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

An ITEA 3 Call 3 collaboration project: 16010 VMAP

Project report	
Title	D6.8 Press publications during project
Author(s)	Gino Duffett
Organization	NAFEMS GmbH
Date	20/09/2018
Number	D6.8

Dissemination Level		
PU	Public	PU
PP	Restricted to other programme participants within ITEA	
RE	Restricted to a group specified by the VMAP consortium	
CO	Confidential, only for members of the VMAP consortium	

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.

Document status

Revision Number	Date	Author/Partner	Main changes
01	20/09/2018	Gino Duffett	New document
02	27/09/2018	Gino Duffett	Images added
03	28/09/2018	Gino Duffett	Images added

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Project acronyms

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

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):

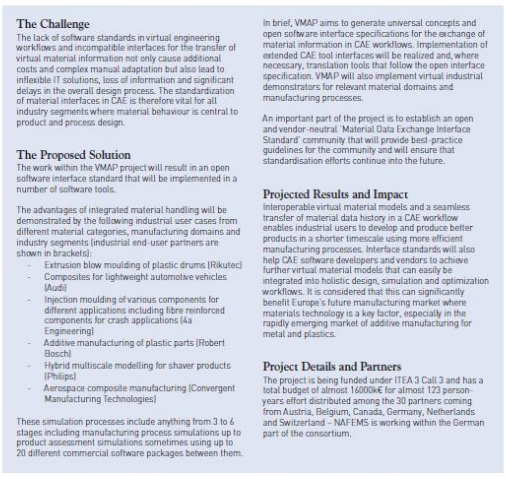
A large number of these leaflets were printed and distributed to conferences to be placed in the attendance packs, see also section 2.4.

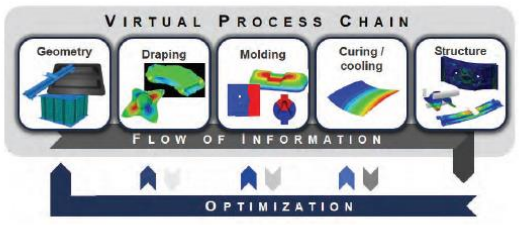
Published VMAP leaflet (2 sides):

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.





The project is being managed and led by Fraunhofer SCAI based in Sankt Augustin, Germany and includes the industrial case leader companies mentioned above as well as manufacturing companies, software vendors, engineering companies, materials institutes and universities forming the following project consortium:

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, DavControl, In Summa Innovation, KE-works, Materials innovation institute M2i, MSC Software Benelux, Philips, Reden, University Groningen,

Switzerland: BETA CAE Systems International, Sintratec.

Questionnaire and Community

During the next few months VMAP will be sending out a simple questionnaire to interested parties in order to gather information on as many simulation processes, and the material data transfer, as possible. This will enable the standardization process to be more open and far-reaching and encourage the participation of more software vendors. Following on from this the first 'Material Data Exchange Interface Standard' community meetings and communications will take place.

If you or your company is interested in the VMAP project please contact Dr. Gino Duffett of NAFEMS.
Gino Duffett, gino.duffett@nafems.org

21 22

[1] "Development and validation of a CAE chain for unidirectional fibre reinforced composite components", L. Kärger, A. Bernath, F. Fritz, S. Galkin, D. Magagnato, A. Oeckerath, A. Schön and F. Henning Composite Structures 132: 350–358, 2015.

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:

July 2018:

Bezug kostenlos - ISSN 2311-522X Juli 2018 – Nr. 2/2018, 46. Ausgabe

NAFEMS

Online-Magazin

Zeitschrift für numerische Simulationsmethoden und angrenzende Gebiete: FEM, CFD, MKS, VR / VIS, PROZESS, SDM

Fachbeiträge

DIGITALER ZWILLING

- **Simulationsbasierte Entwicklung von Werkzeugmaschinen**
  Dr. Binde Ingenieure Design & Engineering

STRUKTUROPTIMIERUNG

- **Über das Design von Gitterstrukturen für die additive Fertigung, basierend auf Topologieoptimierung**
  Siemens Industry Software / Materialise / Ghent University / Siemens Corporate Technology
- **Automatisierung der Strukturoptimierung für eine einfache und fehlerfreie Prozesskette**
  Universität Bayreuth

CFD – COMPUTATIONAL FLUID DYNAMICS

- **Nutzung von CFD Simulation zur Entwicklung innovativer Kühllösungen für Hochleistungsmodule**
  Danfoss Silicon Power / Mentor Graphics (Deutschland)

