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EXCS in one slide

- A national **centre of excellence in research** (CoE) 2008–2015
- dedicated to the study of **computer science** and computational sciences,
- funded within the Measure for the development of CoEs of the Estonian system for the implementation of the EU Structural Funds 2007–2013,
- composed of researchers at the **Institute of Cybernetics at TUT** (IoC), **Cybernetica AS** (CybAS) and the **University of Tartu** (UT),
- coordinated by IoC, project leader Tarmo Uustalu.
- [http://cs.ioc.ee/excs/](http://cs.ioc.ee/excs/)
- One of the 7 CoEs funded within this measure (across all disciplines), selected from 24 proposals in spring-summer 2008.
Financing

- Budgeted eligible cost for the structural funds during the 7-year duration is 69.9 MEEK.

- **Structural assistance** comes from the European Regional Development Fund, ERDF, and amounts to 95 pct, i.e., 66.4 MEEK (ca 4.25 MEUR).

![EU and Estonia logos]

- The Estonian state contributes an **additional grant** of 3.8 MEEK (ca 0.25 MEUR)

- and **compensates** for the ineligible **VAT**.

- The measure is administered by the Ministry of Education and Research and the Archimedes Foundation.
Other Estonian CoEs 2008–2015

1. Frontiers in Biodiversity Research, FIBIR (UT)
2. CoE in Genomics (EBC, UT)
3. CoE for Translational Medicine, CETM (UT)
4. CoE in Chemical Biology, CECB (TUIT, UT, EBC, TUT)
5. CoE in Cultural Theory, CECT (UT, TLU/EIH)
6. Centre for Integrated Electronic Systems and Biomedical Engineering, CEBE (TUT)
Institutions and people (1)

- The participating institutions and people are determined by four HTM target-financed themes, led by Tarmo Uustalu, Ahto Buldas, Jaak Vilo, Mare Koit.

- Three institutions:
  - Institute of Cybernetics at TUT
  - Cybernetica AS (via its non-profit making Information Security Institute)
  - University of Tartu (through its Dept of Computer Science)
Institutions and people (2)

(As of 1 March 2009) 54 senior staff:
3 DScs (Ülo Jaaksoo, Enn Tõugu, Haldur Õim, all members of the Estonian Academy of Sciences), 45 PhDs and CScs, 6 MScs

60 PhD/MSc students

The core is a young generation of Estonian CS research leaders:
Ahto Buldas, Peeter Laud, Sven Laur, Helger Lipmaa, Kaili Müürisep, Tarmo Uustalu, Eero Vainikko, Varmo Vene, Jaak Vilo + Marlon Dumas, the Swedbank professor of software engineering at UT.
Objectives

- General objective: to consolidate and advance the Estonian computer science in six areas of recognized strength.

- Specific objectives: to boost the research potential of the groups involved by facilitating collaboration and safeguarding their sustainability and growth, to increase the impact of their research results in academia, industry and society as well as to popularize them.

- To be achieved by: carefully planned coordination and joint actions, to create a thriving, highly reputed research environment, attractive for young researchers, in particular from abroad.
Activities

The activities to EXCS fall into two groups:

- coordinated research:
  regular research activity, aiming at the highest quality and emphasizing, in particular, collaboration across institutions and topic areas

- coordinated support actions:
  specific actions targeted at developing the research potential of the groups involved and increasing the impact
Working groups (WGs)

- The research activities of EXCS are centered around 6 thematic working groups (WGs) (for the 6 areas of strength):
  - programming languages and systems (PLS),
  - information security and cryptology (Sec),
  - software engineering (SE),
  - scientific and engineering computing (Comp),
  - bioinformatics (BI),
  - human language technology (LT)

These cross the TFT and institution boundaries wherever appropriate.
WG research areas (1)

- **Programming languages and systems**
  design of type-theoretical programming languages; program logics/type systems for to certify code in mainstream languages; static analysis of multithreaded code; algebraic and categorical automata theory and theory of context-dependent computing; hybrid systems verification and testing

- **Information security and cryptology**
  secure communication protocols for oblivious transfer, e-voting, privacy-preserving information retrieval, secure function evaluation in general, time-stamping etc; security assessment of information systems
  A Buldas, P Laud, H Lipmaa, I Tšahhirov (CybAS + UT)
WG research areas (2)

- **Software engineering**
  service-oriented architectures, rapid aggregation of services, incl ontology induction, data mining to assess architectural quality of service-oriented systems
  M Dumas, I Astrova, H-M Haav, A Kalja, P Küngas (UT + IoC + CybAS)

