



DIGITAL SOLUTIONS

# INTERNATIONAL INDUSTRIAL ONTOLOGIES WORKSHOP

4-7 February 2019

DNV GL Headquarters and University of Oslo, Norway

Hosted by DNV GL in cooperation with:

The Industrial Ontology Foundry (IOF) and SIRIUS (Centre for Scalable Data Access - University of Oslo)



**SIRIUS**

# AGENDA

## DAY 1 - Monday 4 February - International industrial ontologies conference

DNV GL Headquarters

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|-------|---|
| 08:30 | <b>REGISTRATION AND COFFEE</b>  |
| 09:00 | Introduction and HSE  |
| 09:10 | Welcome from DNV GL<br><i>Peter Bjerager, CEO Digital Solutions, DNV GL</i>   |
| 09:20 | Industry needs, leading practice and vision for the future<br>Equinor (Norwegian Oil & Gas Company) is an early adopter of ontologies and a major sponsor of a Joint Industry Project (READI) applying ontologies across the oil and gas supply chain in the Northern Sea operations<br><i>Robert Skaar, Senior Digitalization Project Manager, Equinor</i>   |
| 09:45 | An open, shared reference ontology framework for the manufacturing community<br><i>Prof. Barry Smith, Founder and Director of the National Centre for Ontological Research, University of Buffalo</i>   |
| 10:10 | Panel discussion: Building the global platform <ul style="list-style-type: none"><li>▪ Professor Michael Gruninger, Semantics Technology Lab, University of Toronto and IOF Technical Oversight Board</li><li>▪ Nicola Guarino, Director of ISTC - CNR Laboratory for Applied Ontology and IOF Governance Board</li><li>▪ Jim Wilson - OAGi and AgGateway (USA), Chairman of the IOF Board</li><li>▪ Dr. Todd Schneider, Engineering Semantics (USA) and IOF Technical Oversight Board</li></ul> <i>Moderated by Prof. Melinda Hodkiewicz, University of Western Australia</i>  |
| 10:50 | <b>COFFEE AND NETWORKING BREAK</b>  |
| 11:20 | European Commission activities in ontology developments in the framework of industrial commons<br><i>Ernest Ćutuk, Policy Officer, DG Research and Innovation, European Commission</i>  |
| 11:45 | Panel discussion: Ontologies for industries <ul style="list-style-type: none"><li>▪ Fernando Mas, representative of Airbus in the IOF GB</li><li>▪ Per Olav Opdahl, Information Architect at Aker Solutions</li><li>▪ Sebastian Bader, Enterprise Information Systems at Fraunhofer Institute for Intelligent Analysis and Information Systems IAIS</li><li>▪ Richard A. Beeson III, Chief Technology Officer at OSISoft</li><li>▪ Jean-Charles Leclerc, Total, Quantum program (Digital Plant)</li><li>▪ Dr. Maja Milicic Brandt, Siemens AG, Corporate Technology, Munich</li></ul> <i>Moderated by Dr. Evgeny Kharlamov, Research Scientist, Bosch Center for Artificial Intelligence</i>  |
| 12:30 | <b>LUNCH</b>  |
| 13:30 | Ontology for engineering and procurement<br><i>Berit Gjellan, VP Resources Field Development, Aibel</i>   |
| 13:55 | OPC UA and semantics<br><i>Jouni Aro, CTO, Prosys OPC</i>   |
| 14:30 | <b>COFFEE AND NETWORKING BREAK</b>  |
| 14:50 | Panel discussion: Collaboration on reference data <ul style="list-style-type: none"><li>▪ Per Arne Røstadsand, Chair of the Sector Board Petroleum Industry, The Norwegian Oil and Gas Association/Equinor</li><li>▪ Nils Sandmark, General Manager, POSC Caesar Association</li><li>▪ Kari Anne Haaland Thorsen, EPIM</li><li>▪ Helge Dahl-Jørgensen, Special advisor - Industry collaboration, Digital Norway</li><li>▪ Markus Stumptner, Professor, University of Southern Australia</li><li>▪ Sigve Pettersen, Product Manager, buildingSMART Data Dictionary, buildingSMART International</li><li>▪ Mara Abel, Professor, Universidade Federal do Rio Grande do Sul   UFRGS - Institute of Informatics</li></ul> <i>Moderated by Prof. Melinda Hodkiewicz, University of Western Australia</i> |
| 15:55 | Panel discussion: Ontology-based standards and interoperability <ul style="list-style-type: none"><li>▪ Gerhard Goldbeck, EMMC</li><li>▪ Dr. Dave Raggett, W3C</li><li>▪ Prof. Barry Smith, Founder and Director of the National Centre for Ontological Research, University of Buffalo</li><li>▪ Yves Keraron, President, ISADEUS</li><li>▪ Ian Horrocks, Professor, University of Oxford</li></ul> <i>Moderated by Dr. Johan Wilhelm Klüwer, Principal Specialist, DNV GL</i>   |

