

# Software Technology Exchange Workshop

LINKÖPING 12-13 OCTOBER 2016





## Swedsoft wants to welcomes you to the fifth Software Technology Exchange Workshop (STEW)

Transfer of results of academic research into real products or integrating them into industrial ways-of-working is one of the key challenges for both academic institutions and companies. Many companies today are often unaware of the existing research and many academic institutions have difficulties to disseminate their results within the industry.

To remedy this, the Software Technology Exchange Workshop (STEW) has been organized by Swedsoft to facilitate knowledge exchange and dissemination of academic results within the industry. STEW provides a forum for researchers and industry representatives to meet and learn about recent, industry-relevant research in the domain of software development including software technology, software systems engineering and leadership. The workshop also promotes networking among academic and industrial attendees. This year the focus will be on Best of Swedish industry-academia joint research in software intensive system 2015-2016. Welcome to STEW 2016!



**Stefan Andersson**  
Chairman of the board  
Swedsoft

## QUESTIONS?

Please contact

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# PROGRAM



## Wednesday October 12<sup>th</sup>

- 09:15 **Opening speech**  
Pontus De Laval, Saab
- 10:00 **Software Ecosystems for the Internet of Things**  
Jakob Axelsson, SICS/ Mälardalen University
- 10:30 **Coffee**
- 11:00 **AUTO-CAAS: Model-Based Fault Prediction and Diagnosis of Automotive Software**  
Wojciech Mostowski and Mohammad Reza Mousavi,  
Centre for Research on Embedded System, Halmstad University
- 11:35 **Why a values-driven approach is necessary to stimulate innovation in SW development**  
Niklas Lindhardt, CaptureInnovation
- 12:10 **Lunch sponsored by:**  
**COMBITECH**
- 13:15 **KEYNOTE: Speed, Data and Ecosystems: Excelling in a Software Driven World**  
Jan Bosch, Chalmers University of Technology & Software center
- 14:05 **The Lack of Sharing of Customer Data in Large Software Organizations**  
Aleksander Fabijan & Helena H. Olsson, Malmö University
- 14:40 **On the Integration of System Anatomy, System Architecture and Project Management**  
Lars Taxén, Linköping University and Peter Olow, Knowit TM
- 15:10 **Coffee sponsored by:**  
**Mjärdevi**  
SCIENCE PARK
- 15:40 **Exploratory testing - black or white?**  
Per Runeson, Lund University
- 16:15 **Implementing an organizational capability for systems management – a model based approach**  
Tom Strandberg, Syntell
- 18:30 **Dinner sponsored by:**



The dinner will take place at Datamuseet IT-ceum,  
a part of Östergötlands museum  
Situated at Raoul Wallenbergs plats, Linköping.



# PROGRAM



## Thursday October 13<sup>th</sup>

**09:15 Swedsoft - gathering Swedish software**

Stefan Andersson, Chairman Swedsoft/Future Programs Saab Aeronotics

**10:00 Challenges, Opportunities, and Recommendations for Scaling Agile in Mechatronics Organizations**

Ulrik Eklund, Malmö University

**10:30 Coffee**

**11:00 Model-based development of vehicular embedded systems**

Alessio Bucaioni, Mälardalen University

**11:35 SCALARE – supporting the industry in SCALing softwARE capabilities**

Henrik Cosmo, Addalot, MAPCI and Max Sunemark, Addalot

**12:10 Lunch sponsored by:**



Teknikföretagen

**13:15 KEYNOTE: Towards the Networked Society – a software challenge**

Ulf Wahlberg, VP Industry and Research Relations Ericsson

**14:05 Ontology-based software test case generation (OSTAG)**

Vladimir Tarasov, Jönköping University, School of Engineering,  
Department of Computer Science and Informatics

