

LUCAS

Center for Applied Software Research

Activity Report

2002



LUND INSTITUTE OF TECHNOLOGY
Lund University

LUCAS 2002

LUCAS – CENTER FOR APPLIED SOFTWARE RESEARCH was established in late 1999 as a research center at Lund Institute of Technology, Lund University. The objective of LUCAS is to gather the competence on applied software research at Lund Institute of Technology into a network. Today it comprises of about 40 researchers half which are faculty members and half are Ph. D. Students.

The research of LUCAS covers three thematic areas:

- Software Engineering Environments – languages and tools for software development
- Methods in Software Engineering – methods and processes for software development
- Real-Time System Development – software in systems with hard realtime constraints

Industry relevance is a key issue for the LUCAS research and much of the research is conducted in joint projects with primarily Swedish, but also international industry. During 2002 LUCAS has deepened the common interface to our industrial partners and members. A wide spectrum of involved groups offer a variety of application domains, which gives LUCAS

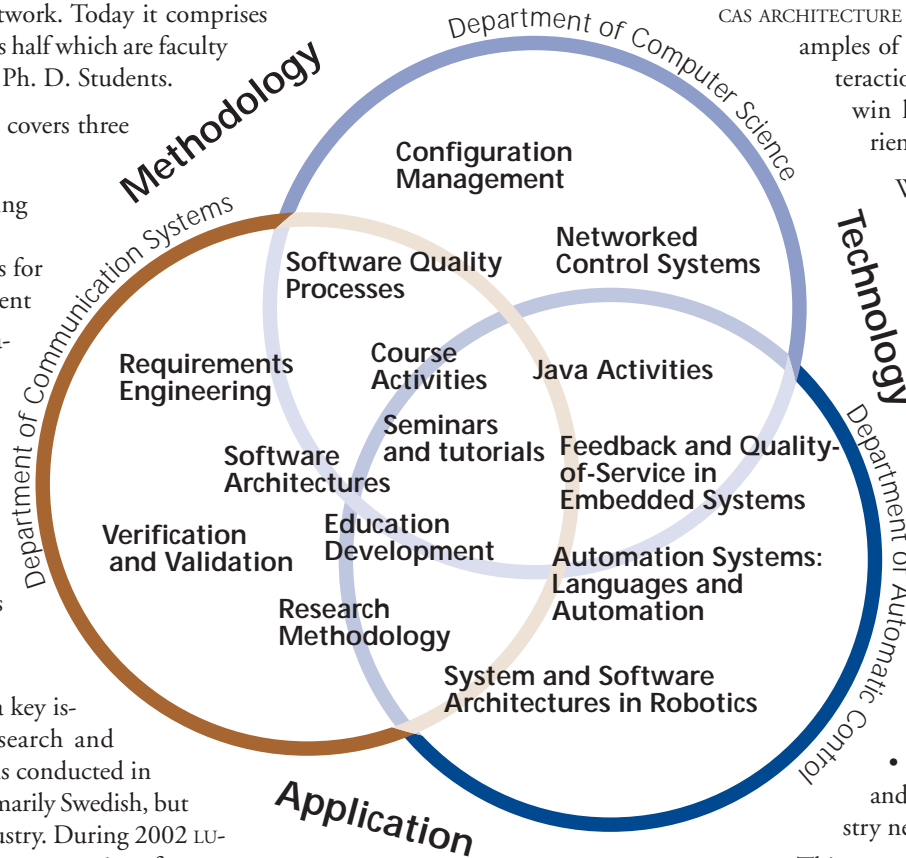
unique possibilities to perform software research. Examples of joint efforts are co-funding of Ph. D. students and using industrial projects as research objects. A course in Software Engineering for technical managers at Sony Ericsson and the LUCAS ARCHITECTURE ACADEMY are other examples of industry-academia interaction where both parties win knowledge and experiences.

