

CASTOR Annual Report 2018 - 2019



SAAB



ERICSSON

2018, when it all started!

Our centre has been officially kicked-off in May 2018, and has been publicly inaugurated in September. During this first year, a lot has happened in order to pave the way with the industry, towards sustainable research collaborations in Software Technology around Stockholm. Benoit Baudry, director of the centre, shares his insights after this first intensive year.



*Benoit Baudry,
Director of CASTOR*

I am very happy to share some news about CASTOR one year after its official launch. It has been an intensive year during which we have worked on the CASTOR setup along three axes:

Consolidate software research at KTH. This has been a key objective for this year. There are extremely strong scientific activities in the area of software technology scattered at KTH. I believe it is important for all of us (faculty, students, industry partners) that we can showcase all this activity as a collective effort. This shows large impact in PhD supervision, publications and software development, which is great for the visibility of all our works towards partners and society. The CASTOR web site is the main instrument that we have used to consolidate this activity, and we wish to use it as the main showcase for the KTH software research activities.

Deepen the understanding of software challenges at Ericsson and SAAB. This is essential to establish long-term collaborations in the wide area of software research, and eventually lunch industry PhD theses on challenging scientific and technical topics that are of interest for all CASTOR partners. We have organized two large workshops at Ericsson and SAAB as well as smaller workshops on specific CASTOR topics. These activities have been essential to crystallize the four key research areas of CASTOR, which are recognized by all partners: automated software development; software security; distributed systems; embedded systems.

Increase the visibility and the network of CASTOR. This third activity aimed at amplifying the two others. We have organized meetings with many companies that share some of our challenges in software technology and software research, we have showcased the CASTOR

technology towards the IT industry in Stockholm. These aim at increasing the visibility of our research and eventually grow the CASTOR center with new partnerships.

These consolidation and showcasing activities have lead to new collaborative activities, as it is detailed in this document. We have also strengthened our collaboration with WASP: CASTOR hosts the WARA for software, and CASTOR has received three PhD grants from WASP. I am convinced that the CASTOR Software Days in October will be another key milestone for the visibility and impact of our research activities.

Thank you for your interest and your support in the CASTOR centre!

*Benoit Baudry,
Professor in software technology at KTH and director of CASTOR.*

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[KTH Software Research Meetup](#)

Seed Projects

Seed projects are funded by CASTOR over a period of several months in order to launch preliminary studies between KTH researchers and Saab or Ericsson. During this first year, three seed projects have been kicked-off.



Real-time Analytics for 5G RAN Engineering and Operation

Jan. 2019 to Dec. 2019

Ericsson - Andreas Ermedahl, Thomas Lundborg, Loghman Andimeh
KTH - Rolf Stadler, Forough Shahab

The objective of this project is to study, develop, and demonstrate novel, data-driven methods for 5G Cloud RAN environments with emphasis on real-time analytics during system operation. The current focus is on KPI estimation and forecasting whereby the tradeoff between prediction accuracy and overhead is studied. The results are intended to use for proactive resource management. Outcomes are expected in two areas: first, software for monitoring and prediction that can be used with the Ericsson-built lab testbed and the RAN simulator; second, publications with the scientific results. We have studied the RAN data and the methods for accessing and processing data on the prototyping platform. Also, we have analyzed event streams from a large set of base-station traces to better understand traffic characteristics of operational systems.



Correct-by-Construction Design of Embedded and Cyber-Physical Systems

Nov. 2018 to Sep. 2019

SAAB - Ingemar Söderquist, Mats Ekman, and Timmy Sundström
KTH - Ingo Sander, Dilian Gurov, George Ungureanu, Rodolfo Jordao

This seed project is a pre-study with the objective to investigate how formal design transformations can be integrated into a formal correct-by-construction design flow that targets the design of heterogeneous avionics embedded systems. As a first result of the pre-study for a three-year project proposal has been submitted to Vinnova for the NFFP7 call 2. The basic idea is to use formal contracts to formalize design transformations, to establish the concepts of a transformational refinement flow, and based on the ForSyDe system design flow, which has a sound formal base in form of models of computation theory.

