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1st workshop on Architectures, Languages and Paradigms for IoT

Date: September 18th, 2017

Location: Co-located with the 13th International Conference on integrated Formal Methods (iFM 2017), University of Torino, Turin, Italy

Registration: All attendees at the workshop must register for iFM 2017 through the conference website.

Accepted papers: papers.zip

Scope

The Internet of Things is ushering a dramatic increase in number and variety of interconnected and smart objects. Communication capabilities and computational power are growingly embedded in everyday devices including personal smart devices, public displays, cars, drones and electronic tags. This state of the things opens an unprecedented range of research opportunities. Inherent distribution, mobility, situatedness, and heterogeneity of such devices calls for proper scientific understanding of the foundations of such systems as well as for novel software methods. The workshop aims at critically reviewing the state-of-the-art and the state-of-the-practice of formal techniques and software methods for the IoT. The presentation of open problems and challenges will trigger discussion between the participants with different views and backgrounds with the ultimate goal of identifying a common research agenda. This workshop solicits original contributions on architectures, languages, paradigms, and techniques with potential practical and theoretical impact on software systems targeting the IoT. We welcome inter-disciplinary approaches.

Important Dates

• Abstract registration: June 5th 12th 22th, 2017
• Paper submission: June 12th-16th, 2017
• Notification of Acceptance: July 14th-18th, 2017
• Camera-Ready Version: July 21st-25th, 2017

Topics of interest

This workshop accepts both theoretical and practical contributions targeting the emerging field of the Internet of Things, and in particular:

• Engineering methodologies
• Formal models
• Novel paradigms
• Novel languages
• Programming tools
• Verification
• Distributed platforms
• Frameworks for the IoT
• Architectures for the IoT
• Case studies

Submission and publication

We will accept two types of contributions:

• "regular papers" (between 5 and 15 pages), and
• "extended abstracts" (between 2 and 4 pages).

All papers should be submitted in PDF format using this Easychair login page. We require the authors to follow the formatting rules of EPTCS, as such papers should be prepared in LaTeX using the EPTCS macro package.

By submitting a paper, the authors confirm that in case of acceptance, at least one author will attend the workshop to present the work.

Papers will be peer reviewed on the basis of originality, readability, relevance to themes, soundness, and overall quality.

Accepted regular papers will be published in EPTCS - Electronic Proceedings in Theoretical Computer Science. Extended abstracts will be presented at the workshop, but will not appear in the proceedings: they will be published (according to the EPTCS publication policy), in HTML form on EPTCS online.

Invited speakers

Keynote 1 by Einar Broch Johnsen, University of Oslo, Norway

Title: Asynchronous Software Evolution: Obtaining Type Safety by Combining Type Checking and Runtime Constraints

Abstract: The Internet of Things connects devices ranging from every day objects to sensors and actuators, in order to enable data sensing, analysis, and interaction between devices. Deploying these "things" at scale leads to complex interconnected systems such as smart houses, condition-based maintenance of industrial installations, etc. It is a major challenge how to maintain and evolve software for these systems, in which things dynamically connect and disconnect, and in which interactions between devices are typically asynchronous, in order to fix bugs, add features, or improve analysis or performance. In this talk, we discuss this problem in terms of a model of asynchronous software evolution for active objects and propose language abstractions to program asynchronous evolution, which can guarantee type safety by combining type checking with runtime constraints.

About the speaker: Einar Broch Johnsen is Professor at the Department of Informatics, University of Oslo. His research interests are in the field of software development and analysis, spanning from programming languages and methodology, via system specification and modeling, to formal methods and associated theory. Johnsen is particularly interested in the analysis of concurrent and distributed systems, resource awareness and resource management, and mechanisms for software evolution and reuse. His research in the last years has increasingly focused on abstract behavioral specification formalisms and their use for model-based verification of real systems. Prof. Johnsen was the coordinator of the European research project Engineering
Virtualized Services (Envisage) on model-based verification techniques to predict the behavior of services deployed on the cloud, and he is the deputy director of Sirius, a Norwegian Center for research-driven Innovation on scalable data access.

Invited industrial talk by Cristina Chesta, REPLY

Title: IoT Opportunities and Solutions

Abstract: The Internet of Things is becoming part of every aspect of our lives, enabling new use cases and creating value for consumers, companies, and economies. In this talk we introduce some relevant trends, challenges and opportunities related to IoT from an industry perspective, and we present some examples of solutions developed by Concept Reply in this area.

