

Accelerating
innovation!



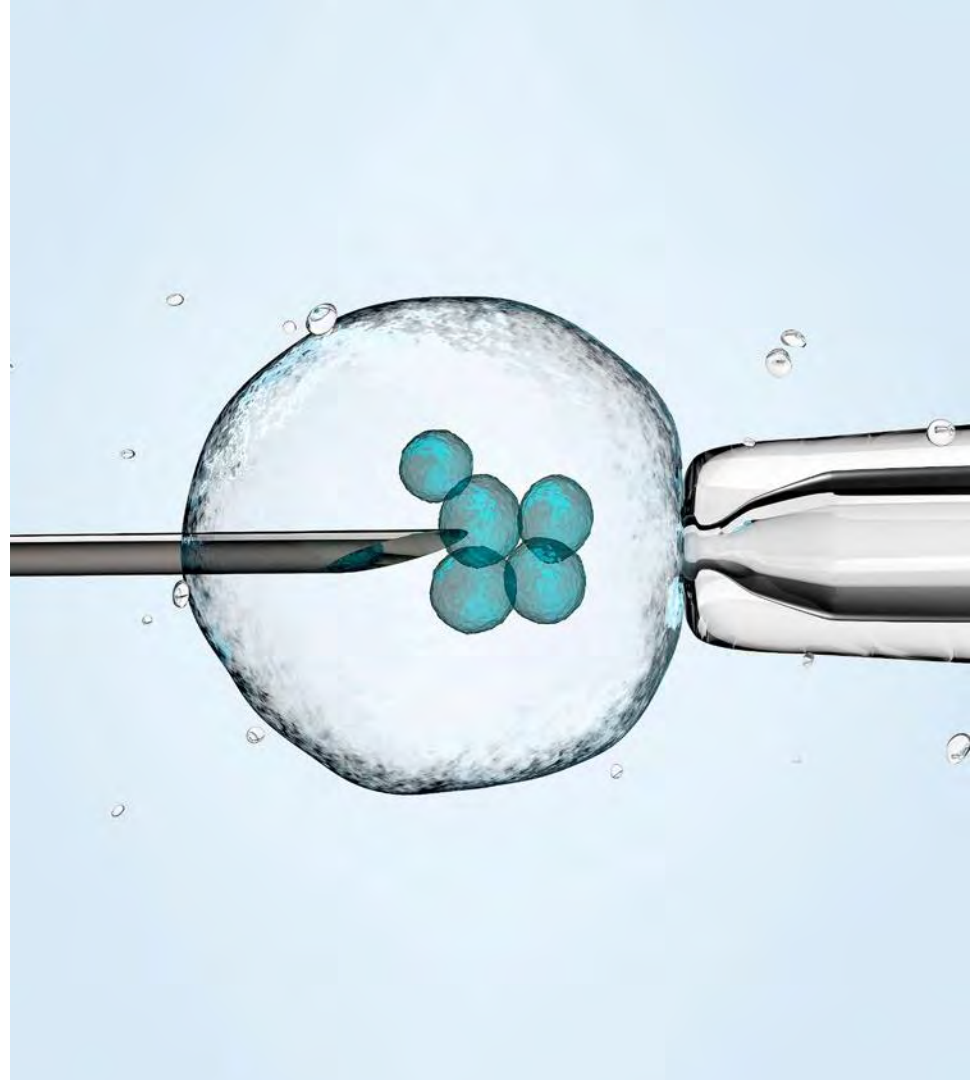
RISE's Mission from the Swedish Government

“The industrial research institutes shall be internationally competitive and facilitate sustainable growth in Sweden by strengthening competitiveness and renewal in the business community.”

Excerpt from the Research Bill 2016/17: 50 (Kunskap i samverkan).

One strong, unified institute for Sweden

- Sweden needs a strong, national innovation capacity to compete on the international stage and to meet major global challenges.
- The new RISE aims to build a stronger Swedish institute sector that will actively support Swedish industry, providing increased benefits for trade and industry, and society in general.