When 2001 was a year of expansion, 2002 has been a year of consolidation and further research. LUCAS enters the future well confident in its ability to serve its purpose:

When 2001 was a year of expansion, 2002 has been a year of consolidation and further research. LUCAS enters the future well confident in its ability to serve its purpose:

- to stay on the competitive edge on applied software research
- to offer results to industry for future software development projects
- to provide education and training to fulfil industry needs.

This report gives a brief picture of LUCAS 2002. Please follow our activities and achievements at www.lucas.lth.se.



Industry members

Gold Members



ABB Automation



Ericsson Mobile Platforms



Sony Ericsson
Mobile Communications

Silver Members



Ericsson Microwave Systems



Q-Labs



Telelogic

Bronze Members



ABB Robotics



Axis



BlueCell



connectBlue





Software Engineering for technical managers at Sony Ericsson Mobile Communications

During 2002 LUCAS started an high level course in Software Engineering for a group of technical managers at Sony Ericsson. Faculty staff from LUCAS arranges eight one-day seminars on topics like Requirements Engineering, Extreme Programming, Configuration Management, Java in real-time embedded systems etc. The course will be finished and evaluated in the summer 2003 and probably opened for a broader group of participants in the future.



Development of a bicycle cart during Extreme Hour.

LUCAS-days

In late October 2002 about one hundred practitioners and researcher, mostly from LUCAS member companies, gathered for a two-day forum at Lund Institute of Technology. Besides a key-note speech on Usability Engineering, held by Mary-Beth Rosson, Virginia tech, the LUCAS-DAYS offered eight seminars on a variety of LUCAS research areas and a demo-show with applications and demonstrations from current research.



The ball-catching koala was demonstrated by Anders Ive during the LUCAS-DAYS.



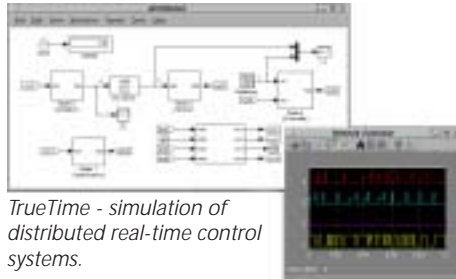
Johan Natt och Dag demonstrated a tool for sorting, structuring and selection of software requirements.

TrueTime gets Network Interface

TRUETIME is a Matlab/Simulink-based simulator for real-time control systems, which makes it possible to simulate the temporal behavior of a multi-tasking real-time kernel executing controller tasks.

TRUETIME is used as an experimental platform for research on dynamic real-time control systems.

During 2002 a network interface has been developed, which makes it possible to simulate simple models of communication networks and their influence on networked control loops.



TrueTime - simulation of distributed real-time control systems.

IBM Eclipse Innovation Award

As support for further research on advanced solutions for Configuration Management, LUCAS received the IBM Eclipse Innovation Award.

LUCAS Architecture Academy

LUCAS ARCHITECTURE ACADEMY is a forum for current and upcoming architects targeted at LUCAS gold and silver members. During a 10 months part time program experienced practitioners and LUCAS researchers have seminars, evaluations and discussions on topics related to advance software architecture. A typical 10-month program consists of 6 sessions, each 2-3 days off site.



LUCAS ARCHITECTURE ACADEMY

During 2002 the first program finished and the second one started with industry participants from Telelogic, Q-Labs, Ericsson Microwave Systems, Sony Ericsson Mobile Communications and ABB.

Dissertations

Doctoral

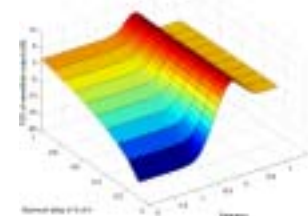
- Håkan Petersson "Supporting Software Inspections through Fault Content Estimation and Effectiveness Analysis", September 13th.
- Thomas Thelin, "Empirical Evaluations of Usage-Based Reading and Fault Content Estimation for Software Inspections," September 20th.
- Ulf Asklund, "Configuration Management for Distributed Development in an Integrated Environment", December 12th.

