflets were printed and distributed to conferences to be placed in the attendance packs, see also section 2.4.
This leaflet will be updated for years 2 and 3 of the project and references and logos of the local funding agencies will be added.
2.2. Articles

The following article was published in Benchmark, the international quarterly magazine published by NAFEMS (the magazine cover is shown as well). This article attracted much interest from external users and implementers alike.
2.3. Adverts

To promote the project during its initial stages adverts were also placed in the “NAFEMS German Online-Magazin” in the following editions.

March 2018:

![Advert Image]

July 2018:
VMAP project report D6.8
Rev. 03  28/09/2018

D6.8 Press publications during project
2.4. Extended abstracts included in conference proceedings

The project was presented at many conferences either as a presentation in a specific session or as a workshop or, in many cases, both. For this a specific extended abstract was written for inclusion in the proceeding when this was possible.

The following NAFEMS conferences were (and will be) attended:

- **24-25 April 2018 NAFEMS Nordic Conference (Göteborg, Sweden)**
  - Approximate attendance 130
  - Booth, Presentation, Discussion workshop, Leaflets, **Conference proceedings**.
  - Attending: Gino Duffett, Roger Oswald.

- **14-16 May 2018 NAFEMS DACH Conference (Bamberg, Germany)**
  - Approximate attendance 320
  - Booth, Presentation, Discussion workshop, Leaflets, **Conference proceedings**.
  - Attending: Klaus Wolf, Tim Morris, Roger Oswald.

- **5-7 June 2018 NAFEMS Americas’ CAASE 201 (Cleveland, OH, USA)**
  - Approximate attendance 600
  - Presentation, Discussion workshop, Leaflets, **Conference proceedings**.
  - Attending: Andrew Floyd.

- **17-18 July 2018 NAFEMS UK Conference (Milton Keynes, UK)**
  - Approximate attendance 280
  - Booth, Discussion workshop, Leaflets, Information, **Conference proceedings**.
  - Attending: Gino Duffett, Tim Morris, Ian Symington.

- **20-21 July 2018 NAFEMS India Conference (Bangalore, India)**
  - Approximate attendance 320
  - Presentation, Leaflets.
  - Attending: Tim Morris.

- **23 July 2018 NAFEMS ASEAN Conference (Singapore, SE Asia)**
  - Approximate attendance 80
  - Presentation, Leaflets.
  - Attending: Tim Morris.

- **08-09 October 2018 International CAE Conference (Vicenza, Italy) – future**
  - Expected attendance 700
  - Presentation, Leaflets.
  - Attending: Paul Steward.

- **14-15 November 2018 NAFEMS France Conference (Paris, France) - future**
  - Expected attendance 270
  - Presentation, Leaflets.
  - Attending: Tim Morris.
The same extended abstract was used, as follows:

**VMAP: Standardisation for Material Data Interfaces in CAE Workflows**

K. Wolf (Fraunhofer SCAI); G. Duffett (NAFEMS)

**Summary**

VMAP[1] is a project organised by ITEA[2], a EUREKA Cluster programme supporting innovative, industry-driven, pre-competitive R&D projects in the area of Software-intensive Systems & Services (SiSS). Project funding is realized by the related national research agencies. The project aims to develop a standard for the transfer of material data within complex Computer Aided Engineering (CAE) simulation workflows such as those found in virtual manufacturing simulation process and product design. It is considered that this can significantly benefit Europe’s future manufacturing market where material technology is a key factor, especially in the rapidly emerging market of additive manufacturing for metal and plastics.

**Project and Partners**

This 3-year project - started in September 2017 - is lead by Fraunhofer SCAI (Sankt Augustin, Germany) and has a total budget of approximately 16M€ for almost 123 person years effort. The collaboration will be between 30 partners from Austria, Belgium, Canada, Germany, Netherlands and Switzerland that includes manufacturing companies, software vendors, engineering companies, materials institutes and universities:

