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# On the Move to Meaningful Internet Systems

## OTM 2018 Workshops

Confederated International Workshops: EI2N, FBM,  
ICSP, and Meta4eS 2018  
Valletta, Malta, October 22–26, 2018  
Revised Selected Papers

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## **General Co-chairs and Editors' Message for OnTheMove 2018**

The OnTheMove 2018 event held during October 22–26 in Valletta, Malta, further consolidated the importance of the series of annual conferences that was started in 2002 in Irvine, California. It then moved to Catania, Sicily, in 2003, to Cyprus in 2004 and 2005, Montpellier in 2006, Vilamoura in 2007 and 2009, in 2008 to Monterrey, Mexico, to Heraklion, Crete, in 2010 and 2011, Rome 2012, Graz in 2013, Amantea, Italy, in 2014, and lastly in Rhodes in 2015, 2016, and 2017 as well.

This prime event continues to attract a diverse and relevant selection of today's research worldwide on the scientific concepts underlying new computing paradigms, which of necessity must be distributed, heterogeneous and supporting an environment of resources that are autonomous yet must meaningfully cooperate. Indeed, as such large, complex, and networked intelligent information systems become the focus and norm for computing, there continues to be an acute and even increasing need to address the software, system, and enterprise issues that are involved and discuss them face to face in an integrated forum that covers methodological, semantic, theoretical, and application issues too. As we all realize, e-mail, the Internet, and even video conferences are not by themselves optimal nor even sufficient for effective and efficient scientific exchange.

The OnTheMove (OTM) International Federated Conference series has been created precisely to cover the scientific exchange needs of the communities that work in the broad yet closely connected fundamental technological spectrum of Web-based distributed computing. The OTM program every year covers data and Web semantics, distributed objects, Web services, databases, information systems, enterprise workflow and collaboration, ubiquity, interoperability, mobility, grid, and high-performance computing.

OnTheMove is proud to give meaning to the “federated” aspect in its full title: it aspires to be a primary scientific meeting place where all aspects of research and development of Internet- and intranet-based systems in organizations and for e-business are discussed in a scientifically motivated way, in a forum of interconnected workshops and conferences. This year's 15th edition of the OTM Federated Conferences event therefore once more provided an opportunity for researchers and practitioners to understand, discuss, and publish these developments within the broader context of distributed, ubiquitous computing. To further promote synergy and coherence, the main conferences of OTM 2018 were conceived against a background of their three interlocking global themes:

- Trusted Cloud Computing Infrastructures Emphasizing Security and Privacy
- Technology and Methodology for Data and Knowledge Resources on the (Semantic) Web
- Deployment of Collaborative and Social Computing for and in an Enterprise Context

Originally the federative structure of OTM was formed by the co-location of three related, complementary, and successful main conference series: DOA (Distributed Objects and Applications, held since 1999), covering the relevant infrastructure-enabling technologies, ODBASE (Ontologies, DataBases and Applications of SEmantics, since 2002) covering Web semantics, XML databases and ontologies, and of course CoopIS (Cooperative Information Systems, held since 1993), which studies the application of these technologies in an enterprise context through, e.g., workflow systems and knowledge management. In the 2011 edition security issues, originally started as topics of the IS workshop in OTM 2006, became the focus of DOA as secure virtual infrastructures, further broadened to cover aspects of trust and privacy in so-called cloud-based systems. As this latter aspect came to dominate agendas in this and overlapping research communities, we decided in 2014 to rename the event as the Cloud and Trusted Computing (C&TC) Conference, and was originally launched in a workshop format.

These three main conferences specifically seek high-quality contributions of a more mature nature and encourage researchers to treat their respective topics within a framework that simultaneously incorporates (a) theory, (b) conceptual design and development, (c) methodology and pragmatics, and (d) application in particular case studies and industrial solutions.

As in previous years, we again solicited and selected additional quality workshop proposals to complement the more mature and “archival” nature of the main conferences. Our workshops are intended to serve as “incubators” for emergent research results in selected areas related, or becoming related, to the general domain of Web-based distributed computing. We were very glad to see that our earlier successful workshops (EI2N, META4eS, FBM) re-appeared in 2018. The Fact-Based Modeling (FBM) <workshop in 2015 succeeded and expanded the scope of the successful earlier ORM <workshop. The Industry Case Studies Program, started in 2011, under the leadership of Hervé Panetto, Wided Guédria, and Gash Bhullar, further gained momentum and visibility in its seventh edition this year.