**14:40 Eiffel – Achieving Enterprise Scale Continuous Integration and Delivery Traceability**

Daniel Ståhl and Kristofer Hallén, Ericsson

**15:10 Coffee sponsored by:**



**15:40 Pre-runtime scheduling of avionic systems**

Elina Rönnberg, Linköping University and Saab

**16:15 An industrial application of the Semantic web technology**

Dag Rende, FindOut Technologies AB

# ABSTRACTS



Here you can find the abstracts to the presentations that you will hear over the next two days. We hope the following days will inspire you, let you obtain fresh knowledge and interesting new contacts. If you want to help us spread the word about STEW or if you get an idea, have a question or even a revelation - please use

# #STEW16





## Wednesday October 12<sup>th</sup>

### Opening speech

Pontus De Laval, Saab

Saab's product portfolio will be described with specific emphasises on how software and digitalisation influence the company, both from a development perspective – how do we increase efficiency? - and from a product perspective – how do we increase customer value? Collaborative initiatives in the software area, e.g Combient and Wallenberg Autonomous systems Program, will be addressed – how can we be more competitive by working together?

### Software Ecosystems for the Internet of Things

Jakob Axelsson, SICS / Mälardalen University

Developments in the Internet of Things (IoT) area have so far focused on finding technical solutions that enable the connection of devices to the Internet. This technology has now reached a sufficient maturity to enable companies to implement IoT on a broad scale, which leads to a shift in attention towards large-scale systems engineering issues and how to make a successful business out of IoT. In this presentation we will present our research findings on software ecosystems for IoT, where a partly open development model is used in which different actors can extend a base product with new features and services. We address the IoT challenges through a concept we call Federated Embedded Systems (FES). In a FES, each device has the possibility to dynamically plug-in software extensions, and this provides benefits when it comes to time-to-market for new features; system-of-systems integration; and open innovation. In the presentation, we will discuss implications on business models, system architecture, and quality assurance when transforming into an IoT ecosystem. Application areas include automotive, energy, process automation, smart cities and buildings.

The presentation summarizes the results from the research project “Project development and open innovation in ecosystems of embedded systems”. The project has been carried out during 2013-2016. It is led by SICS, and the project partners are Volvo Car Corporation, Volvo Technology, Yaskawa Nordic, Arcticus Systems, Springworks, Tolpagorni, Danfoss, and Linnaeus University, with financial support from Vinnova.

# ABSTRACTS



## AUTO-CAAS: Model-Based Fault Prediction and Diagnosis of Automotive Software

Wojciech Mostowski and Mohammad Reza Mousavi,  
Centre for Research on Embedded System, Halmstad University

We provide an overview of the AUTO-CAAS project, an ongoing collaboration among ArcCore AB, QuviQ AB and Halmstad University. The aim of the project is to exploit the formal models of the automotive standard AUTOSAR. These models were developed by QuviQ in order to detect defects in concrete implementations based on AUTOSAR components that may possibly exhibit deviations from the standard. We use a model-based technique to align the actual behaviour of components with their interface models. We then exploit the result of this analysis in order to generate targeted test-cases to push the components towards detected failures. For experimentation we use the AUTOSAR implementation from ArcCore AB.

One of the first challenges in our project is to represent detected failures (non-conformances) of software components in a comprehensible and processable format for later failure analysis of the larger system. In this context single counter examples (failing test execution traces) are not sufficient as they do not generalise the failing behaviour, only exemplify it. To construct the more general failure description, i.e., a failure model, we run the tests repeatedly and employ automata learning techniques to build a complete model of the failure out of several failing test traces. This process is automatic in most part, however, it needs to be controlled by providing some a-priori knowledge about the system under test to guide and control the learning process.

## Why a values-driven approach is necessary to stimulate innovation in SW development

Niklas Lindhardt, CaptureInnovation

How do we create optimal conditions for innovation? Starting from a well-designed process and ending in personal values and drivers, this seminar paints the full picture of keys for innovation. Get new perspectives on what really matters when it comes to innovation, and learn how to start from the right end.

Sweden, and the Nordic countries, have a cultural benefit when it comes to building innovative organizations. How can we make this benefit contribute to our society?