Topologie Optimierung zum Auffinden von **Zonen** für Lattice und Bulk unter Berücksichtigung der wahren Gittermaterialeigenschaften und der Herstellbarkeit

Rot: = Bulk
Blau: = Lattice

Post-Processing nach der Topologie Optimierung für rauhe Oberflächen

Erstellung von **Leichtbaustrukturen** unter Berücksichtigung des variablen lokalen Gitterdurchmessers basierend auf Ergebnissen der Topologieoptimierung

FE Verifikation des Designs für alle Lastfälle

NAFEMS World Congress 2019:
Call for Papers ab Anfang August
Abstracteinreichung bis 21.11.2018

www.nafems.org/congress

NWC NAFEMS WORLD CONGRESS 2019
17-20 JUNE | QUEBEC CITY | CANADA
A WORLD OF ENGINEERING SIMULATION

Incorporating the spdm INTERNATIONAL CONFERENCE Simulation Process & Data Management

Alle bisherigen Ausgaben kostenlos zum Download unter: www.nafems.org/magazin

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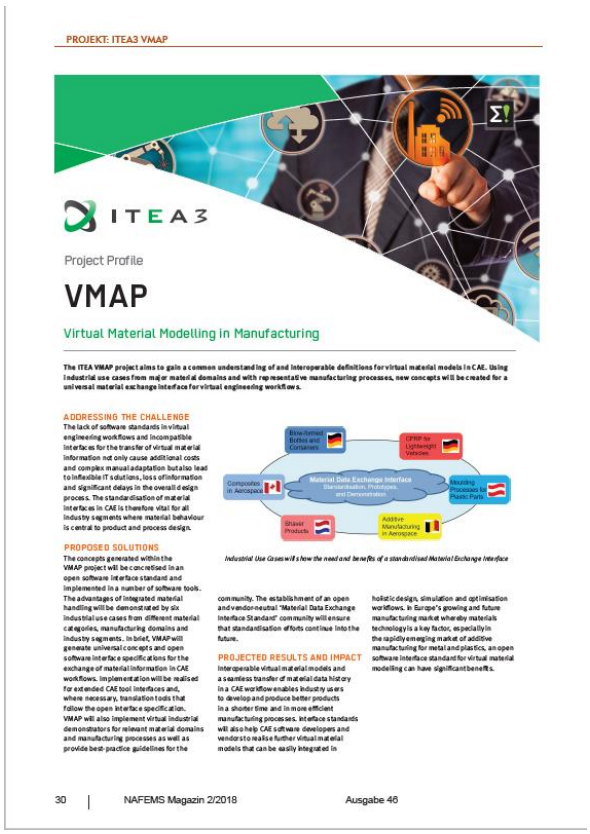

PROJEKT: ITEA3 VMAP

ITEA3

Project Profile

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.

Industrial Use Cases with how the need and benefits of a standardised Material Exchange Interface

PROPOSED SOLUTIONS

The concepts generated within the VMAP project will be concretised in an open software interface standard and implemented in a number of software tools. The advantages of integrated material handling will be demonstrated by six industrial use cases from different material categories, manufacturing domains and industry segments. In brief, VMAP will generate universal concepts and open software interface specifications for the exchange of material information in CAE workflows. Implementation will be realised for extended CAE tool interfaces and, where necessary, translation tools that follow the open interface specification. VMAP will also implement virtual industrial demonstrators for relevant material domains and manufacturing processes as well as provide best-practice guidelines for the community. The establishment of an open and vendor-neutral "Material Data Exchange Interface Standard" community will ensure that standardisation efforts continue into the future.

PROJECTED RESULTS AND IMPACT

Interoperable virtual material models and a seamless transfer of material data history in a CAE workflow enables industry users to develop and produce better products in a shorter time and in more efficient manufacturing processes. Interface standards will also help CAE software developers and vendors to realise further virtual material models that can be easily integrated in holistic design, simulation and optimisation workflows. In Europe's growing and future manufacturing market whereby materials technology is a key factor, especially in the rapidly emerging market of additive manufacturing for metal and plastics, an open software interface standard for virtual material modelling can have significant benefits.

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PROJEKT: ITEA3 VMAP

Project start
September 2017

Project leader
Klaus Wolf, FraunhoferSCAI

Project website
https://itea3.org/project/vmap.html

Project end
September 2020

Project email
klaus.wolf@scai.fraunhofer.de

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

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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.

