ABSTRACT
Novel approaches in theory and practice of unified modeling of the computer and the computed in order to create self-managing adaptive computations, also parallel calls for new computing models to address distributed, interactive, concurrent dynamic processes. ASDS workshop addresses these and other related approaches to increase the efficiency of computations in order to meet the challenges of high degree of scaling and large fluctuations. We believe that introducing elements of cognition into distributed computing systems that makes them "aware" of both the intent and evolution will enable self-managing capabilities to address both scale and fluctuations. The workshop brings together researchers in software architecture, computing and cognition to discuss and evaluate various approaches to introduce cognition into distributed computing elements.

The outcome of the workshop will be an increased shared understanding of challenges and opportunities in distributed computing system architecture by means of self-management with elements of cognitive computing.

1. Workshop organization
The workshop organizers:

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Workshop web page: http://www.ecsa-conference.org/2015/asds

2. Workshop Theme
Distributed computing systems, by their very nature, consist of hardware and software components with spatial structures executing temporal evolution of computations that are designed to deliver intent. However as scale and fluctuations disturb the evolution often dictated by the distributed computing system interacting with its environment, assuring the evolution to deliver the intent is often ad-hoc and results in complexity and cost. There are calls for re-examining the distributed computing models to infuse cognition and thus introduce self-management properties to cope with such changes and deliver the intent efficiently. This workshop is meant to address the current limitations and examine new approaches to create self-managing distributed systems that improve resiliency, scaling and efficiency in delivering the system’s intent.

In distributed computing systems dynamic systems software working with hardware delivers information processing services that allow modeling, interaction, reasoning, analysis and control of the environment external to them. “The key property of a general-purpose computer is that it can be used to model any physical system, of which the computer itself is not itself a part, to an arbitrary degree of accuracy. Their logical limits arise when we try to get them to model a part of world that includes themselves.” - as Paul Cockshott, Lewis MacKenzie, and Greg Michelson point out in their book Computation and its Limits (Oxford Press 2012). However, with the increasing use of embedded computing and cyber-physical systems we need computing models that include computers themselves.

Current computing architecture consisting of hardware and software is well designed to process data. The architecture is based on Turing’s concept of computation of functions. Computation is thus defined as execution of an algorithm using simple read, compute (change state) and write instructions, with the program-data duality introduced by von Neumann. This architecture is the basis for the evolution of current hardware and software and has allowed information technology to model, monitor, and reason and to control physical systems. Todays’ computing however has evolved to a complex network of Turing Machines that execute very complex algorithms processing multitudes of data streams, which creates new representations i.e. the “knowledge” of the system. This is accompanied with the management where the algorithms are designed to address the evolution of data. The (external) knowledge is used to design other algorithms to further evolve the system.

While the “intent” of the algorithm is well defined in terms of a sequence of steps, the resources and the time required for executing the intent depends on many factors outside the specification and scope of the algorithm itself. Computing resources such as the speed and memory determine the outcome of the execution. The nature of the algorithm also dictates the resources required.

Whereas current day hardware and software architectures implement complex algorithms to model physical system, reason about it and exercise control over it, the optimization of the resources to improve the efficiency is independent of the power of the algorithm. Mark Burgin in his book Super-Recursive Algorithms. Monographs in Computer Science (Springer 2005) emphasizes that “efficiency of an algorithm depends on two
parameters: power of the algorithm and the resources that are used in the process of solution. If the algorithm does not have necessary resources, it cannot solve the problem under consideration."

The computing resources required for the computation depend both on their availability in terms of CPU, memory, network bandwidth, latency, storage capacity, IOPs and throughput characteristics of the hardware and also on the nature of the algorithm (the software). The efficiency of execution of the computation depends upon managing the dynamic relationship of the hardware and the software to monitor the fluctuations and adjusting the resources to execute the computation. Often, based on the function of the computation, the structure of the computing resources may be altered to meet the fluctuating demands for resources dictated by the computation. Thus function, structure and fluctuations dictate the evolution of computation. In order to improve the efficiency of computation the knowledge how to manage the dynamics that is outside the purview of the computation is necessary, as well as an external model that integrates the computer (the hardware resources) and the computed (the software), monitoring and managing their evolution in a unified fashion.

3. Workshop Topics

- Current limitations and new approaches to self-managing distributed systems
- Improving the efficiency of computations to address high degree of scaling and large fluctuations
- Adaptive Distributed Intelligent Computing
- Collaborative and Autonomic Cognitive Computing
- Adaptive and Reconfigurable Architectures
- Cyber Physical Systems and Cognitive Computing Architectures
- Software Architecture of Cognition and Cognition in Software Architecture
- Policy based application orchestration to build self-managing systems
- Cognitive distributed computing systems
- Computing models and intelligent systems design
- Intelligent systems for Cloud Data management
- Emerging policies, algorithms and architectural frameworks for Service Level Agreement (SLA) for unified computing infrastructures
- Intelligent systems for deploying and configuration of Clouds and Grid Services
- Emerging infrastructures, middleware, frameworks for Unified computing platforms
- Intelligent systems for unified and federated utility computing infrastructures
- Adaptive intelligent Computing and HCI

4. Proceedings

We have accepted four full papers and seven short papers. All contributed papers have been reviewed by at least three reviewers.

5. Workshop format

The ASDS is run as a one-day workshop with sessions including paper presentations followed by discussions. In addition to these sessions, we have a keynote and invited speakers. We will also have a concluding discussion session.

6. Program Committee Members

- Mark Burgin, University of California, Los Angeles, USA
- Giacomo Cabri University of Modena and Reggio Emilia, Italy
- Morten Fjeld, Chalmers University of Technology, Sweden
- Giuseppe Primiero, Middlesex University London, UK
- Mizumachi Hiroaki, NEC, Japan
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- Robert Lowe, Chalmers Technical University, Sweden
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- Ramiro Salas, Pivotal, USA
- Peter Wegner, Brown University, USA
- Fatos Xhafa, Universitat Politècnica de Catalunya, Spain
- Kenneth Owens, Cisco, USA
- Deepak Gupta, NTI, India
- Khelender Sasan, NTI, India
- Antonella Di Stefano, University of Catania, Italy
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- Luyi Wang, Samsung Research America
- Stefaneas S. Petros, National Technical University of Athens, Greece

7. Acknowledgements

We would like to thank all authors, reviewers, and program committee members for their contributions to the workshop as well as ECSA 2015 Workshops Chair Matthias Galster for excellent collaboration.

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