Software Center

SOFTWARE CENTER ANNUAL REPORT

2017

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CONTENT

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Metrics: http://metrics.blogg.gu.se/

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Jan Bosch, Director of Software Center
Department of Computer Science and Engineering, Chalmers/University of Gothenburg

Jan Bosch
Professor of Software Engineering
Chalmers University of Technology

Dear Software Center family,

As 2017 is coming to end, I would like to share a few thoughts to reflect on the year. We have a very good year behind us with new partners (Robert Bosch and Qamcom), several new projects and two great reporting workshops. We have a new website including an intranet and we have opened up Software Center for SMEs (Qamcom is the first SME that joined). Also, we kicked off a company to company workshop series where the first workshop was held in October to discuss the SAFe framework and held the first Digitalization workshop for senior leaders of the Software Center companies. Last, but certainly not least, we started a workshop series around continuous deployment for software subject to functional safety standards such as ISO 26262 and will be kicking off Vinnova funded work around software engineering for outcome-driven and AI/ML/DL-driven development.

For me, 2017 is the year that Software Center changed perspective from the more confined scope of best practices to software engineering to the broader scope of digitalization, as the activities and results mentioned in the previous paragraph illustrate. In addition, we changed the scope from Nordic to European. So, the expanded mission of Software Center is to "improve the digitalization capability of the European Software-Intensive industry with an order of magnitude".

For 2018, my hope is that we can deliver on this expanded mission and during the latest reporting workshop, I shared the need to expand the scope of the organizational units that we work with. We have done a lot of work in the area of software R&D and we have great projects ongoing in that area. Digitalization, however, is not confined to this part of the organization and we need to work with the other parts of the company in order to create the future the European software-intensive systems industry deserves.

Onward and upward!

RESEARCH THEMES

Continuous Delivery

Theme leader:

Kristian Sandahl
Linköping University

The vision of the theme Continuous delivery is to reach a level where changes in the code by developers can be automatically delivered to the customers with a minimum of delay while still ensuring the quality of the product by a multitude of automated testing, validation, build and packaging. In our projects universities and companies are working together both with innovative techniques as well as solving current problems and bottlenecks. The research is focusing on the development and operation of tools and methods for automated continuous integration and testing. We have also specialized research in processes, GUI testing, data visualization, human aspects of software engineering, and collaborative machines.

Projects

- Implications of Continuous Deployment: Agneta Nilsson
- Enterprise Scale Continuous Integration and Delivery: Daniel Ståhl and Torvald Mårtensson
- Automated GUI-based Exploratory Testing and Visual GUI Testing: Jan Bosch
- Visualizations as decision support in continuous integration: Ola Leifler
- Behavioral Software Engineering: Robert Feldt
- Aspects of automated testing: Kristian Sandahl
- Modeling and Analyzing Collaborating Machines: Marjan Sirjani

Continuous Architecture

Theme leader:

Jan Carlson
Mälardalen University

Development of high quality complex software systems, in particular in modern embedded and cyber-physical systems, requires careful attention to the software architecture and design. The overall scope of the Continuous Architecture theme is to identify and develop means to help companies improve their processes, methods and technologies related to software architecture, in order to support development of increasingly complex products and to react and adapt quicker to changed market needs.

Current research within the theme includes, for example:

- Identification, management and reduction of architectural debt
- Interoperability and model-driven development
- Combined safety and security analysis and argumentation
- Industrial IoT and Service-level Agreements

Projects

- Managing Architectural Technical Debt (Antonio Martini)
- Managing Interoperability Concerns in Large Systems (Romina Spalazzese)
- Evolution support for architectural artefacts (Jan Carlson)
- Ensuring Quality of Service through Modeling of Service-level Agreements in Industrial IoT (Alessandro Papadopoulos)
- Closing the Safety-Security gap in software intensive systems (Kaj Hänninen)

RESEARCH THEMES

Metrics

Innovation and improvement in software development need effective and efficient measurement. In the age of continuous deployment and focus on speed, ecosystems and data, one of the cornerstones is the development of new metrics (data), processes (speed) and infrastructure (ecosystems) to support modern software development.