ForSyDe web page: <https://forsyde.github.io/>
ForSyDe github repository: <https://github.com/forsyde>

Seed Projects



Design Space Exploration of Mixed-Criticality Applications on Predictable Multi-Processor Platforms

Nov. 2018 to Sep. 2019

SAAB - Ingemar Söderquist, Mats Ekman, and Timmy Sundström
KTH - Ingo Sander, Christin Schulte, Tage Mohammadat, Rodolfo Jordao

The seed project is a pre-study with the objective to investigate how to design efficient design space exploration (DSE) techniques for avionics systems, where several applications with individual criticality levels and design constraints have to be implemented on a shared distributed multiprocessor platform. The techniques studied and proposed in the seed project shall be the base for a larger project that will develop an efficient DSE-tool for future avionics systems and integrate it into the ForSyDe design flow. The seed project makes use of the lessons learned from the existing DSE tool DeSyDe, which was restricted to specific application and platform models. In particular, the seed project investigates heterogeneous workload models, avionics platform models, efficient solving techniques capable to exploit designer's knowledge, and platform exploration as part of the DSE process. The seed project shall explore promising research directions, which will then be the base for the larger project proposal. The objective is to submit such a proposal shortly after the project deadline, for instance as part of Vinnova "Smartare Elektroniksystem" or a new Vinnova NFFP-call.

ForSyDe web page: <https://forsyde.github.io/>

ForSyDe github repository: <https://github.com/forsyde>

Organization

DIRECTOR & VICE DIRECTORS

Benoit Baudry, KTH

Christian Schulte, KTH

Mads Dam, KTH

BOARD

Catrin Granbom, Ericsson

Stefan Andersson, SAAB

Jens Zander, KTH

MANAGEMENT TEAM

Benoit Baudry, director, KTH

Frédéric Loiret, Project Manager, KTH

Maria Berthelius, Service Coordinator, KTH

Gabriella Ågren, Finance, KTH

Alexandra Leyton, Communication, KTH

Madeleine Printzsköld, HR, KTH

Stefan Hagdahl, SAAB liaison, SAAB

KTH RESEARCH STAFF MEMBERS

Amir H. Payberah, Assistant Professor

Benoit Baudry, Professor

Christian Schulte, Professor

Cyrille Artho, Associate Professor

David Broman, Associate Professor

Dejan Kostic, Professor

Dilian Gurov, Associate Professor

Douglas Wikström, Associate Professor

Elena Troubitsyna, Associate Professor

Frédéric Loiret, Senior Researcher

Ingo Sander, Professor

Jana Tumova, Assistant Professor

Jim Dowling, Associate Professor

Karl Meinke, Professor

Mads Dam, Professor

Martin Monperus, Professor

Musard Balliu, Assistant Professor

Paris Carbone, Research Scientist

Philipp Haller, Associate Professor

Roberto Guanciale, Assistant Professor

Rolf Stadler, Professor

Sarunas Girdzijauskas, Associate Professor

Seif Haridi, Professor



Benoit Baudry



Christian Schulte



Mads Dam



Catrin Granbom



Stefan Andersson



Jens Zander



Frédéric Loiret



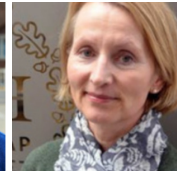
Maria Berthelius



Gabriella Ågren



Stefan Hagdahl



Madeleine
Printzsköld



Alexandra Leyton



Amir H. Payberah



Cyrille Artho



David Broman



Dejan Kostic



Dilian Gurov



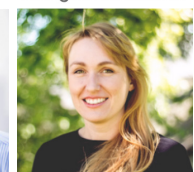
Douglas Wikström



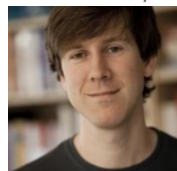
Elena Troubitsyna



Ingo Sander



Jana Tumova



Jim Dowling



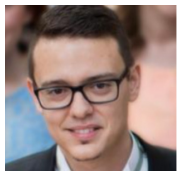
Karl Meinke



Martin Monperus



Musard Balliu



Paris Carbone



Philipp Haller



Roberto Guanciale



Rolf Stadler



Sarunas
Girdzijauskas



Seif Haridi

News & Events of the Year

PRESS RELEASES & "POPULAR SCIENCE"

