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On the Move to Meaningful Internet Systems: OTM 2015 Conferences

Confederated International Conferences:
CoopIS, ODBASE, and C&TC 2015
Rhodes, Greece, October 26–30, 2015
Proceedings

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Editors
Christophe Debruyne
Trinity College Dublin
Dublin 2
Ireland

Hervé Panetto
University of Lorraine
Vandoeuvre-les-Nancy Cedex
France

Robert Meersman
TU Graz
Graz
Austria

Tharam Dillon
La Trobe University
Melbourne
Australia

Georg Weichhart
PROFACTOR GmbH
Steyr-Gleink
Austria

Yuan An
Drexel University
Philadelphia, PA
USA

Claudio Agostino Ardagna
Università degli Studi di Milano
Crema
Italy

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General Co-Chairs' Message for OnTheMove 2015, Rhodes, Greece

The OnTheMove 2015 event held during October 26–30, in Rhodes, Greece, further consolidated the importance of this 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 in 2012, Graz in 2013, and Amantea, Italy, in 2014. 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 implied software, system, and enterprise issues and discuss them face to face in an integrated forum that covers methodological, semantic, theoretical, and application issues as well. As we all realize, e-mail, the Internet, and even video conferences on their own are not optimal or even sufficient for effective and efficient scientific exchange.

The OnTheMove (OTM) Federated Conference series was 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, as well as grid and high-performance computing.

OTM does *not* consider itself a so-called multi-conference event but instead is proud to give meaning to the "federated" aspect in its full title[1]: 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 loosely interconnected workshops and conferences. This year's 14th 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 2015 were conceived against a background of three interlocking global themes:

- Trusted Cloud Computing Infrastructures Emphasizing Security and Privacy
- Technology and Methodology for Data and Knowledge Resources on the (Semantic) Web

[1] On The Move Towards Meaningful Internet Systems and Ubiquitous Computing – Federated Conferences and Workshops

– 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 to organize and launch it in a workshop format to define future editions.

Both 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. This year the difficult and time-consuming job of selecting and coordinating the workshops was brought to a successful end by Ioana Ciuciu, and we were very glad to see that some of our earlier successful workshops (EI2N, META4eS, ISDE, INBAST, MSC) re-appeared in 2015, in some cases in alliance with other older or newly emerging workshops. The new Fact-Based Modeling (FBM) workshop succeeded and expanded the scope of the successful ORM workshop. The Industry Case Studies Program, started in 2011 under the leadership of Hervé Panetto and OMG's Richard Mark Soley, further gained momentum and visibility in its fifth edition this year.

The OTM registration format ("one workshop or conference buys all workshops or 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 happy to see that also in 2015 the number of quality submissions for the OnTheMove Academy (OTMA) stabilized for the fourth consecutive year. 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 2015 edition was organized and managed by

a dedicated team of collaborators and faculty, Peter Spyns, Maria-Esther Vidal, Anja Metzner, and Alfred Holl, 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 will readily appreciate the resources invested in this by OTM and especially 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. For ODBASE 2015, the focus continued to be the knowledge bases and methods required for enabling the use of formal semantics in Web-based databases and information systems. For CoopIS 2015, the focus as before was on the interaction of such technologies and methods with business process issues, such as occur in networked organizations and enterprises. These subject areas overlap in a scientifically natural and fascinating fashion and many submissions in fact also covered and exploited the mutual impact among them. For our C&TC 2015 event, its primary emphasis was again squarely put on the virtual and security aspects of Web-based computing in the broadest sense. As with the earlier OTM editions, the organizers wanted to stimulate this cross-pollination by a program of famous keynote speakers from academia and industry around the chosen themes and shared by all OTM component events. We are quite proud to list for this year:

- Michele Bezzi
- Eva Kühn
- John Mylopoulos
- Sjir Nijssen

The general downturn in submissions observed in recent years for almost all conferences in computer science and IT is also affecting OTM, but we were still fortunate to receive a total of 130 submissions for the three main conferences and 86 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 two to three submitted (nearly one in four for CoopIS), yet as always these rates are subordinated to professional peer assessment of proper scientific quality. As usual we have separated the proceedings into two volumes with their own titles, one for the main conferences and one for the workshops and posters, and 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.