The metrics theme focuses on:

- Measurement, assessment and visualization of product and organizational performance
- Smart techniques for data management and decision support (e.g. machine learning)
- Infrastructure for continuous experimentation and simulation of organizational performance (e.g. metrics portfolio, self-healing)
- Optimization of measurement processes in modern software development enterprises (e.g. measurement program robustness assessment)
- Pro-active complexity reduction in large scale software development
- Prediction and assessment of impact of meta-model changes on product cost and quality

http://metrics.blogg.gu.se/

Projects

- Metrics for measuring of speed in software development: Miroslaw Staron
- KPI Quality model – high quality KPIs for software development: Wilhelm Meding
- Quasar (Associated project): Miroslaw Staron
- Unsupervised machine learning for multi-dimensional classifications of signal disturbance: Miroslaw Staron

Theme leaders:

Miroslaw Staron, Chalmers

Wilhelm Meding, Ericsson

Customer Data- and Ecosystem-Driven Development

In this theme, we explore the shift towards continuous software engineering practices and the ways in which the increasing digitalisation of industries requires companies to adopt new ways-of-working.

We focus our research on methods, processes and tools that help software-intensive companies to accelerate the adoption of new development practices and we provide support for how to move beyond agile development and towards continuous deployment of software. We take a holistic approach in which we study both technical and organizational implications and we provide support for R&D teams as well as managers in software organizations.

In the different projects, we study the role of customer and product data as a means to digitally enhance existing products and services and as the basis for new innovations, we study how strategies for managing business and software ecosystems are becoming increasingly important to maximize value between stakeholders, we develop best practices to manage requirements and related knowledge in large-scale system development and we provide industrial partners with support for how to build an API strategy that involve both internal and external stakeholders.

Also, and in order to facilitate and accelerate knowledge sharing between companies in Software Center and other large research initiatives, we conduct research on self-experimentation in autonomous systems in collaboration with Wallenberg Autonomous Systems and Software Program (WASP).

Projects

- Accelerating Digitalization Through Data: Towards Digitally Enhanced and Digital Products and Services (Helena H. Olsson, Jan Bosch and Aleksander Fabian)
- Strategic Ecosystem.Driven R&D Management (Helena H. Olsson, Jan Bosch)
- Data-Driven Continuous Evolution of Autonomous Systems of Systems (David Issa Mattos, Jan Bosch and Helena H. Olsson)
- API Strategy (Jennifer Horkoff, Juho Lindman, Imed Hammouda, Eric Knauss)
- Requirements Engineering for Large-Scale Agile System Development (Eric Knauss, Jennifer Horkoff, Rashidah Kasauli, Grischa Liebel, Francisco Gomes)

Theme leader:

Helena H. Olsson, Malmö University

ORGANISATION

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Linda Svedberg, *Axis Communications*
Robert Lagerstedt, *Bosch*
Axel Franke, *Bosch*
Staffan Lindgren, *Bosch*
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HIGHLIGHTS

Reporting Workshops

The Software Center spring reporting workshop took place at Chalmers, Lindholmen in June. Software developers, engineers and researchers from a number of different organisations came together to learn about recent development in Software Center projects and to discuss common challenges for future development. A novel element on the agenda was the Exploration Space where Software Center projects were presented through posters and presentations.

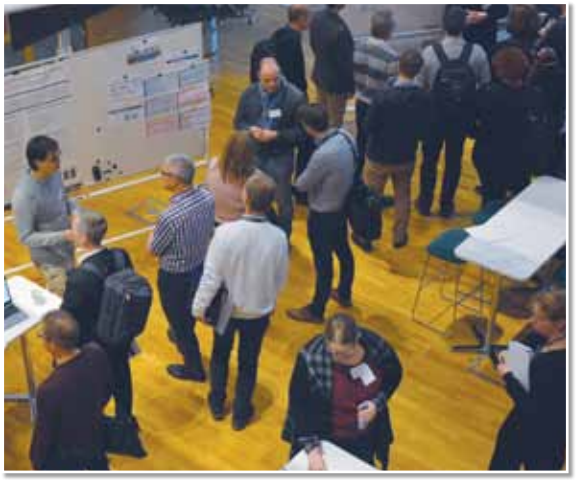
The December reporting workshop was hosted by Ericsson at Lindholmen, Gothenburg. About 20 active Software Center project were presented both in a poster session, and during theme break-out sessions. The evaluation of the event confirmed that participants appreciated the possibility to visit the Ericsson facilities and we encourage Software Center members to host reporting workshops in future sprints.

Senior leaders workshop on Implications of Digitalization: Speed, Services and Software

A new Software Center initiative gathered senior leaders from member companies to discuss implications of digitalization, and in particular how business models are affected by digitalization. Digitalization not just affects products and services. It requires a fundamental reinvention of the organization. We are moving towards a new business operating system focused on speed, data, ecosystems and empowerment. Participants in the workshop presented their companies´ approach to addressing the digitalization challenge and shared best practice. The workshop took place in Gothenburg and was hosted by Jeppesen. During the workshop some participants were interviewed and we expect to release a short movie summarizing the event in early 2018.