- Austria: 4a Engineering, Wittmann Battenfeld,
- Belgium: e-Xstream engineering,
- Canada: Convergent Manufacturing Technologies Inc.,
- Germany: AF-Color, Audi, Dr. Reinold Hagen Stiftung, DYNAmore, EDAG Engineering, ESI Software Germany, Fraunhofer SCAI, Hagen Engineering, inuTech, Karlsruhe Institute of Technology (KIT), Kautex Maschinenbau, NAFEMS Deutschland, RIKUTEC Richter Kunststofftechnik, Robert Bosch, Simcon kunststofftechnische Software,
- Netherlands: Delft University of Technology, DevControl, In Summa Innovation, KE-works, Materials innovation institute M2i, MSC Software Benelux, Philips, Reden, University Groningen,
- Switzerland: BETA CAE Systems International, Sintratec

**Project Work and Results**

The transfer of virtual material information within virtual engineering workflows between many incompatible interfaces currently causes much additional cost and complex manual adaptation leading to inflexible IT solutions, loss of information and significant delays in the overall design process. The standardization of material interfaces in CAE is therefore vital for all industry segments where material behaviour is central to product and process design.

The VMAP project will generate universal concepts and open software interface specifications for the exchange of material information in CAE workflows resulting in an open software interface standard.

The advantages of this integrated material handling will be demonstrated by the following industrial use cases from different material categories, manufacturing domains and industry segments (industrial end-user partners are shown in brackets):

- Extrusion blow moulding of plastic drums (Rikutec)
- Composites for lightweight automotive vehicles (Audi)
- Injection moulding of various components for different applications including fibre reinforced components for crash applications (4a Engineering)
- Additive manufacturing of plastic parts (Robert Bosch)
- Hybrid multiscale modelling for shaver products (Philips)
- Aerospace composite manufacturing (Convergent Manufacturing Technologies)

These simulation processes include many simulation stages including manufacturing process simulations up to product assessment simulations using approximately 20 different commercial softwares between them.

The implementation of extended CAE software interfaces will be realized including, where necessary, translation tools that follow the open interface specification.

**Conclusions**

Interoperable virtual material models and a seamless transfer of material data history in a CAE workflow will enable industrial users to develop and produce better products in a shorter timescale using more efficient manufacturing processes. Interface standards will also help CAE software developers and vendors to achieve further virtual material models that can easily be integrated into holistic design, simulation and optimization workflows. It is considered that this can significantly benefit Europe’s future manufacturing market where material technology is a key factor, especially in the rapidly emerging market of additive manufacturing for metal and plastics.

However, a standard needs to be supported continually and hence the project will establish an open and vendor-neutral ‘Material Data Exchange Interface Standard’ community that will provide best-practice guidelines for the community and will ensure that standardisation efforts continue into the future.

**References**


[2] ITEA is the EUREKA Cluster programme supporting innovative, industry-driven, pre-competitive R&D projects in the area of Software-intensive Systems & Services (SiSS). ITEA stimulates projects in an open community of large industry, SMEs, universities, research institutes and user organisations. As ITEA is a EUREKA Cluster, the community is founded in Europe based on the EUREKA principles and is open to participants worldwide. https://itea3.org

The presentation provided at the conferences is considered a presentation rather than a press publication and so is not included here. This may be obtained by contacting the report author.
2.5. Conference banner

For the booth or table that the project had at some conferences a banner was created to attract attention. The banner was simple in order to provide a good message.

Conference booth banner:
2.6. Website

A website was also created to inform the international community about the VMAP project. This will continually be updated and serve as the initial website for the VMAP Standardization Community.

The web is located at vmap.eu.com and the home page looks like the following. Here one can appreciate the pages that are included within the website informing people of the project, news, events, the use cases, project partners, the community, publications and any contacts if they wish to discuss any aspect of the project with us.
The website contains the “VMAP Standardization Community” website, vmap.eu.com/community, where all community activities and news will be published (see image below).

Examples:
- the VMAP questionnaire exists as a download on this page,
- The Community has already had its first Kick-off meeting on 20 September 2018 and information will soon be placed here (once the meeting summary has been agreed).
3. Conclusions

All publications made during the first year of the project have been presented. These have created much international awareness on the VMAP project and generated much interest and helped build the VMAP Standardization Community.

In the future years of the VMAP project similar press publications will be released and distributed. However, once the standard becomes more developed these will detail the technical advances made.