Licentiate

- Enrico Johanson, "Quality Improvement in Software Platform Development", April 26th.
- Johan Natt och Dag, "Elicitation and Management of User Requirements in Market-Driven Software Development", June 12th.
- Thomas Olsson, "Software Information Management in Requirements and Test Documentation", October 3rd.
- Daniel Karlström, "Increasing Involvement in Software Process Improvement", November 6th.
- Josef Nedstam, "Changes to Processes and Architectures; Suggested, Implemented and Analyzed from a Project Viewpoint", November 14th
- Rasmus Olsson, "Exception Handling in Recipe-Based Batch Control", December 6th.

Jitterbug Covers all System Signals

JITTERBUG is a Matlab toolbox for easy control system performance evaluation in real-time implementations. The toolbox allows modeling of random delays (jitter) and other random events such as data drop-out. New for year 2002 was that JITTERBUG can calculate power spectral densities of all signals in the system.



Sensitivity power spectral density with jitter.

Funders



Vinnova



SSF



European Union



Vetenskapsrådet

Economy 2002

Company financing

ABB ATP	1 500
Axis	50
Ericsson Mobile Platforms	500
IAR Systems	50
Sony Ericsson Mobile Communications	500
Telelogic	50

Company support in other resources

ABB Robotics	50
BlueCell	50
connectBlue	50
Ericsson Microwave Systems	160
Q-Labs	200
Telelogic	200
Total	3 360

Public financing

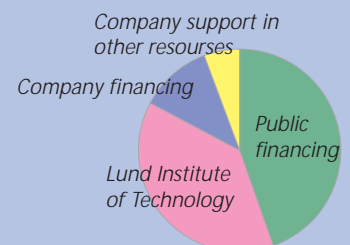
European Union	2 835
SSF	1 460
VINNOVA	3 850
Vetenskapsrådet	550
Total	8 695