RISE in brief

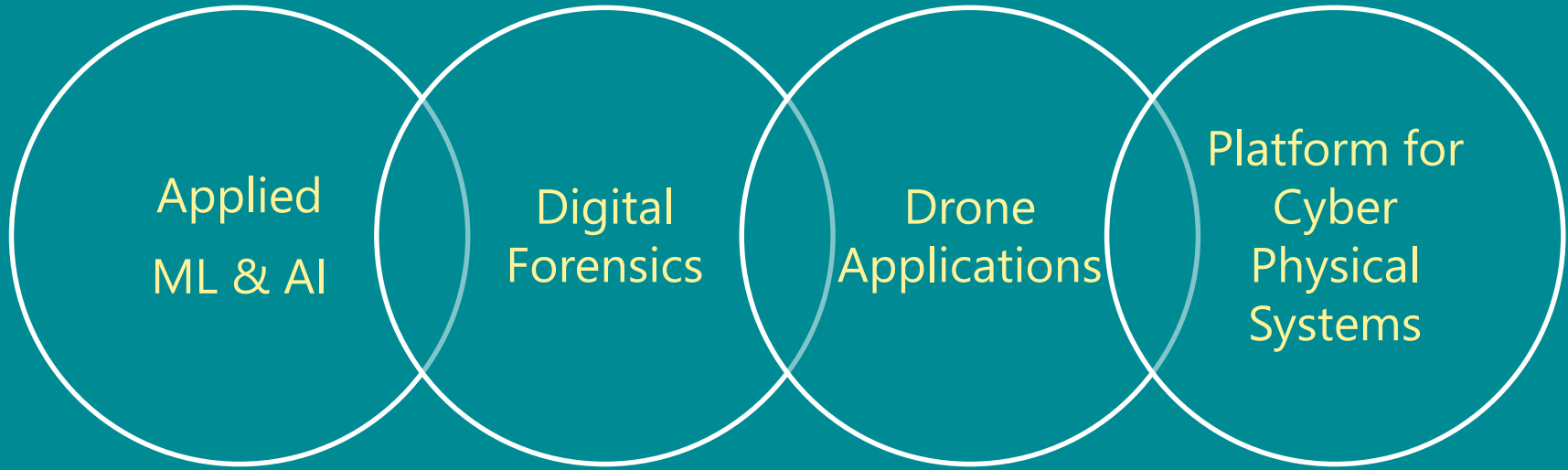
- Present across the whole of Sweden. And beyond.
- 2,700 employees, 30 % with a PhD.
- Turnover approx. SEK 3 billion (2018).
- A large proportion of customers are SME clients, accounting for approx. 30 % industry turnover.
- Runs 100s of test and demonstration facilities, open for industry, SMEs, universities and institutes (RISE is owner and partner in 60 % of all Sweden's T&D facilities).

Our vision

An internationally
leading partner for
innovation

With our broad range of competencies and unique expertise, we create added value

Bioeconomy	Fire and safety	Cement and concrete	Certification	Circular economy
Design	Electronics	Energy and fuels	Packaging	Glass
Health and Care	ICT and telecoms	Agriculture and food	Chemistry, materials and surfaces	Life Science
Maritime	Mechanical engineering	Mechanics	Metrology and measurement technology	Paper and Pulp
Process development	Built environment	Safety	Mobility	Wood
Water	Production	Corrosion	Work environment	Composites
Manufacturing processes	Metals	Additive manufacturing	Casting	Textiles



Logistics Sensor Technology IoT Big Data Analytics Machine Learning

Natural Language Tech Software & Systems Engineering Computer/Machine Vision

Standards & Policies System of Systems Man-Machine-Interaction Autonomous

Systems

Simulations/Modelling Innovation process Digitalization Open data

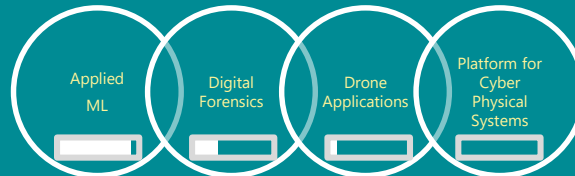


- **Mission and scope**

- Applied data-to-knowledge with focus on ML & AI applications
- Data generation, collection, annotation and processing / analysis

- **Competences**

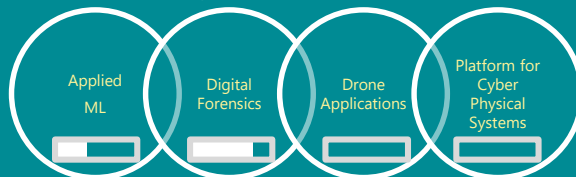
- ML/AI, computer vision, IoT, RFID/NFC, data ontologies, logistics



Digital Forensics Competence Centre



- National consortium to enhance the field of digital forensics in Sweden
- Partners
 - LiU, HH, RISE
 - NFC, MSB, Swedish tax Agency
 - 13 private companies (Sectra, Visage, RecordedFuture, MSAB, Ericsson, Combitech,...)