The OTM registration format (“one workshop or conference buys all workshops and conferences”) actively intends to promote synergy between related areas in the field of distributed computing and to stimulate workshop audiences to productively mingle with each other and, optionally, with those of the main conferences. In particular, EI2N continues to create and exploit a visible cross-pollination with CoopIS.

We were very happy to see that in 2018 the number of quality submissions for the OnTheMove Academy (OTMA) noticeably increased. OTMA implements our unique, actively coached and therefore very time- and effort-intensive formula to bring PhD students together, and aims to carry our “vision for the future” in research in the areas covered by OTM. Its 2018 edition was organized and managed by a dedicated team of collaborators and faculty, Peter Spyns, Maria-Esther Vidal, inspired as always by the OTMA Dean, Erich Neuhold.

In the OTM Academy, PhD research proposals are submitted by students for peer review; selected submissions and their approaches are to be presented by the students in front of a wider audience at the conference, and are independently and extensively analyzed and discussed in front of this audience by a panel of senior professors. One

may readily appreciate the time, effort, and funds invested in this by OnTheMove and especially by the OTMA faculty.

As the three main conferences and the associated workshops all share the distributed aspects of modern computing systems, they experience the application pull created by the Internet and by the so-called Semantic Web, in particular developments of big data, increased importance of security issues, and the globalization of mobile-based technologies.

The three conferences seek exclusively original submissions that cover scientific aspects of fundamental theories, methodologies, architectures, and emergent technologies, as well as their adoption and application in enterprises and their impact on societally relevant IT issues.

- CoopIS 2018, Cooperative Information Systems, our flagship event in its 26th edition since its inception in 1993, invites fundamental contributions on principles and applications of distributed and collaborative computing in the broadest scientific sense in workflows of networked organizations, enterprises, governments, or just communities.
- C&TC 2018 (Cloud and Trusted Computing 2018), is the successor of DOA (Distributed Object Applications) and focuses on critical aspects of virtual infrastructure for cloud computing, specifically spanning issues of trust, reputation, and security.
- ODBASE 2018, Ontologies, Databases, and Applications of Semantics covers the fundamental study of structured and semi-structured data, including linked (open) data and big data, and the meaning of such data as is needed for today's databases; as well as the role of data and semantics in design methodologies and new applications of databases.

As with the earlier OnTheMove editions, the organizers wanted to stimulate this cross-pollination by a program of engaging keynote speakers from academia and industry and shared by all OTM component events. We are quite proud to list for this year:

- Martin Hepp, Universität der Bundeswehr Munich/Hepp Research GmbH
- Pieter De Leenheer, Colibra
- Richard Mark Soley, Object Management Group, Inc. (OMG)
- Tom Raftery, SAP/Instituto Internacional San Telmo

The general downturn in submissions observed in recent years for almost all conferences in computer science and IT has also affected OnTheMove, but this year the harvest again stabilized at a total of 173 submissions for the three main conferences and over 50 submissions in total for the workshops. Not only may we indeed again claim success in attracting a representative volume of scientific papers, many from the USA and Asia, but these numbers of course allowed the respective Program Committees to again compose a high-quality cross-section of current research in the areas covered by OTM. Acceptance rates vary but the aim was to stay consistently at about one accepted full paper for three submitted, yet as always these rates are subordinated to professional peer assessment of proper scientific quality.

As usual, we separated the proceedings into two volumes with their own titles, one for the main conferences and one for the workshops and posters. But in a different approach to previous years, we decided the latter should appear after the event and so allow workshop authors to eventually improve their peer-reviewed papers based on critiques by the Program Committees and on live interaction at OTM. The resulting additional complexity and effort of editing the proceedings was professionally shouldered by our leading editor Christophe Debruyne - with the general chairs for the conference volume, and with Hervé Panetto for the workshop volume. We are again most grateful to the Springer LNCS team in Heidelberg for their professional support, suggestions, and meticulous collaboration in producing the files and indexes ready for downloading on the USB sticks. It is a pleasure to work with staff that so deeply understands the scientific context at large, and the specific logistics of conference proceedings publication.