# ABSTRACTS



## KEYNOTE: Speed, Data and Ecosystems: Excelling in a Software Driven World

Jan Bosch, Chalmers University of Technology & Software center

The future of software engineering is centered around three main developments: Speed, Data and Ecosystems. The focus on speed is concerned with the constantly increasing rate of deploying new software in the field. This continuous integration and deployment is no longer only the purview of internet companies but is also increasingly deployed in embedded systems. Second, data is concerned with the vast amounts of information collected from systems deployed in the field and the behaviour of the users of these systems. The software-intensive systems industry needs to significantly improve its ability to exploit the value present in that data. Finally, ecosystems are concerned with the transition in many companies from doing everything in-house to strategic use of innovation partners and commodity providing partners. The keynote addresses these three main developments, provides numerous examples from the Nordic and international industry and predicts the next steps that industry and academia need to engage in to remain competitive.

## The Lack of Sharing of Customer Data in Large Software Organizations

Aleksander Fabijan & Helena H. Olsson, Malmö University

With agile teams becoming increasingly multi-disciplinary and including all functions, the role of customer feedback is gaining momentum. Today, companies collect feedback from customers, as well as from their products in the field. As a result, companies face a situation in which the amount of data from which they can learn about customer behaviours and preferences is larger than ever before. In previous studies, the collection of data is often identified as the main challenge. However, and as illustrated in our research, the challenge is not the collection of data but rather how to share this data across development phases and among roles and units in the organization in order to make effective use of it. In this presentation, and based on case study research in three large software-intensive companies, we (1) provide empirical evidence that 'lack of sharing' is the primary reason for insufficient use of customer and product data, and (2) outline a model in which we identify what data is collected, by whom data is collected and the development phases in which it is used. In particular, the model depicts critical hand-overs where certain types of data get lost, as well as the implications associated with this. We conclude that companies benefit from a very limited part of the data they collect, and that lack of sharing of data drives inaccurate assumptions of what constitutes customer value.



## On the Integration of System Anatomy, System Architecture and Project Management

Lars Taxén, Linköping University and Peter Olow, Knowit TM

In this contribution, we discuss an elaboration of the System Anatomy model. The purpose of this model, which shows dependencies between functions from basic to “money-making” ones, is to provide a common view for all stakeholders of a system under development. The System Anatomy, which was conceived at Ericsson in the early 1990s, is the basis for a system development method called Integration Driven Development. The results from applying this method in numerous, complex development projects over many years, are spectacularly successful. However, transferring this method to organizations outside Ericsson has been surprisingly difficult. One plausible reason is that some stakeholders, like system architects, cannot relate to the anatomy, since this shows only functions without indicating how these are implemented in hardware or software. This may result in a resistance to adopt the method, which in turn may jeopardize its introduction in new settings. To remedy this, we propose an additional view in the anatomy that creates an opening for significant architectural concepts, which in turn enable architects to relate to the anatomy. This example can be generalized to other stakeholders, where the anatomy functions as a “boundary object” between socially organized activities like project management, product management, architectural management, and the like. To further develop the System Anatomy thinking along these lines, we suggest several topics for collaboration between academia and industry. The implications of such collaborations might be profound for Swedish software industry, which, by and large, still have not capitalized on the possibilities the System Anatomy based method provides.

## Exploratory testing - black or white?

Per Runeson, Lund University

The methods of exploratory testing has gained significant attention in industry and research in the last years. However, as many “buzzword” technologies, the introduction and application of exploratory testing is not straightforward. Exploratory testing it is not only black or white - scripted or exploratory - but also all shades of grey in between. Within the EASE industrial excellence center, we have executed an industrial workshop on exploratory testing, that helps providing understanding of how to choose feasible levels of exploration in exploratory testing. We will present the concepts of levels of exploration in exploratory testing, the outcomes of the workshop, along with relevant empirical research findings on exploratory testing.

# ABSTRACTS



## Implementing an organizational capability for systems management – a model based approach

Tom Strandberg, Syntell

With the rapid speed of technology development and the trend towards smart and networking systems the complexity of almost any system will increase. These trends, in association with high demands on performance, availability and safety compliance, create challenges for the development and lifecycle management of systems. Introducing, applying and continuously enhancing a sound systems approach in order to connect the stakeholder needs with the development of software over time will be crucial to success. Systems engineering, and in particular model-based systems engineering, provides a method for software engineering in a system context.