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 OTM 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 set-up of these federated conferences. Not everyone realizes the large number of persons that need to be involved, and the huge amount of work, commitment, and in the uncertain economic and funding climate of 2015 certainly also financial risk that is entailed by the organization of an event like OTM. Apart from the persons in their aforementioned roles, we therefore wish to thank in particular explicitly our main conference Program Committee Chairs:

- CoopIS 2015: Georg Weichhart, with Heiko Ludwig and Michael Rosemann
- ODBASE 2015: Yuan An, with Min Song and Markus Strohmaier
- C&TC 2015: Claudio Ardagna, with Meiko Jensen

And similarly we thank the Program Committee (Co-)Chairs of the 2015 ICSP, OTMA, and Workshops (in their order of appearance on the website): Peter Spyns, Maria-Esther Vidal, Arne J. Berre, Gregoris Mentzas, Nadia Abchiche-Mimouni, Alexis Aubry, Fenareti Lampathaki, Eduardo Rocha Loures, Milan Zdravkovic, Peter Bollen, Hans Mulder, Maurice Nijssen, Miguel Ángel Rodríguez-García, Rafael Valencia García, Thomas Moser, Ricardo Colomo Palacios, Alok Mishra, Deepti Mishra, Jürgen Münch, Ioana Ciuciu, Christophe Debruyne, Anna Fensel, Maria Chiara Caschera, Fernando Ferri, Patrizia Grifoni, Arianna D'Ulizia, Mustafa Jarrar, António Lucas Soares, Cristovão Sousa.

Together with their many Program Committee members, they performed a superb and professional job in managing the difficult yet existential process of peer review and selection of the best papers from the harvest of submissions. We all also owe a significant debt of gratitude to our supremely competent and experienced Conference Secretariat and technical support staff in Guadalajara, Brussels, and Dublin, respectively, Daniel Meersman, Jan Demey, 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 Babes-Bolyai University, Cluj, Romania — without which such a project quite simply would not be feasible. We do hope that the results of this federated scientific enterprise contribute to your research and your place in the scientific network. We look forward to seeing you at next year's event!

September 2015

Robert Meersman
Hervé Panetto
Tharam Dillon
Ernesto Damiani
Ioana Ciuciu

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 2015 Federated conferences, consisting of CoopIS 2015 (Co-operative Information Systems), ODBASE 2015 (Ontologies, Databases, and Applications of Semantics), and C&TC 2015 (Cloud and Trusted Computing).

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OnTheMove 2015 Keynotes

Data Semantics in the Days of Big Data

John Mylopoulos

University of Trento, Italy

Short Bio

John Mylopoulos holds a professor emeritus position at the Universities of Trento and Toronto. He earned a PhD degree from Princeton University in 1970 and joined the Department of Computer Science at the University of Toronto that year. His research interests include conceptual modelling, requirements engineering, data semantics, and knowledge management. Mylopoulos is a fellow of the Association for the Advancement of Artificial Intelligence (AAAI) and the Royal Society of Canada (Academy of Sciences). He has served as program/general chair of international conferences in artificial intelligence, databases and software engineering, including IJCAI (1991), Requirements Engineering (1997), and VLDB (2004). Mylopoulos is the recipient of an advanced grant from the European Research Council for a project titled "Lucretius: Foundations for Software Evolution."