Lund Institute of Technology

7 430

Grand total

19 485



Publications 2002

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- Askklund, U., "Configuration Management for Distributed Development in an Integrated Environment" Ph. D. thesis, Dissertation 14, LU-CS-DISS:2002-01, ISSN 1404-1219 ISBN 91-628-5470-4, December 2002.
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- Henriksson, D., Cervin, A., Årzén, K.-E., "TrueTime: Simulation of Control Loops Under Shared Computer Resources", In Proceedings of the 15th IFAC World Congress on Automatic Control, Barcelona, Spain, 2002
- Höst, M., "Introducing Empirical Software Engineering Methods in Education", Proceedings of Conference on Software Engineering Education and training (CSEE&T), Feb. 25-27, Covington, Northern Kentucky, USA, 2002.
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 - Robertsson, A., Scalapogna, D., Grundelius, M. and Johansson, R., "Cascaded Iterative Learning Control for Improved Task Execution of Optimal Control", Proc. 2002 IEEE Int. Conf. Robotics and Automation Washington, DC, May 2002, pp. 1290-1295.
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- ## Committee assignments
- ### Program Chair
- CC 2003 (12th International Conference on Compiler Construction), Warsaw, 2003, Program Chair, Görel Hedin
 - Conference on Engineering Computer-Based Systems, Lund, 2002, Program Chair, Per Runeson
 - ECOOP 2002 (16th European Conference on Object Oriented Programming), Málaga, 2002, Program Chair, Boris Magnusson
 - LDTA 2004 (4th Workshop on Language Descriptions, Tools and Applications), Barcelona, 2004, Program Co-Chair, Görel Hedin
 - REFSQ/02 Eighth International Workshop on Requirements Engineering: Foundation for Software Quality Programme Co-Chair, Björn Regnell
- ### Technical Committee
- IEEE Control Systems Society Technical Committee on Real-Time Control, Computing and Signal Processing, Committee Chair, Karl-Erik Årzén
 - FAC Technical Committee on Computers and Control, Vice Chair, Karl-Erik Årzén
- ### Program Committee
- 9th IEEE Conference on Mechatronics and Machine Vision in Practice (M2VIP), Chiang Mai, Thailand, September 2002, PC member, Rolf Johansson
 - ADHS'03 (IFAC Conference of Analysis and Design of Hybrid Systems), PC member, Karl-Erik Årzén
 - CBSE Euromicro, 2002, PC member, Even-André Karlsson
 - CC 2004 (13th International Conference on Compiler Construction), Barcelona, 2004, PC member, Görel Hedin
 - Conference of Software Engineering Education and Training, 2002, PC member, Per Runeson
 - Conference on Software Engineering Research and Practice in Sweden, 2002, PC member, Even-André Karlsson and Per Runeson
 - Empirical Assessment and Evaluation in Software Engineering (EASE), 2002, PC member, Martin Höst
 - ETAPS 2002 (European Joint Conferences on Theory and Practice of Software), Grenoble, 2002, Member of the Steering Committee, Görel Hedin
- ETAPS 2003 (European Joint Conferences on Theory and Practice of Software), Warsaw, 2003, Member of the Steering Committee, Görel Hedin
 - Euromicro 2003 (The 15th Euromicro Conference on Real-Time Systems), PC member, Karl-Erik Årzén
 - Guest editor, together with Prof. Claes Wohlin, for a special issue of Information and Software Technology on controlled experiments in software engineering, 2002, Martin Höst.
 - LDTA'02 (2nd Workshop on Language Definitions Tools and Applications), Grenoble, 2002, Member of the Organizing Committee. Görel Hedin
 - NWPER'02, (10th Nordic workshop on Programming and Software Development Tools and Techniques), Copenhagen, 2002, PC member, Görel Hedin
 - OOPSLA'02 ACM Conference on Object Oriented Programming, Systems, Languages and Applications, Seattle 2002, PC member, Boris Magnusson
 - RE'02 10th International Conference on Requirements Engineering, 2002, PC member, Björn Regnell
 - RTAS 2002 (The 8th IEEE Real-Time and Embedded Technology and Applications Symposium), PC member, Karl-Erik Årzén
 - TCRE 2002, International Workshop on Time Constrained Requirements Engineering 2002, PC member, Björn Regnell
- ## Events and Seminars
- Industrial Automation, LUCAS workshop, February 26.
 - Software Architecture in Practice, seminar with Dr. Paul C. Clements, SEI, March 5.
 - ECBS Conferens on Engineering of Computer-Based Systems, April 4-6.
 - Formal Engineering Methods for Software Systems Development, seminar by Prof. Shaoying Liu, Hosei University, Tokyo, Japan, September 30.
 - LUCAS days, October 21-22.
- ## External presentations
- Extreme Programming. Tutorial at Konstruktörsstämman i Göteborg, May 2002, Gothenburg, Sweden. Görel Hedin
 - Patterns in Software Architecture. Tutorial at JAOO 2002 Conference (6th European Developer Conference on Java Technology and Object-Oriented Software Engineering), Sept 2002, Aarhus, Denmark. Görel Hedin and Aino Cornils
 - Aspect-Oriented Software Development. Tutorial at Konstruktörsstämman i Göteborg, May 2002, Gothenburg, Sweden. Görel Hedin
 - Sample-induced delays in synchronous multirate systems, University of Illinois, April 26, 2002. Björn Wittenmark
 - JGrafchart: a Java-based graphical language environment for sequences, procedures, and state-machines, Dept of Electrical Engineering & Computer Science, Univ of California Berkeley, September 23, 2002, Karl-Erik Årzén
- Seminar at AXIS, November 6, 2002 on Requirements Engineering Process Improvement. Björn Regnell and Lena Karlsson
 - Seminarium på Sveriges verkstadsindustriers konferens om produktledning den November 27. Björn Regnell
 - Configuration Management från utvecklarens perspektiv - att använda metaforer för att identifiera och lösa problem, Swedish Configuration Management Summit, December 5-6, 2002. Lars Bendix
 - Konfigurationsstyrning - hvad, hvorfor og hvem?, Softwareudvikling-på-tværs, Copenhagen, Denmark, May 29, 2002. Lars Bendix
 - Esperienze con XP in un curriculum universitario, seminars at Italian universities, Lars Bendix
- ## Master thesis projects
- "Porting the Ericsson Bluetooth Stack - A Real-Time Analysis", Dept of Automatic Control and Ericsson. Mats Attnäs, Ulrik Laurén
 - "Introducing a Software Test Process into a Small-Scale Software Organisation", Dept. of Communication Systems and Tancom, Lund University, 2002. Anders Bengtsson and Magnus Björnfor
 - "AICG Axis Internet Camera Gateway" AXIS and Dept. of Communication Systems and Tancom, Lund University, 2002. Niklas Brunlid and Peter Happonen
 - "Distributed Brake-By-Wire Based on TTP/C", Dept of Automatic Control and Volvo TU, Maria Bruce
 - "Implementation and design of an intelligent and dynamic remote control in Palm OS", Dept of Automatic Control and LindInvent, Henrik Fredriksson
 - "Common Language Infrastructure - positioning and impact on Ericsson mobile platform", Dept. of Computer Science, Dariusz Cieplota och Patrik Hansson
 - "MUI - Migrating User Interfaces for Audio Video Recorder, Dept. of Computer Science and Bluecell, December 2002. Torbjörn Eklund and David Svensson
 - "Scheduling of Real-time Traffic in a Switched Ethernet Network", Dept of Automatic Control, Anders Martinsson
 - "An experimental compiler for RAPID, a language for programming industrial robots" Dept. of Computer Science and ABB, Marie Persson
 - "Qualitative and Quantitative Evaluation of Software Inspections", Q-Labs and Dept. of Communication Systems, Pernilla Persson
 - "Software Architecture Verification Tool for Software Platforms", Dept. of Computer Science and Ericsson Mobile Platforms AB, Camilla Johansson and Lotta Wennöf
 - "Evaluation of UML in Real-Time Systems", Dept. of Communication Systems, Arash Karimi Ericsson
 - "Real-Time Linux in an Embedded Environment A Port and Evaluation of RTAI on the CRIS Architecture", Dept. of Computer Science and Axis, Martin P. Andersson and Jens-Henrik Lindskov