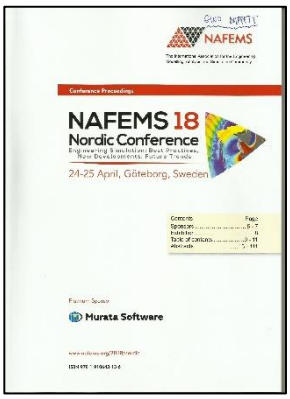
The following NAFEMS conferences were (and will be) attended:

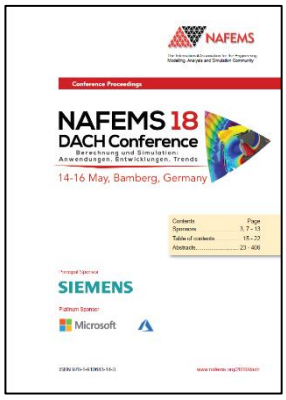
24-25 April 2018 NAFEMS Nordic Conference (Göteborg, Sweden)
- Approximate attendance 130
- Booth, Presentation, Discussion workshop, Leaflets, **Conference proceedings.**
- Attending: Gino Duffett, Roger Oswald.

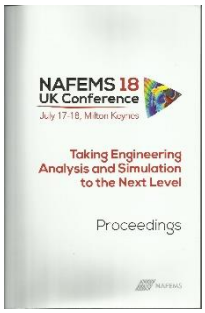
14-16 May 2018 NAFEMS DACH Conference (Bamberg, Germany)
- Approximate attendance 320
- Booth, Presentation, Discussion workshop, Leaflets, **Conference proceedings.**
- Attending: Klaus Wolf, Tim Morris, Roger Oswald.

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 Inferfaces 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 Fraunhaufer 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 Sofware 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 user 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

[1] ITEA3 Call 3 - 16010 VMAP – A new Interface Standard for Integrated Virtual Material Modelling in Manufacturing Industry. www.vmap.eu.com 2017.

[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

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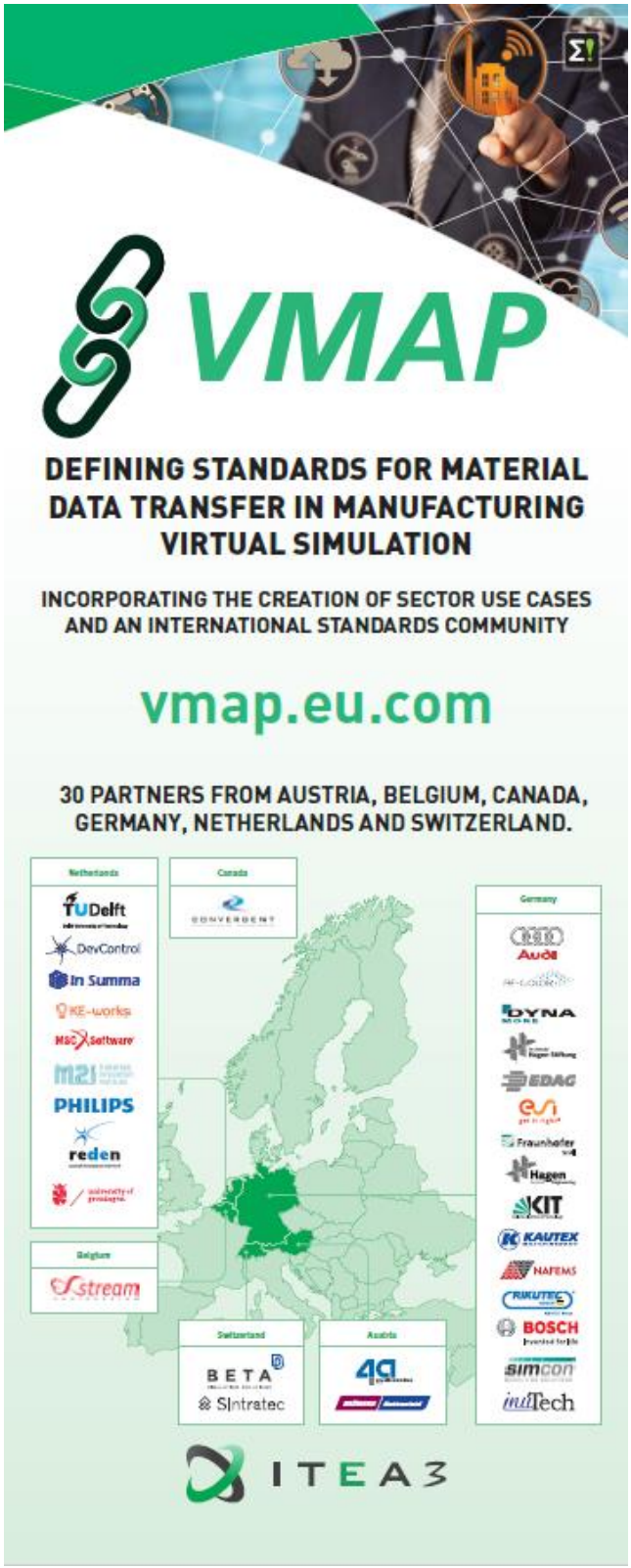
The presentation provided at the conferences is considered a presentation rather than a press publication and so is not included here. This may be obtained by contacting the report author.