Talk

"Data Semantics in the Days of Big Data"

In the good old days, the semantics of data was defined in terms of entities and relationships. For example, a tuple (widget:w#123, price: €10, date: 1970.07.30) in the SALES relation meant something like "widget w#123 was sold for €10 on July 30, 1970." This simple view of semantics no longer applies in the days of big data, where gigabytes of data are pouring in every day and the intended meaning is defined in terms of strategic objectives such as, "We want to grow our sales by 2 % over three years," or tactical ones such as, "We want to grow sales for our clothing products by 2.5 % over the next quarter in Lombardia." We review some of the elements of this new perspective on data and present some of the analysis techniques that are emerging along with big data technologies.

Reusable Coordination Components: A Silver Bullet for Reliable Development of Cooperative Information Systems?

Eva Kühn

TU Wien, Austria

Short Bio

Eva Kühn graduated as an engineer of computer sciences, with a PhD, habilitation, and professor position at TU Wien. Heinz-Zemanek Research Award for PhD work on "Multi Database Systems". She received a Kurt-Gödel Research Grant from the Austrian Government for a sabbatical at the Indiana Center for Databases at Purdue University, USA. She has several international publications and teaching experience in the areas of methods and tools for software development, software engineering, coordination languages, software integration, parallel and distributed programming, heterogeneous transaction processing, and space-based computing. Eva has been project coordinator of nationally (FWF, FFG, AT) and internationally (EU Commission) funded research projects as well as projects with industry. She has international software patents for research work on a new "Coordination System," and seven years of experience as Chief Technological Officer (CTO) of an Austrian spin-off company for software development. She has served as conference chair, program committee member, organizer, and coordinator of international conferences. She is a member of the Governing Board of the Austrian and European UNIX systems user group, of the ISO Working Group for the standardization of Prolog, of the Senate of the Christian Doppler Forschungsgesellschaft (CDG), and of the Science and Research Council of the Federal State of Salzburg.

Talk

"Reusable Coordination Components: A Silver Bullet for Reliable Development of Cooperative Information Systems?"

Today's emerging trends such as factory of the future, big data, Internet of Things, intelligent traffic solutions, cyber-physical systems, wireless sensor networks, and smart home/city/grid raise major new challenges on software development. They are characterized by high concurrency, distribution, and dynamics as well as huge numbers of heterogeneous devices, resources, and users that must collaborate in a reliable way. The management of all interactions and dependencies between the participants is a

complex task posing massive coordination and integration problems. Must these be solved for each new application from scratch?

An alternative approach would be to identify similarities in their communication and synchronization behavior, to design corresponding "reusable patterns" with the help of a suitable and flexible coordination model, and finally to realize the patterns in the form of software components that run on a suitable middleware platform. In this keynote we discuss state-of-the-art coordination models and middleware systems to achieve this goal. The sharing of coordination components among different use cases on different platforms, reaching from energy-aware micro-controller platforms to enterprise server systems, is demonstrated by means of real-life scenarios from different domains. The vision is to compose advanced cooperative information systems from proven, configurable, reusable "coordination components," thus reducing software development risks and costs.

Durable Modeling and Ever-Changing Implementation Technologies

Sjir Nijssen

PNA Group, Netherlands

Short Bio

Dr. Sjir Nijssen is an emeritus professor and has been CTO at PNA in The Netherlands (www.pna-group.com) for the last 25 years. Dr. Nijssen first experienced the essential steps of working with facts in 1959 and 1960 while serving as a draft officer in the Royal Dutch Air Force, where at that time there was careful observation of planes of friends and enemies by boys on towers in the field, and girls plotting the information by the boys in one of the seven areas of The Netherlands, over telephone lines on a large table in atomic-free bunkers. The contents of the tables of the seven areas was verbalized by girls sitting at the next higher level and were then plotted by girls in the central command on a table covering the entire Netherlands. That information was used by the officers to direct interceptor planes. This was a world with very clear protocols on how to observe, how to formulate the facts, how to convert the facts into another representation of the facts on a land map table, verbalizing the information of the local tables into facts and transmitting these facts to the girls plotting the information read on the central table. Dr. Nijssen started with fact-based business communication modeling in the early 1970s, at Control Data's European headquarters in Brussels. Since then it has been more than his full-time occupation. It was there that NIAM (Natural language Information Analysis Method), a fact-based protocol to develop a conceptual schema and notation, was conceived. Prof. Robert Meersman was one of the pillars of the 22-person research lab at Control Data, from 1970 to 1982. From 1983, Dr. Nijssen held a position as professor of Computer Science for seven years at the University of Queensland in Australia. In 1989 he founded the company PNA, exclusively dedicated to delivering durable and tested business requirements, conceptual modeling, consulting, and educational services fully based on fact orientation. PNA currently employs about 30 people. Dr. Nijssen can be reached directly at `sjir.nijssen@pna-group.com`.