This presentation will describe an approach to implement a systems engineering capability in an organization. The presentation makes reference to a case study in which a model based systems engineering capability was to be implemented in an international industrial corporation. As a foundation a model for organizational capability has been developed. The model consists of the elements required to create a long-term systems engineering capability and how these are balanced to the specific needs of the company (product, business and organizational factors). Implementing an organizational capability is not primarily a technical effort but rather a people and change management challenge. The presentation will also present a number of risks (pitfalls) and opportunities that can be the difference between a successful implementation and an expensive and demotivating failure.

# ABSTRACTS



## Thursday October 13<sup>th</sup>

### Swedsoft - gathering Swedish software

Stefan Andersson, Chairman Swedsoft/Future Programs Saab Aeronotics

Introduction to the non-profit organization Swedsoft and some reflections about the importance of Software today and in the future.

### Challenges, Opportunities, and Recommendations for Scaling Agile in Mechatronics Organizations

Ulrik Eklund, Malmö University and and Christian Berger, University of Gothenburg

Speaker: Ulrik Eklund

One of the present challenges among large mechatronics companies is how to scale agile beyond short iterations on the team level. These iterations are never visible as shortened lead-times in launching new or updated products since the overall R&D approach for the organization is still governed by an overall stage-gate or V-model. The software deliveries are still planned in time towards scheduled integration points determined by mechanics and manufacturing development, even if individual software teams are able to reprioritize and implement features in a 2-4 week cycle.

In this talk, we will present findings from our two-year research project following and collaborating with six large companies attempting to scale agile development. The companies are from different domains dealing with mechatronics systems: Volvo Cars, Volvo Trucks, Tetra Pak, Axis, Saab EDS and Grundfos. We will highlight challenges and opportunities from the companies, together with a checklist of 26 practices specific to the mechatronics domain, which support agile principles at scale.

Preliminary results from the first year of the project were presented at the XP conference 2015:

DOI: [10.1007/978-3-319-18612-2\\_2](https://doi.org/10.1007/978-3-319-18612-2_2)



## Model-based development of vehicular embedded systems

Alessio Bucaioni, Mälardalen University

The design, the implementation and the deployment of modern vehicles is heavily affected by software; in fact, as much as 80% of the vehicles' innovation is delivered by software. Complex modern vehicle features i) increase the size and complexity of the vehicular embedded software and ii) require higher computational power and more complex coordination. In this context, industry is seeking for new development approaches able i) to develop advance computational-intensive features and ii) to keep the development costs and time-to-market low.

In this talk, we are going to illustrate a model-based development approach for the development of vehicular embedded software. The approach leverages the interplay of model based techniques ( such as metamodeling, model-based timing analysis, etc.) and industrial technologies (such as Rubus Component Model, Rubus RTOS, etc).

## SCALARE – supporting the industry in SCALing softwARE capabilities

Henrik Cosmo, Addalot, MAPCI and Max Sunemark, Addalot

The Scalare project tackles one of the key challenges of the European industry: how do we transform our organization when software is becoming a critical part of our business? How can we be assisted in the digital transformation of our assets and offerings? These transformations can partly be driven by the technological evolution and partly by the business.

The project has developed the Scaling Management Framework (SMF), that is unique in the sense that it supports the digital transformation and scaling of capabilities in three dimensions, covering organization, products and processes. More the project presents real case studies from companies having done a transformation journey, a.k.a Travel Story, which we can learn and get inspiration from. The SMF gives the Map, the Compass, and an experience database (with the Travel Brochures and the Travel Stories) that will guide your company through its transformation journey. Let's start plan.

The Scalare project is a strong European teamwork under the wings of the ITEA (Information Technology for European Advancement), which is a European program to support industry-driven research. It's a joint effort between industry and academia in Ireland, Spain, Sweden and Germany. The project is financed by Vinnova in Sweden and by Enterprise Ireland in Ireland.