Drone Applications



Safe drone flights (technology, standards and regulatory)



Development of applications with drones (flexible platform)



Drone swarms (ongoing research)



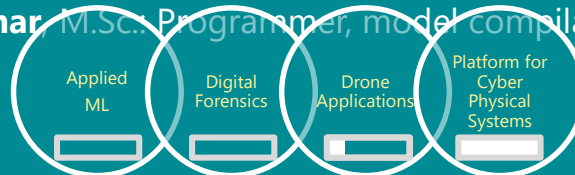
Test of drones (testbed and certifications)

CPS Lab, Cyber-Physical Systems (Peter Fritzson)

- **Competence profile:**
 - Software and Systems Engineering, Software, Compilers, Multi-core
- **Partner organisations:**
 - About 50 organizations part of the Open Source Modelica Consortium, including ABB, Siemens Turbo Machinery, SKF, etc.
- **Industrial areas:**
 - IT, Telecom, Aerospace, Vehicle manufacturers, Energy systems, etc.

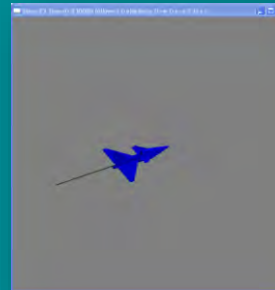
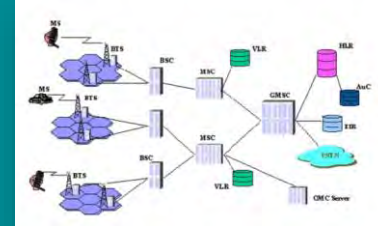
CPS Lab - Personnel

- **Fritzson, Peter**, Professor: project manager, research in cyberphysical system tools and methods.
- **Pop, Adrian**, Docent, Adjunct associate prof. RISE HUBCAP and EMISYS proj leader. Research in compilers and debuggers for CPS. Technical coordinator of OSMC.
- **Buffoni, Lena**, PhD: Overall Project coordinator of European EMBRACE project. Research in CPS requirement verification.
- **Sjölund, Martin**, PhD: RISE Proj leader of EMPHYSIS. Research in model compilers and debuggers.
- **Ochel, Lennart**, PhD: Programmer and expert in numerical and symbolic aspects of simulation, FMI.
- **Östlund, Per**, M.Sc: Programmer and Expert in Modelica language compilation.
- **Asghar, Adeel**, M.Sc: Programmer and Graphical user interface expert, also scripting and FMI
- **Palanisamy, Arunkumar**, M.Sc.: Programmer, model compilation, tool scripting interfaces.



Industrial Challenges for Cyber-Physical Products of both Software and Hardware

- Increased Software Fraction
- Embedded and real time constraints
- Higher demands on effective strategic decision making
**Digitalization Revolution
Happening Now!**



CPS Lab - Main projects

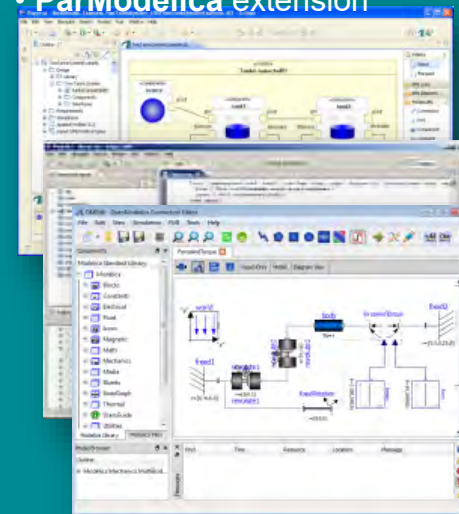
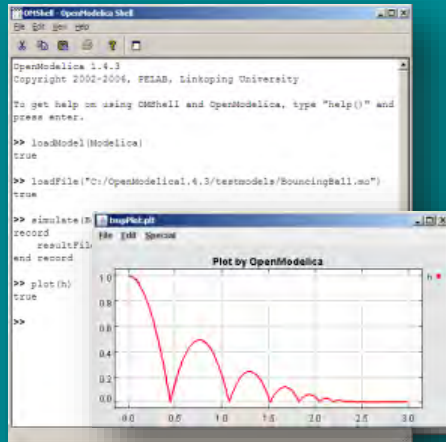
- **Important Projects**