People

Members of the Board

Jerker Wilander, chairman
Sten Minör,
Sony Ericsson Mobile Communications
Göran Arinder,
ABB Automation Technology Products
Anders Ek, Telelogic AB
Björn Wittenmark,
Lund Institute of Technology

Senior Researchers

Ulf Asklund, Dr.
Lars Bendix, Dr.
Görel Hedin, Dr.
Roger Henriksson, Dr.

Martin Höst, Dr.
Rolf Johansson, Prof.
Even-André Karlsson, adj. Prof.
Boris Magnusson, Prof.
Klas Nilsson, Dr.
Pierre Nugues, Dr.
Håkan Petersson, Dr.
Björn Regnell, Dr.
Anders Robertsson, Dr.
Per Runeson, Dr.
Thomas Thelin, Dr.
Björn Wittenmark, Prof.
Karl Erik Årzén, Prof.
Kasper Østerbye, Dr.

Ph.D. Students

Carina Andersson, MSc.
Christian Andersson, MSc.
Tomas Berling, Lic. Eng.
Anton Cervin, Lic. Eng.
Torbjörn Eklund, MSc.
Torbjörn Ekman, MSc.
Magnus Gäfvert, MSc.
Mathias Haage, BSc.
Dan Henriksson, MSc.
Anders Ive, MSc.
Enrico Johansson, Lic. Eng.
Lena Karlsson, MSc.
Daniel Karlström, Lic. Eng.

Bo Lincoln, MSc.
Johan Natt och Dag, Lic. Eng.
Josef Nedstam, Lic. Eng.
Anders Nilsson, MSc.
Rasmus Olsson, Lic. Eng.
Thomas Olsson, Lic. Eng.
Sven G. Robertz, MSc.
David Svensson, MSc.

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Anders Blomdell, Research Engineer
Jonas Wisbrant, Project Secretary

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New technologies are developed in co-operation with industry in order to master complex software systems. Industry offers co-

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