## KEYNOTE: Towards the Networked Society – a software challenge

Ulf Wahlberg, VP Industry and Research Relations Ericsson

Some global trends in the rapid development and deployment of information and communication technologies will be highlighted, we are entering the networked society. Along with the increased demand for data capacity for personal communication we foresee a number of new use cases in different industry segments and from a high number of connected devices beyond smartphones. New possibilities driven by broadband, cloud services and mobility is transforming existing industry and society, creating new products and services and the way they are developed and delivered. The main requirements and capabilities of 5G, the next generation of communication infrastructure will be described, as well as some key technologies identified to reach these requirements. Most of this new functionality will be implemented in software and some identified key challenges in developing these software intense systems will be addressed.

## Ontology-based software test case generation (OSTAG)

Vladimir Tarasov, Jönköping University, School of Engineering,  
Department of Computer Science and Informatics

An important aspect when developing software is to procure the quality of the final product or system. To obtain a quality product, a large portion of the development costs are invested in the testing of the software. Hence, every improvement or simplification of the testing activities will have a direct and positive impact on the testing costs as well as improving the quality of the final product or system.

At the School of Engineering at Jönköping University a research project is currently carried out with a focus on software testing activities and a strive to diminish the costs related to these activities. The project is funded by the KK Foundation during 2015 to 2017 and has initially identified a number of objectives related to research, technology and business goals in conjunction to software test case generation.

**Research objectives** -To create a method of (semi-)automatically producing software test cases using an ontology that describes the requirements put on a software system and inference rules that describe an experienced testers' skills and competences. Applying the inference rules on the ontology produce software test cases.

**Technical objectives** - Develop a software prototype or tool that (semi-) automatically produces the aforementioned software test cases by applying the inference rules on the ontology. The prototype will be experienced upon and iteratively refined during the course of the project.

**Business objectives** -Iteratively improve the test case production process to make it more efficient in relation to the consumption of resources, time and monetary investments as well as improving the test coverage and helping unexperienced testers while using the developed prototype/tool.

A first version of a “test ontology”, based on a set of software requirements, and associated inference rules, have been developed which in conjunction have the capacity of producing software test cases. The prototype/tool, as well as its capacities, will be demonstrated during the presentation.

# ABSTRACTS



## Eiffel – Achieving Enterprise Scale Continuous Integration and Delivery Traceability

Daniel Ståhl and Kristofer Hallén, Ericsson

Software engineering traceability is as challenging as it is crucial, particularly in large scale projects. Moreover, traceability isn't just for release documentation and regulations compliance – traceability is key to providing feedback to R&D and empowering engineers to take end-to-end responsibility. The Eiffel framework, originally developed by Ericsson and now available as open source, was originally designed to afford scalability and traceability in large, heterogeneous enterprises in a continuous integration and delivery context. Now, after more than three years of in-production experience and a Software Center research study (Daniel Ståhl, Kristofer Hallén and Jan Bosch, 2016) we are happy to present how it works, and how its adoption framework has affected R&D behavior.

## Pre-runtime scheduling of avionic systems

Elina Rönnberg, Linköping University and Saab

A modern aeroplane hosts lots of advanced electronics in the form of sensors that gather information, units where the information is processed, actuators that control the aeroplane, and equipment that presents information to the pilot. During operation, this information is updated repeatedly, giving rise to a complex flow of data between different units and thus putting requirements on when different activities are allowed to be executed.

Electronics in an aeroplane is called avionics. During the last two decades, the majority of the avionics industry has gone from using federated systems to using an integrated architecture called integrated modular avionics (IMA), which is a hard real-time system where applications share hardware resources. Such an architecture necessitates strict requirements on the spatial and temporal partitioning of the system to achieve fault containment. One way to establish a temporal partitioning is through pre-run time scheduling of the system.