Eiffel Summit, Linköping

Ericsson and Tieto held on November 8 the third Eiffel Summit in Linköping, Sweden. The purpose of the Summit was to learn more about the Eiffel protocol, exchange experiences with peers in other organizations and learn about how Eiffel can support continuous practices. More than 60 delegates came from a dozen companies and organizations to learn about and discuss collaboration around the Eiffel protocol and its implementations. The event was successful, with high levels of interest and energy. Apart from presentations and breakout discussions, the event featured demos of implementations and a talk from GitHub on how to build welcoming and successful open source communities.



Tutorials on Experimentation at Axis, Jeppesen and Saab

A tutorial on Controlled Experimentation in Software Product Development was designed and conducted. The purpose of this tutorial was to share the learnings and know-how that we obtained from the online software companies (e.g. from Booking.com, Skyscanner and Microsoft) to Software Center companies. This tutorial tutorial lays the foundation for Software Center companies to integrate experimentation into their development practices. Specifically, it provided the participants with the fundamentals of experimental design, the tools available for this, and guidelines on how to perform trustworthy experimentation.

HIGHLIGHTS

HoliDev - Vinnova addition to Software Center

In December we received happy news from Vinnova, Sweden's innovation agency; the Software Center proposal HoliDev, Holistic DevOps Framework, is granted and will start early 2018. HoliDev means an expansion of Software Center activities, and partners are Chalmers, Ericsson, Volvo Cars and Volvo Technology.

HoliDev combines three elements: continuous development, outcome-driven development, and techniques for artificial intelligence for autonomous software systems. The goal is to develop a first, early version of a holistic development framework for the development of future smart, continuously deployed software-intensive systems.

Rendex

PhD candidate Vard Antinyan has developed a tool for assessing the quality of requirements. In short, the tool helps software designers and business analysis to capture requirements that are ambiguous, hard to implement, hard to test and too complex.

Rendex is based on a formula developed together with Software Center companies and has been successfully implemented in two companies. It has also become a mandatory practice of one of the companies, being implemented in their requirements analysis tool.

New members 2017

During 2017 two new industrial partners joined Software Center. We welcome Robert Bosch AB and Qamcom AB!

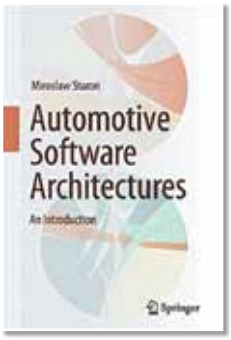
BOSCH qamcom

Books

By Jan Bosch:
Using Data to Build Better Products:
A Hands-On Guide to Working with
Data in R&D - The Basics

By Miroslaw Staron:
Automotive Software Architectures:
An Introduction

The two books are available on Amazon.com



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Alessandro Papadopoulos
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Marjan Sirjani
Henrik Thane

Meetings

Guidelines

- Steering committee meets 4 times per year. Once mid-sprint, once at end of sprint.
- Task force meets 2 times per year, one to two weeks before the end-of-sprint steering committee meeting.
- Coordination team meets once per month
- Every sprint, we organize a 1-day reporting workshop offering all interested parties at the SC companies an opportunity to learn about the ongoing research. This workshop is held one week before the task force meeting
- Every year we organize one brokerage event where companies and research can pitch new projects and build engagement around these
- Theme, project specific meetings and intra-company meetings are in Software Center projects

Meeting schedule Sprint 12

- January 16: Coordination team meeting
- February 20: Coordination team meeting
- March 13: Coordination team meeting
- March 24: Brokerage event
- March 27: Mid-sprint steering committee meeting
- April 24: Coordination team meeting
- May 15: Coordination team meeting
- May 26: Deadline for NEW project proposals
- June 2: Deadline Sprint 13 project proposals
- June 8: Reporting workshop for all companies and other interested parties
- June 9: Task force meeting for planning sprint 11
- June 12: Steering committee meeting
- June 19: Coordination team meeting

Meeting schedule Sprint 13

- August 21: Coordination team meeting
- August 21: General Assembly and strategy workshop
- September 18: Coordination team meeting
- October 2: Mid-sprint steering committee meeting
- October 16: Coordination team meeting
- November 13: Coordination team meeting
- November 17: Deadline for NEW project proposals
- December 1: Deadline Sprint 14 project proposals
- December 7: Reporting workshop for all companies and other interested parties
- December 8: Task force meeting for planning sprint 14
- December 11: Coordination team meeting
- December 11: Steering committee meeting

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