- [New article on the Ericsson's Research Blog about Unison](#)
- [SAP uses Gecode!](#)
- [Benoit Baudry's Interview after CASTOR's Inauguration](#)
- [The Mysterious Life of a Virtual Developer Unmasked!](#)
- [VR Supports Software Technology Research at KTH](#)
- [Christian Schulte on KTH Research News!](#)
- [The Chaos Engineering Day Promoted on the KTH Homepage](#)
- [Stefan Hagdahl's Interview on the KTH & SAAB Collaboration in CASTOR](#)
- [Repairnator mentioned on Sveriges Radio](#)
- ["Popular Science" Video about Research on Domain Specific Languages](#)
- [CASTOR Technologies Cited by the Swedish Consulting Company Claremont](#)

ACADEMIC ACHIEVEMENTS

- [BISS' 18 PhD Spring School Course on Provable Security](#)
- [Outstanding Paper Award to Castor Researcher](#)
- [CASTOR Talk at the ACP Summer School 2018](#)
- [Two Major Publications in ISSRE'18 and EMSE'18 by CASTOR Researchers](#)
- [CASTOR's member in the Executive Committee of the Association of Constraint Programming](#)
- [Best Paper Award in the International Journal SoSyM](#)
- ['Data Showcase Award' at the MSR'19 conference](#)

CASTOR EVENTS & WORKSHOPS

- [CASTOR Inaugural Celebration](#)
- [Success for the 2nd Chaos Engineering Workshop!](#)
- [KTH Security Seminars Organised on a Regular Basis](#)
- [Musard Balliu and Elena Troubitsyna - Talks at Ericsson Research](#)
- [CASTOR SAAB Workshop in Järfälla in September 2018](#)
- [CASTOR SAAB Workshop in Linköping in February 2019](#)
- [CASTOR Ericsson Workshop in Kista in February 2019](#)

JOB OPENINGS

- [10 CASTOR PhD Positions Opening at KTH](#)
- [3 New PhD Grants from WASP Supporting CASTOR](#)

NEW R&D PROJECTS

- [CASTOR-Incubated "Internet of DevOps" Project Kicked-off](#)
- [PAUS Exchange](#)

EVENT CO-ORGANIZED BY CASTOR

- [Distributed Computing & Analytics Workshop](#)
- [OSLC and Linked Data Unconference](#)
- [2nd European Chaos Engineering Day](#)
- [Sweden – Finland Joint ICT/Digitalisation Project Planning Workshop](#)

PHD DEFENSE

- [PhD dissertation by Didem Gürdür \(Data and Visual Analytics for CPS\)](#)

PUBLIC TALKS FROM CASTOR RESEARCHERS

- [Seminar by Han Fu on Industrial Continuous Integration at Ericsson](#)
- [Meetup Talk at Claremont with Benoit Baudry](#)
- [Meetup Talk at Claremont with Martin Monperrus](#)
- [Meetup Talk at DevOps by Frederic Loiret](#)

CASTOR ORGANIZED RESEARCH SEMINARS

- [How can the Eclipse Foundation help you promote your research in open source?](#)
- [Streaming at King, by Anis Nasir](#)
- ["Digitalization Disrupts: Software, Data and AI" – Invited talk by Helena Holmström Olsson](#)
- [Talk by Peter Stuckey – Certifying Optimality in Constraint Programming](#)
- [KTH Research MeetUps](#)

Highlights

CASTOR INAUGURATION - SEPTEMBER 12TH 2018

It was a full house for the inauguration of the CASTOR Software Research Center, as over 50 guests attended. KTH professors, researchers, industry representatives and employees from the French embassy and Vinnova joined in for the afternoon event at the Scandic Anglais at Östermalm.

Prof. Benoit Baudry began the sessions by acknowledging the goals of the center; to succeed in doing very good research that is valuable for industry partners (the center is a collaboration between KTH, Saab and Ericsson, with the aim of delivering outstanding research in software engineering), and also his wishes to increase collaboration through more co-developments of open source software tools. The goal is also to increase the number of industry PhD students to run the core research activities of the center, and contributing to reducing the cultural gap that currently exists when referring to software technology between the industry and the lab.