In this project we develop optimisation models and methods for pre-runtime scheduling of future avionic systems. To efficiently solve such problems is both of industrial relevance for Saab and an interesting topic for research in optimisation because of the computational challenges that such scheduling problems give rise to. In our talk we will present the results obtained this far in the project and put a special emphasis on how we have arranged the industry-academia collaboration.

# ABSTRACTS



## An industrial application of the Semantic web technology

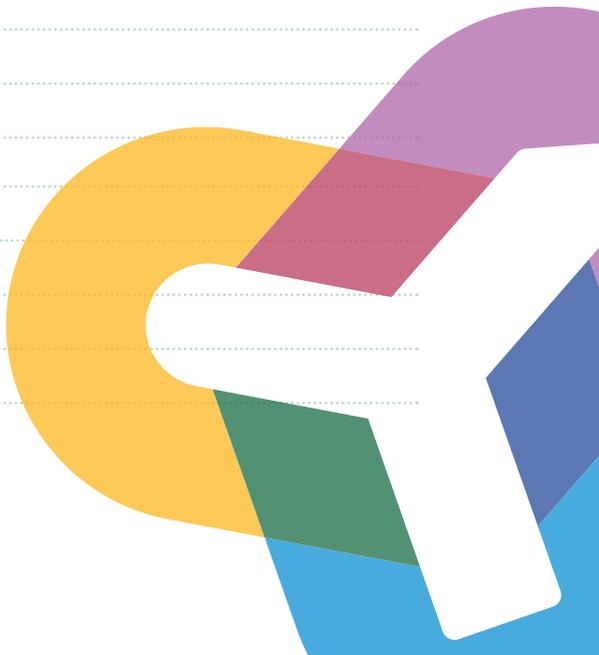
Dag Rende, FindOut Technologies AB

The ITEA3-project ASSUME with Scania, KTH and FindOut Technologies is an exciting application of the Semantic Web technology for tool and data integration in the automotive industry. A huge amount of data and interrelations of various aspects of electrical architectural design of trucks is created and made available. In one part of the project, FindOut has developed a component that visualizes data in the Scania Semantic Web, graphically for various roles at Scania. Tool integrators at Scania can configure the component to support a wide variety of visualization needs. The visualizations are interactive and can be integrated in .NET applications or used in a web browser.

The Semantic Web technology is presented with an example that everyone may have encountered, without knowing that it is based on this technology. The background of the Scania effort using this technology is presented and its relation to the ISO 26262 standard. Finally the the visualization system created by FindOut Technologies is described and demonstrated.