## AGENDA CONTINUED

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| 16:45         | A view of the (near) future and next steps<br><i>Johan Kluwer and Melinda HodkiewiczL</i> |
| 16:55 - 17:00 | Practicalities for the days to follow   |

## DAY 2 - Tuesday 5 February - Parallel ontology workshops

DNV GL Headquarters

|              | <b>WORKSHOP 1 - Ontology-based requirements management, with application to system engineering standards</b>  | <b>WORKSHOP 2 - Ontology of the industrial plant: OWL models for lifecycle reasoning</b>   | <b>WORKSHOP 3 - Industry Ontology Foundry (IOF)</b>  |
|--------------|---|--|--|
| <b>09:00</b> | <p>The workshop aims to shed light on the use of ontologies to express and verify requirements. How can it aid requirements writing, and produce better and more consistent sets of requirements? How can requirements expressed in ontologies be used to verify asset models?</p> <p>Two representatives from acquirer and supplier organizations respectively, are invited to inform on how requirements and verification are managed in the industry today. Additionally, a short presentation of the READI project will be given. The discussion should revolve around the feasibility and benefits of using ontologies to express and verify requirements - pro et con.<br/><i>Chair: Atle Kvalheim, Chief Specialist, DNV GL</i></p>  | <p>How can we model the industrial plant in ontology? We want a faithful representation that supports automated reasoning over functional and material aspects for the entire plant lifecycle. The workshop will focus on the crucial notion of "functional location" or "tag". We address core modelling challenges, and demonstrate an approach to overcoming the lack of temporal reasoning in the OWL 2 language.<br/><i>Chair: Prof. Arild Waaler, SIRIUS - University of Oslo</i></p>  | <p>Hands-on session that will explore use cases that motivate applications of the shared ontologies in IOF.<br/><i>Chair: Michael Gruninger, Professor, Semantics Technology Lab. University of Toronto and IOF Technical Oversight Board</i></p>  |
| <b>12:00</b> | <b>LUNCH</b>  |  |  |
|              | <b>WORKSHOP 4 - Maintenance - making industrial ontologies work for maintenance</b>   | <b>WORKSHOP 5 - Ontology patterns in practice</b>  | <b>WORKSHOP 6 - Ontologies for manufacturing and logistics</b>   |
| <b>13:00</b> | <p>Many groups have developed ontologies for the maintenance domain, e.g. for work management, FMEA, predictive maintenance or as part of larger asset lifecycle management efforts. This workshop brings together practitioners to identify ways in which we can share terminology, ontologies, axioms, and use cases to accelerate the uptake of ontologies for querying maintenance data. ROMAIN, a reference ontology for maintenance, and current work by the IOF maintenance working group will be described. Any participant with a maintenance ontology they wish to share is invited to contact the coordinator ahead of the workshop. The goal of the workshop is to identify collaborative opportunities to deliver business value through liberating information locked in maintenance and engineering databases.<br/><i>Chair: Melinda Hodkiewicz, UWA</i></p> | <p>A major bottleneck for the successful adoption of ontology-based information systems in industry is the construction and maintenance of large-scale ontologies. This tutorial will introduce Reasonable Ontology Templates (OTTR), a framework for ontology construction and maintenance based on efficient representation and instantiation of modelling patterns.</p> <p>The participants will learn how such ontology abstraction mechanisms can be beneficial for building, interacting with, and maintaining large-scale ontologies. The tutorial will consist of presentations and plenary and individual exercises using open source tooling. Participants who wish to take part in the individual exercises should bring a laptop with Java 8 installed.<br/><i>Chair: Martin Georg Skjæveland, SIRIUS - University of Oslo</i></p> | <p>The use of ontologies and semantic technologies in engineering applications and more particularly in manufacturing and logistics, is gaining in importance and popularity, while at the same time it seems to generate a lot of controversy in discussions within scientific and engineering communities. A number of Working Groups (WGs) inside IOF have been created to share experiences in this field and the various challenges faced in using ontologies and related tools. The goal of this workshop is to introduce current research topics in manufacturing and logistics discussed in the respective IOF WGs and the motivations for the development and application of ontologies and semantic technologies in this domain.<br/><i>Chair: Dimitris Kiritsis, EPFL</i></p> |