Key-note speakers, Professor of Software Engineering at Chalmers University of Technology in Gothenburg, Robert Feldt, and Professor in Interaction Design at KTH, Kristina Höök. Robert Feldt talked about his experiences for setting up collaborations with the industry on software research in Sweden. Kristina Höök presented her insights after having led for more than 10 years the "Mobile Life" research center at KTH.



The official opening was made by Pontus de Laval – CTO SAAB, Dr. Magnus Frodigh – Acting Head of Research at Ericsson, and Prof. Annika Trigell – KTH Vice-President for research, which followed by a reception dinner until late hours.



Highlights

CHAOS ENGINEERING DAY- DECEMBER 5TH 2018

The 2nd Chaos Engineering Workshop was a success! The main salient points to be emphasized are:

- We had 5 great presentations, with an audience peaking at 85 persons, in a full lecture hall,
- The audience was from KTH, Stockholm, and also from France, UK, Russia, Spain and other European countries,
- We had KTH students, incl. young bachelor students, who got very inspired by the presentations, in particular the keynote by Lorin Hochstein from Netflix,
- A great amount of networking has taken place.



Highlights

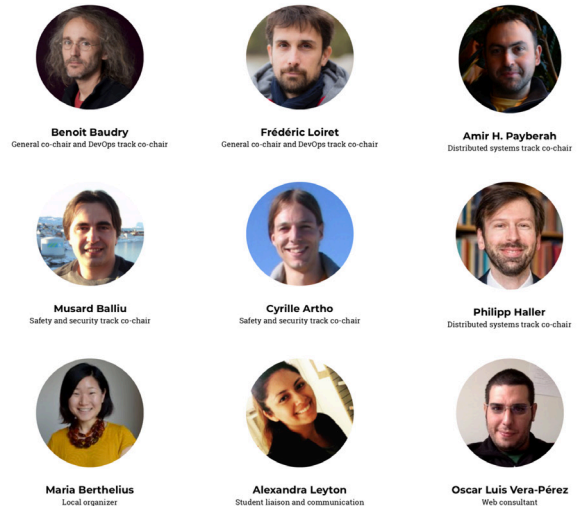


A TEAM SET UP FOR THE UPCOMING CASTOR SOFTWARE DAYS

In early 2019 was presented within CASTOR the idea of organizing a large public event in order to show-case software technology research from our centre, and invite prominent key-note speakers. The *CASTOR Software Days* were born, with the goal to attract software researchers, engineers and students, and discuss cutting-edge technology, state of the art and current challenges in three areas: DevOps, Safety & Security, Large-Scale Distributed Systems.

And we setup a great organization team to take the lead on this endeavour!

▶ [Check out our Software Days' website](#)



CASTOR JOB OPENINGS

During the last year, we were pleased to announce the opening of 10 PhD positions at KTH, in the area of dynamic software analysis with applications to:

- Software technology with an application to
- Distributed systems and networks
- Scalable big data analysis
- Decentralized Machine Learning, Data Mining
- Experimental Software Engineering
- Verification of Safety-Critical Embedded Software
- Hardening Security Libraries

In May 2019, we also received 3 new additional PhD grants from WASP supporting CASTOR in the following areas:

- Secure platform for modern computing
- Artificial intelligence for automatic software bug repair
- Automatic "crash-debudd-fix" system in the CI loop

▶ [Check out our current CASTOR-related job openings](#)

CASTOR WORKSHOPS AT SAAB AND ERICSSON

Three CASTOR workshops were organized at Saab and Ericsson in the last year, in Järfälla in September 2018, in Linköping in February 2019, and in Kista in February 2019. The intention of these workshops were to show-case our main KTH CASTOR software research topics to a wide audience of engineers, researchers and managers from our industrial partners. During these workshops, presentations from KTH researchers took place (by Benoit Baudry, Martin Monperrus, Frédéric Loiret, Musard Balliu, Amir Payberah, Ingo Sander and Johnny Öberg).