About the speaker: Cristina Chesta holds a PhD in Informatics and System Engineering and a MSc in Electronic Engineering both from Politecnico di Torino. She was a visiting scientist at Bell Labs and worked ten years in Motorola as software architect and project manager in different research and development projects related to human computer interaction and software engineering. She is currently a Senior Consultant in Concept Reply and her research interests in the last years have been focusing on the domain of Internet of Things. She is the coordinator of project HyVar, on hybrid variability to support continuous and highly individualized evolution of distributed software applications, and of project PersonAAL, about personalized web applications to improve quality of life and remote care for older adults.

Keynote 2 by Lars-Åke Fredlund, Universidad Politécnica de Madrid, Spain

Title: Testing Shared Resources

Abstract: The talk describes an approach to testing a class of safety-critical concurrent systems implemented using shared resources. A shared resource based system consists of a number of processes (active objects) that interact through calls to a set of shared resources which control the amount of concurrency in the system. Shared resources are described using a declarative specification, from which both efficient implementations can be derived, and which serves as the first approximation of the state-based test model used for testing implementations. In the talk we will illustrate the testing methodology by applying it to the task of testing the safety-critical software that controls an automated shipping plant, initially specified as a shared resource, which fulfills shipping orders serviced by a set of autonomous robots. The operations of the robots are governed by a set of rules limiting the weight of robots, and their cargo, to ensure safe operations.

About the speaker: Dr. Lars-Ake Fredlund is an Associate Professor at the Universidad Politécnica de Madrid (Spain). His research interests focuses on reasoning formally about concurrent programs in programming languages such as Java or the actor-based Erlang programming language. In 2001, Fredlund received his PhD from the KTH Royal Institute of Technology (Sweden) on the topic of using theorem proving techniques to formally prove Erlang programs correct. Later research has focused on providing model checking support for concurrent functional programming languages, and on the application of property-based testing techniques to testing concurrent systems. Fredlund has participated in several EU research projects and has published over 50 papers in international journals and conferences.

Program

8:15 - 8:45 - Entrance, via Verdi 9

Registration

8:45 - 9:00 - Sala Multifunzione 1, via Verdi 9

Plenary session, Paola Pisano (Deputy Mayor for Innovation and Smart City at the City of Turin)

9:00 - 10:00 - Aula Magna del Rettorato, via Verdi 8, first floor

Keynote 1 by Einar Broch Johnsen - joint with ARVI

10:00 - 10:30

Coffee break
10:30 - 12:10 - Sala Principe d'Acaja, via Verdi 8, ground floor

Onoriode Uviase and Gerald Kotonya. *IoT Architectural Framework: A review of Connection and Integration Framework for IoT systems*

Davide Ancona, Luca Franceschini, Giorgio Delzanno, Maurizio Leotta, Marina Ribaudo and Filippo Ricca. *Towards Runtime Monitoring of Node.js and Its Application to the Internet of Things*

Sven Linker and Michele Sevegnani. *Formalising Sensor Topologies for Target Counting*

12:10 - 13:40

Lunch

13:40 - 14:20 - Sala Principe d'Acaja, via Verdi 8, ground floor

Invited industrial talk by Cristina Chesta

14:20 - 15:20 - Sala Principe d'Acaja, via Verdi 8, ground floor

Giorgio Audrito, Ferruccio Damiani and Mirko Viroli. *Aggregate Graph Statistics*

Giorgio Audrito and Sergio Bergamini. *Resilient Blocks for Summarising Distributed Data*

15:20 - 15:50

Coffee break

15:50 - 17:30 - Sala Principe d'Acaja, via Verdi 8, ground floor

WAO'17 Session

Keynote 2 by Lars-Åke Fredlund

Eduard Kambarjan and Reiner Hähnle. *Prototyping Formal System Models with Active Objects*

Minas Charalambides, Karl Palmskog and Gul Agha. *Types for Progress in Actor Programs*

17:30 - Sala Principe d'Acaja, via Verdi 8, ground floor

Closing

19:30

ARVI, ALP4IoT and WAO Social dinner not included in the registration. Details can be found [here](#).

**Program Chairs**

- Danilo Pianini, University of Bologna, Italy
- Guido Salvaneschi, Technical University of Darmstadt, Germany

**Program Committee**

- Marco Aiello, University of Groningen, Netherlands
- Giorgio Audrito, University of Torino, Italy
- Ezio Bartocci, Vienna University of Technology, Austria
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**Steering Committee**

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