# NOTES

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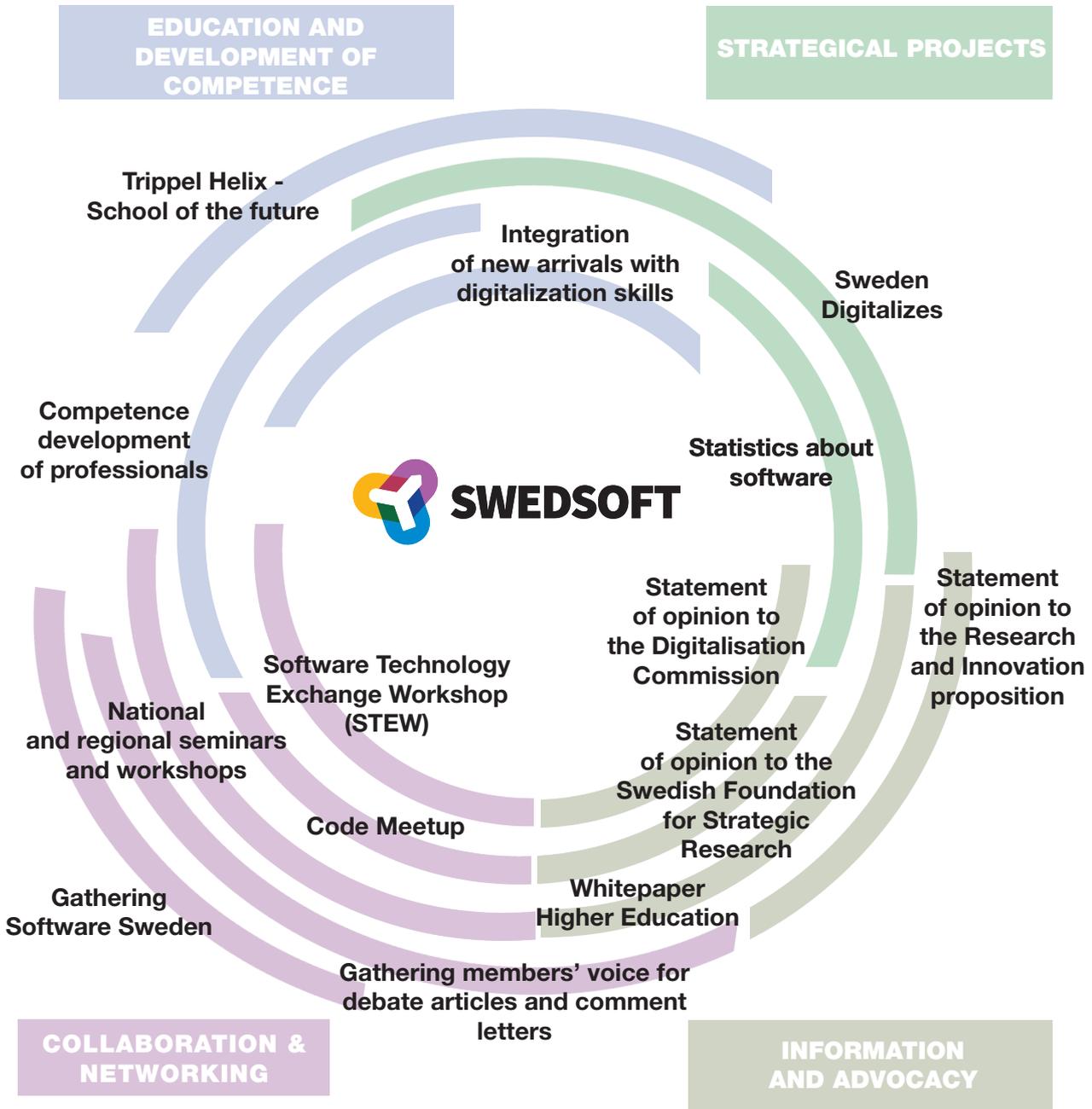
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# THE SWEDSOFT CIRCLE



These are the projects and areas in which Swedsoft operates.

Do you want to know more? Please visit our website

[swedsoft.se](http://swedsoft.se)

# SWEDSOFT'S MEMBERS



Arcticus Systems



LUNDS  
UNIVERSITET  
Lunds Tekniska Högskola



Teknikföretagen



# SWEDSOFT'S EVENTS



## Swedsoft - Upcoming events

### Framtiden inom mjukvaruutveckling

(The future of software development)

November 29<sup>th</sup> 2016

Linnaeus University, Campus Växjö

### Seminarium och höstmöte

(Seminar and autumn meeting)

December 7<sup>th</sup> 2016

Gothenburg

### Samling av Mjukvarusverige

(Gathering Software Sweden)

February 1<sup>st</sup> 2017

Malmö University, Malmö

### Code Meetup

May 16<sup>th</sup> - 17<sup>th</sup> 2017

Kista Expo Center, Kista

### Software Technology Exchange Workshop 2017

October 18<sup>th</sup> -19<sup>th</sup> 2017

KTH Royal Institute of Technology, Stockholm

SAVE THE DATE FOR NEXT YEAR

# Software Technology Exchange Workshop 2017

KTH Royal Institute of Technology, Stockholm

October 18<sup>th</sup> -19<sup>th</sup>, 2017





# SWEDSOFT

Swedsoft is an independent, nonprofit organization

working to increase Swedish software's competitiveness.

We welcome companies, academia and the public sector,

who are interested in software development, as members.

Our goal is to make Sweden a center for innovation

of software intensive systems and through this,

contributing to increased welfare and increased

industrial competitiveness.

# swedsoft.se