The reviewing process by the respective OTM Program Committees was performed to professional quality standards: Each paper review in the main conferences was assigned to at least three referees, with arbitrated e-mail discussions in the case of strongly diverging evaluations. It may be worthwhile to emphasize once more that it is an explicit OnTheMove policy that all conference Program Committees and chairs make their selections in a completely sovereign manner, autonomous, and independent from any OTM organizational considerations. As in recent years, proceedings in paper form are now only available to be ordered separately.

The general chairs are once more especially grateful to the many people directly or indirectly involved in the setup of these federated conferences. Not everyone realizes the large number of qualified persons that need to be involved, and the huge amount of work, commitment, and the financial risk in the uncertain economic and funding climate of 2018, that is entailed by the organization of an event like OTM. Apart from the persons in their roles aforementioned, we therefore wish to thank in particular explicitly our main conference Program Committee chairs:

- CoopIS 2018: Henderik A. Proper, Markus Stumptner and Samir Tata
- ODBASE 2018: Dumitru Roman, Elena Simperl, Ahmet Soylu, and Marko Grobelnik
- C&TC 2018: Claudio A. Ardagna, Adrian Belmonte, and Mauro Conti

And similarly we thank the Program Committee (co-)chairs of the 2018 ICSP, OTMA, and Workshops (in their order of appearance on the website): Wided Guédria, Hervé Panetto, Markus Stumptner, Georg Weichhart, Peter Bollen, Stijn Hoppenbrouwers, Robert Meersman, Maurice Nijssen, Gash Bhullar, Ioana Ciuciu, Anna Fensel, Peter Spyns, and Maria-Esther Vidal.

Together with their many Program Committee members, they performed a superb and professional job in managing the difficult yet essential process of peer review and selection of the best papers from the harvest of submissions. We all also owe a serious debt of gratitude to our supremely competent and experienced conference secretariat and technical admin staff in Guadalajara and Dublin, respectively, Daniel Meersman and Christophe Debruyne.

The general conference and workshop co-chairs also thankfully acknowledge the academic freedom, logistic support, and facilities they enjoy from their respective



institutions—Technical University of Graz, Austria; Université de Lorraine, Nancy, France; Latrobe University, Melbourne, Australia – and without which such a project quite simply would not be feasible. Reader, we do hope that the results of this federated scientific enterprise contribute to your research and your place in the scientific network, and we hope to welcome you at next year's event!

September 2018

Robert Meersman  
Tharam Dillon  
Hervé Panetto  
Ernesto Damiani

# Organization

OTM (On The Move) is a federated event involving a series of major international conferences and workshops. These proceedings contain the papers presented at the OTM 2018 Federated conferences, consisting of CoopIS 2018 (Cooperative Information Systems), C&TC 2018 (Cloud and Trusted Computing) and ODBASE 2018 (Ontologies, Databases, and Applications of Semantics).

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# **OnTheMove 2018 Keynotes**

# **Web Ontologies: Lessons Learned from Conceptual Modeling at Scale**

Martin Hepp

Universität der Bundeswehr Munich/Hepp Research GmbH, Germany

## **Short Bio**

Martin Hepp is a professor of E-business and General Management at the Universität der Bundeswehr Munich and the CEO and Chief Scientist of Hepp Research GmbH. He holds a master's degree in business management and business information systems and a PhD in business information systems from the University of Würzburg (Germany). His key research interests are shared data structures at Web scale, for example Web ontology engineering, both at the technical, social, and economical levels, conceptual modeling in general, and data quality management. As part of his research, he developed the GoodRelations vocabulary, an OWL DL ontology for data interoperability for e-commerce at Web Scale. Since 11/2012, GoodRelations is the e-commerce core of schema.org, the official data markup standard of major search engines, namely Google, Yahoo, Bing, and Yandex. Martin authored more than 80 academic publications and was the organizer of more than fifteen workshops and conference tracks on conceptual modeling, Semantic Web topics, and information systems, and a member of more than sixty conference and workshop program committees, including ECIS, EKAW, ESWC, IEEE CEC/EEE, ISWC, and WWW.

## **Talk**

Ever since the introduction of the term “ontology” to Computer Science, the challenges for information exchange, processing, and intelligent behavior on the World Wide Web, with its vast body of content, huge user base, linguistic and representational heterogeneity, and so forth, have been taken as a justification for ontology-related research. However, despite two decades of work on ontologies in this context, very few ontologies have emerged that are used at Web scale in a way compliant with the original proposals by a diverse, open audience.