Talk

"Durable Modeling and Ever-Changing Implementation Technologies"

In the relative short history of information technology we have seen substantial improvements. However, between the wishes of the users and the implemented services

there is still in many cases an enormous gap. And the problem of very substantial cost overruns in the development of these services is still a serious challenge in too many cases. Today we aim to fill this gap between the requirements and the running services with what is called a durable model. The road toward a durable model has been a long one and an overview will be given since the 1960s. During the 1970s and 1980s the term conceptual model was used to refer to a durable model, with many contributions from the IFIP WG 2.6 conferences and the landmark publication of the ISO Technical Report TR9007 in 1987, "Concepts and Terminology for the Conceptual Schema and the Information Base." Thereafter we discuss how durable modeling has evolved and been misused by various factions in the research and business world.

Since 2012 a co-creation has been established in The Netherlands consisting of government service organizations, universities, and innovative companies with the aim of developing an engineering protocol on how to "transform" laws, regulations, and policies into a durable model. The aim is to develop a national protocol that will be offered to all government departments and all other organizations in The Netherlands. Of course it will be offered to the world. We discuss the scientific foundation of this protocol, called CogniLex, as well as its practical version and report on experiences obtained so far. To the best of our knowledge, this is the most extensive protocol currently available. The skills of protocolled observation and transformation into facts, transforming the facts into another representation mode adequate for a specific purpose, and transforming the other representation mode back into verbalized facts are vital parts of any testing protocol, called ex-ante in Terra Legis. We demonstrate how certain legal domain protocol essentials like Hohfeld can be modeled in fact-based modeling, a durable modeling approach. We also demonstrate how fact-based modeling has been used to detect the needed extensions to the famous work of Hohfeld. If time permits, the transformation of such a durable model into UML, ER, OWL, SBVR, and DMN will be discussed.

From (Security) Research to Innovation

Michele Bezzi

Sap Labs, France

Short Bio

Michele Bezzi is Research Manager at SAP Product Security Research. He heads a group of researchers investigating applied research and innovative security solutions, addressing topics such as security tools for development, intrusion detection systems, and software security analysis.

He received his Master of Physics degree from the University of Florence in 1994 and his PhD in Physics from the University of Bologna in 1998. He has over 15 years' experience in industrial research in SONY, Accenture, and SAP. He has supervised several European projects, and has published more than 50 scientific papers in various research areas: security, privacy, pervasive computing, neural networks, evolutionary models, and complex systems.

Talk

"From (Security) Research to Innovation"

I present some concrete examples of research projects, and show how these research results have been used in SAP products and processes.

The security research team addresses different topics such as security tools for development, intrusion detection systems, and software security analysis. For example, in recent years, we prototyped an application level intrusion detection software, now released as a product — SAP Enterprise Threat Detection (ETD) — able to detect attacks, in real time, on complex software landscape. We also devise tools to support developers in secure development, allowing, for example, security testing during the code writing phase, as well as innovative tools for security governance. In this talk, starting from these examples, I also discuss challenges and opportunities in transferring research results to industrial products or processes.

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Cloud and Trusted Computing 2015 (C&TC) 2015

C&TC 2015 PC Co-Chairs' Message