## DAY 3 - Wednesday 6 February - Industrial Ontology Foundry Meeting

SIRIUS Centre - University of Oslo

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| 09:00 | <b>Introduction and overview</b><br><i>International Ontologies Foundry (IOF)</i>  |
| 09:30 | <b>Report from the Governance Board</b><br>In this session, the IOF Governance Board will report on their work in several areas: <ul style="list-style-type: none"><li>▪ Establish IOF goals</li><li>▪ Oversee a process to select foundational ontology</li><li>▪ Oversee a process to define a domain-group-establishment process</li><li>▪ Legally establish the IOF</li></ul> <i>Jim Wilson, President, Open Applications Group (OAG)</i>  |
| 10:30 | <b>COFFEE AND NETWORKING BREAK</b>   |
| 11:00 | <b>Choosing a foundational ontology for IOF</b><br><i>Chris Will, CTO, Delmia division of Dassault Systèmes SA and Boonserm Kulvatunyo, NIST</i>   |
| 12:30 | <b>LUNCH</b>   |
| 13:30 | <b>A foundationless approach to IOF</b><br><i>Michael Gruninger, Professor, University of Toronto</i>  |
| 15:00 | <b>COFFEE AND NETWORKING BREAK</b>   |
| 15:30 | <b>Reports from Bottom-Up groups: Progress and challenges</b><br>The IOF has four working groups. Each working group will report on the progress made since the last meeting to identify core concepts in their focus area, develop definitions and resolve technical issues <ul style="list-style-type: none"><li>▪ Supply chain (Farhad Ameri, Associate Professor, Texas State University)</li><li>▪ Maintenance (Melinda Hodkiewicz, Professor, University of Western Australia)</li></ul> <i>IOF Team</i> |

## DAY 4 - Thursday 7 February - Industrial Ontology Foundry Meeting

SIRIUS Centre - University of Oslo

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| 09:00 | <b>Reports from Bottom-Up Groups: Progress and challenges</b><br>The IOF has four working groups. Each working group will report on the progress made since the last meeting to identify core concepts in their focus area, develop for specific notions and resolve technical issues <ul style="list-style-type: none"><li>▪ Production planning and scheduling (Dusan Sormaz, Professor, Ohio University)</li><li>▪ Product service system (Dimitris Kiritsis, Professor, EPFL Lausanne)</li></ul> <i>IOF Team</i> |
| 10:30 | <b>COFFEE AND NETWORKING BREAK</b>   |
| 11:00 | <b>Technical principles and outstanding technical challenges</b><br>In order to meet the goals of interoperable and modular reference ontologies there needs to be consistency among the ontologies created. In addition to ontological consistency there is also a need for a 'technical' consistency. We will review the technical principles adopted by the IOF.<br><i>Dr. Todd Schneider, Engineering Semantics, LLC</i>   |
| 12:30 | <b>LUNCH</b>   |
| 13:30 | <b>Discussion and next steps</b><br>In this session, plans for the next year for the various IOF groups and Board will be identified and allocated.<br><i>Michael Gruninger, Professor, University of Toronto</i>  |
| 15:00 | <b>COFFEE AND NETWORKING BREAK</b>   |
| 15:30 | <b>New roadmap</b><br><i>IOF Team</i>  |