In this talk, I will analyze the differences between the original idea of ontologies in computer science, and Web ontologies, and analyze the specific economic, social, and technical challenges of building, maintaining, and using socially agreed, global data structures that are suited for the Web at large, also with respect to the skills, expectations, and particular needs of owners of Web sites and potential consumers of Web data.

# **Data Governance: The New Imperative to Democratize Data Science**

Pieter De Leenheer

Collibra, USA

## **Short Bio**

Pieter De Leenheer is a cofounder of Collibra and leads the company's Research & Education group, including the Collibra University, which offers a range of self-paced learning and certification courses to help data governance professionals and data citizens gain new skills and expertise. Prior to co-founding the company, Pieter was a professor at VU University of Amsterdam. Today he still serves as adjunct professor at Columbia University in the City of New York and as visiting scholar at several universities across the globe including UC San Diego and Stanford.

## **Talk**

We live in the age of abundant data. Through technology, more data is available, and the processing of that data easier and cheaper than ever before. Data science emerged from an unparalleled fascination to empirically understand and predict societies businesses and markets. Yet there is an understated risk inherent to democratizing data science such as data spills, cost of data exploration, and blind trust in unregulated, incontestable and oblique models. In their journey to unlock competitive advantage and maximize value from the application of big data, it is vital that data leaders find the right balance between value creation and risk exposure. To realize the true value of this wealth of data, data leaders must not act impulsively, but rethink assumptions, processes, and approaches to managing, governing, and stewarding that data. And to succeed, they must deliver credible, coherent, and trustworthy data and data access clearing mechanisms for everyone who can use it. As data becomes the most valuable resource, data governance delivers a imperative certification for any business to trust one another, but also increasingly sets a precondition for any citizen to engage in a trustworthy and endurable relationship with a company or government.



# Learning to Implement the Industrial Internet

Richard Mark Soley

Object Management Group, Inc. (OMG), USA

## Short Bio

Dr. Richard Mark Soley is Chairman and CEO of the Object Management Group (r), also leading the Cloud Standards Customer Council (tm) the Industrial Internet Consortium (r). Previously cofounder and former Chairman/CEO of A. I. Architects, he worked for technology companies and venture firms like TI, Gold Hill, Honeywell & IBM. Dr. Soley has SB, SM and PhD degrees in Computer Science and Engineering from MIT.

A longer bio is available here: <http://www.omg.org/soley/>.

## Talk

- The Industrial Internet Consortium and its members develop testbeds to learn more about Industrial Internet implementation: hiring, ecosystem development, standards requirements
- The Object Management Group takes real-world standards requirements and develops standards to maximize interoperability and portability
- The first insights into implementation and the first requirements for standards are underway
- Dr. Soley will give an overview of both processes and talk about the first insights from the projects

# **The Future of Digital: What the Next 10 Years Have in Store**

Tom Raftery

SAP/Instituto Internacional San Telmo, Spain

## **Short Bio**

Tom Raftery is a Global Vice President for multinational software corporation SAP, an adjunct professor at the Instituto Internacional San Telmo, and a board advisor for a number of start-ups.

Before joining SAP Tom worked as an independent industry analyst focusing on the Internet of Things, Energy and CleanTech and as a Futurist for Gerd Leonhard's Futures Agency.

Tom has a very strong background in technology and social media having worked in the industry since 1991. He is the co-founder of an Irish software development company, a social media consultancy, and is co-founder and director of hyper energy-efficient data center Cork Internet eXchange – the data centre with the lowest latency connection between Europe and North America.

Tom also worked as an Analyst for industry analyst firm RedMonk, leading their GreenMonk practice for over 7 years. Tom serves on the Advisory Boards of Smart-Cities World and RetailEverywhere.com.

## **Talk**

Digital Transformation, the Internet of Things and associated technologies (block-chain, machine learning, edge computing, etc.) are the latest buzz words in technology. Organisations are scrambling to get up to speed on them before their competitors, or some young start-up gets there first and completely disrupts them.

Right now, these digital innovation systems are, roughly speaking at the same level of maturity as the web was in 1995. So where are these new digital technologies taking us? What is coming down the line, and how will these changes affect my organisation, my wallet, and the planet?

Join Tom Raftery for our OnTheMove keynote as he unpacks what the Future of Digitisation is going to bring us.

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