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 pro ide 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.

Home News Events Use Cases Project Project Partners Community Publications Contact

HOME

VMAP – Virtual Material Modelling in Manufacturing

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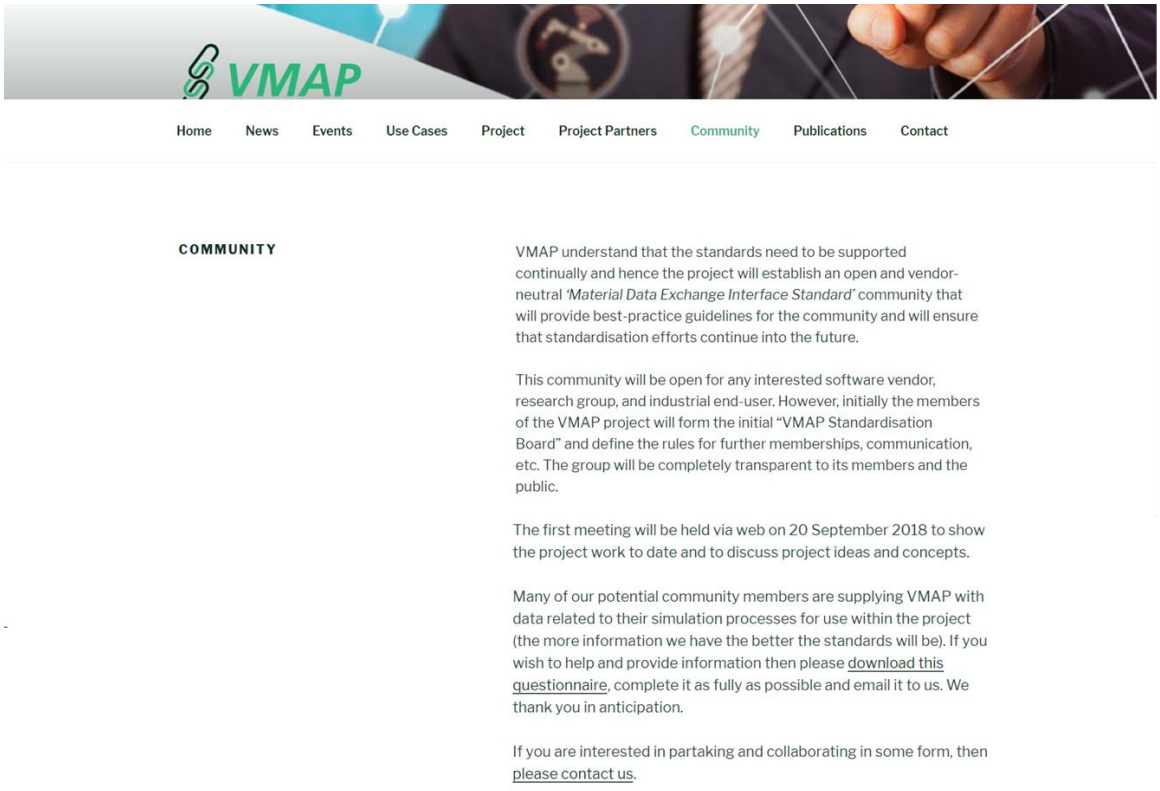
The website contains the “VMAP Standardization Community” website, vmap.eu.com/community, where all community activities and news will be published (see image below).
Examples:

- 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 (one 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.