- **OSMC** – Open Source Modelica Consortium of about 50 member organizations
- **EMBRACE** – new European project on requirement verification and large-scale simulation (2020-2022)
- **EMPHYSIS** – European ITEA project on compilation and simulation of embedded systems (incl Volvo Car).
- **EMISYS** – European ITEA project on large-scale simulation (incl Volvo Trucks) (2019-2021)
- **HUBCAP** – new European H2020 project on collaborative hub platform for CPS. (2020-2022)

The OpenModelica Open Source Environment

www.openmodelica.org

- Advanced Interactive Modelica compiler (OMC)
 - Supports most of the Modelica Language
 - **Modelica, Python, Julia, Matlab scripting**
- OMSimulator – FMI Simulation/Co-simulation
- Basic environment for creating models
 - **OMShell** – an interactive command handler
 - **OMNotebook** – a literate programming notebook
 - **MDT** – an advanced textual environment in Eclipse
- **OMEdit** graphic Editor
- **OMDebugger** for equations
- **OMOptim** optimization tool
- **OM Dynamic optimizer** collocation
- **ModelicaML** UML Profile
- **MetaModelica** extension
- **ParModelica** extension



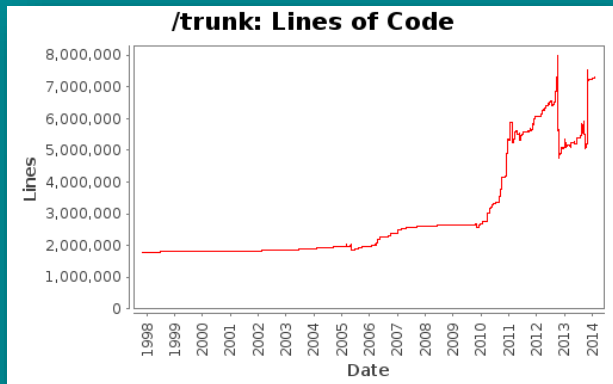
OSMC – International Consortium for Open Source Model-based Development Tools, 51 members Febr 2019

Founded Dec 4, 2007

Open-source community services

- Website and Support Forum
- Version-controlled source base
- Bug database
- Development courses
- www.openmodelica.org

Code Statistics



Industrial members

- ABB AB, Sweden
- Bosch Rexroth AG, Germany
- Brainheart Energy AB, Sweden
- CDAC Centre, Kerala, India
- Creative Connections, Prague
- DHI, Aarhus, Denmark
- Dynamica s.r.l., Cremona, Italy
- EDF, Paris, France
- Equa Simulation AB, Sweden
- Fraunhofer IWES, Bremerhaven
- INRIA, Rennes, France
- Maplesoft, Canada
- RTE France, Paris, France
- Saab AB, Linköping, Sweden
- SKF, Göteborg, Sweden
- TLK Thermo, Germany
- Siemens Turbo, Sweden
- Sozhou Tongyuan, China
- Talent Swarm, Spain
- VTI, Linköping, Sweden
- VTT, Finland
- Wolfram MathCore, Sweden

University members

- Augsburg University, Germany
- FH Bielefeld, Bielefeld, Germany
- University of Bolivar, Colombia
- TU Braunschweig, Germany
- Univ California, Berkeley, USA
- Chalmers Univ, Control, Sweden
- Chalmers Univ, Machine, Sweden
- TU Darmstadt, Germany
- TU Delft, The Netherlands
- TU Dresden, Germany
- Université Laval, Canada
- Georgia Inst of Technology, USA
- Ghent University, Belgium
- Halmstad University, Sweden
- Heidelberg University, Germany
- TU Hamburg/Harburg, Germany
- IIT Bombay, Mumbai, India
- KTH, Stockholm, Sweden
- Linköping University, Sweden
- Univ of Maryland, Syst Eng USA
- Univ of Maryland, CEEE, USA
- Politecnico di Milano, Italy
- Ecoles des Mines, CEP, France
- Mälardalen University, Sweden
- RPI, Troy, USA
- Univ Pisa, Italy
- Univ College SouthEast Norway
- Tsinghua Univ, Beijing, China
- Vanderbilt Univ, USA