

# Workshop on Software Architectures for Adaptive Autonomous Systems (SAAAS)

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## Preface

The workshop on Software Architectures for Adaptive Autonomous Systems (SAAAS 2016) is held in conjunction with the 9th Indian Software Engineering Conference (ISEC), Goa, India, on 18th February. The objective of the workshop is to bring together researchers and practitioners to discuss and explore the architectural elements which can exhibit such intelligent behavior as is essential to manage and operate large and complex systems.

It is widely acknowledged that we are heading to the IoT era, an era where we will see a proliferation of devices that are intended to aid human activity through automatic sensing and actuation capabilities. Correspondingly, their management and operations will increase in complexity, so much so that it will be impossible to manage them with current methodologies. One of the ways to deal with this situation is to create autonomous systems that are self-configuring, self-managing, self-healing, etc. To do this, one has to write intelligent software that leverages the learnings from AI and cognitive technologies research.

Interestingly, the ever-increasing scale and complexity has been the reason behind exploration of suitable paradigms since the 90's. In the beginning of the new millenium, the need for management and operation of large software systems led to efforts for scalable architectures such as MAPE-K (IBM), Adaptive Enterprises (Hewlett-Packard) and Dynamic Systems (Microsoft), in addition to research and prototypes in academia. However, the advent of IoT and the promise of integration of software and "things" is disruptive in its scale and complexity and calls for a re-evaluation of the existing architectural solutions.

While the problem space seems to be daunting, there have been a number of positives in the solution space as well. There has been a huge jump in available computing power due to the ever-increasing raw processing power in the silicon and cloud computing, high-speed, high bandwidth communication resources within (PCI-E) and without (Gigabit, 5G). In the methodologies front, there has been a tremendous spurt in big data analytics and great strides in formal methods engines and planning/scheduling techniques. The challenge is to utilize these resources and methodologies in either the existing or novel architectures to provide large industrial scale solutions such as smart cities (water, power, waste management), smart electric grids, intelligent transport systems etc. The objective of the workshop is to expose the audience to these challenges and the state-of-the-art in research and implementation in the field.

**Topics under scope:** All aspects of autonomous and adaptive software including but not limited to the following areas - Multi-agent systems, Self-adaptive software, Planning techniques, Analytics, Specifications, Architecture and Design, Monitoring and Control, Testing and Verification, Formal Methods.

The program committee selected one paper for short presentation based on relevance and quality. In addition to the keynote setting the stage for the workshop, there are three invited talks and a panel session with experts to facilitate open discussions with the audience in the related topics.

## Program Committee

Biplav Srivastava, IBM, Delhi (Chair)  
Ramamurthy Badrinath, Ericsson  
Sudeshna Sarkar, IIT, Kharagpur  
Rajdeep Niyogi, IIT, Roorkee  
Manoranjan Satapathy, IIT, Bhubaneswar  
Meenakshi D'Souza, IIIT, Bangalore  
Swarup Kumar Mohalik, Ericsson Research, Bangalore

Mahesh Babu Jayaraman, Ericsson Research, Bangalore  
S. Ramesh, General Motors, USA  
Aneta Vulgarakis, Ericsson Research, Sweden  
Nanjangud C Narendra , Ericsson Research, Bangalore

## Keynote

**Title** - Complex Systems : Use Cases, Technology Challenges and Solution Approaches

**Speaker** - *Padmanabhuni Srinivas*

## Invited Talks

Software Architectures for Autonomous Systems

*Swarup Kumar Mohalik and Mahesh Babu Jayaraman*

Assuring Software Safety in Adaptive Industrial Automation Systems

*S D Sudarshan and Raoul Jetley*

Formal Verification of Autonomous Systems

*Meenakshi D'Souza*

## Accepted Papers

1. Performance Modeling of Cloud-based Web Systems to Estimate Response Time Distribution  
*Dayle Chettiar, Arindam Das and Olivia Das*

## Panel Discussion

**Topic** - Perspectives and Possible Directions in Realization of Complex Systems

### Panel Members

Gabi Zodik, IBM, Haifa Research Lab, Israel

S.D. Sudarsan, ABB Corporate Research, Bangalore

Santonu Sarkar, BITS Pilani, Goa

Mahesh Babu Jayaraman, Ericsson Research, Bangalore

Meenakshi D'Souza, IIIT, Bangalore (Moderator)

Swarup Kumar Mohalik, Ericsson Research, Bangalore (Moderator)