- **Scientific and engineering computing**
  parallel algorithms for solving large computational problems, system DOUG for solving large systems of linear equations; middleware for GRID and P2P computing, friend-to-friend (F2F) computing; knowledge-based tools for engineering computations, modelling and simulation
  E Vainikko, M Harf, U Norbisrath, E Tõugu (UT + IoC)
WG research areas (3)

- **Bioinformatics**
  interpretation of biological data through novel advanced algorithmic designs using machine learning and data mining, visualization, techniques for hypothesis prioritization; dissection of gene regulation mechanisms, reconstruction and analysis of genetic networks, gene expression data mining
  J Vilo, S Laur (UT + CybAS)

- **Human language technology**
  linguistic changes of Estonian for computer processing of written Estonian; sentence and discourse modelling, dialogue modelling for written Estonian; models for Estonian speech recognition, coping with signal variability, spontaneous and emotional speech
  M Koit, K Müürisep, T Alumäe, K Jokinen, H-J Kaalep, K Kaljurand, T Kirt, E Meister, K Muischnek, M Traat, H Õim (UT + IoC)
Research activities

- The research activities comprise:
  - research within the WGs,
  - cross-WG research efforts,
  - dissemination,
    via high-level scientific publications, tutorials, intensive courses, seminar talks at foreign universities, the centre’s web portal
- The MC monitors the quality of the centre’s publications and other dissemination.
Support actions

- The support actions go into strengthening the centre and increasing its impact.

- **Strengthening the centre**: making it a sustainable thriving research environment capable of attracting and keeping talent.

  - **Human resources**:
    - positions for *postdocs* PhD students, technical personnel, training.

    Personnel development is conducted in adherence to the European charter for researchers and code of conduct for the recruitment of researchers.

  - **Equipment**.

Most of the centre’s funds are put into personnel and equipment.
Increasing the impact: enhancing the centre’s visibility, i.e., raising the awareness of the target groups of the centre’s research results.

- **International cooperation:**
  - organization of high-level scientific events,
  - international cooperation projects.

- **Technology transfer:**
  - contact days for industry,
  - industrial cooperation projects.

- **Contribution to policy-making:**
  - contributions to shaping of policies in R&D, higher education and IT related areas, technology roadmapping and foresighting, standardization etc

- **Popularization:**
  - media coverage,
  - popular books,
  - open-door events for the general public
Management

- **Management committee (MC):**
  operative management, consists of the leaders of the 4 TFTs and the leaders of the WGs

- **General assembly (GA):**
  institutional strategy, consists of institution administration representatives (one from each) + the leaders of the 4 TFTs

- **International advisory board (IAB):**
  scientific advice, consists of internationally renowned researchers from abroad
    - Ivan Damgård (U. of Aarhus),
    - Reino Kurki-Suonio (Tampere U. of Techn.),
    - Kim G. Larsen (Aalborg U.),
    - Heikki Mannila (Helsinki Inst. of IT),
    - José Nuno Oliveira (U. do Minho),
    - Martin Volk (U. Zürich),
    - Reinhard Wilhelm (U. des Saarlandes).
Track record

- Main players on the Estonian computer science scene.
- Esp during the last 5 years a very strong emphasis on internationalization:
  active involvement in FP5/6/7 and other int projects, active organizers of high-level int conferences in Estonia, highly reputed int winter schools in TCS since 1996, visiting researchers etc
- A young generation of research leaders, several from PhD degrees and/or postdoctoral research experience from abroad.
EXCS vs CDC

- **CDC** (the Centre for Dependable Computing) was one of Estonia’s 10 national CoEs 2002–2007 funded by the Estonian state.

- Roughly,

\[
\text{EXCS} = \text{CDC} - \text{computer engineering} + \text{bioinformatics} + \text{human language technology}
\]

- The computer engineering part, supplemented with **electronics** and **biomedical engineering**, spawned another successful CoE proposal in IT, **CEBE**, [http://cebe.ttu.ee/](http://cebe.ttu.ee/).

- So 1/10 became 2/7!
EXCS vs Estonian computer science

- EXCS encompasses most of the computer science research done in Estonia, except
  - automated theorem proving, semantic web by T Tammet at DCS/TUT,
  - proactive systems research by L Mõtus, M Meriste at DCC/TUT and TUIT
  - information systems and other research pursued at DInf/TUT,
  - robotics research by M Kruusmaa at Biorobotics/TUT
  - social software research at TLU.

- Major opportunities to overcome fragmentation and harvest synergy.
EXCS values

- High-quality research has priority over any other activity. Nonsense cannot be afforded.
- People matter most.
- Quality of research is defined by recognition by true experts (the international research community) rather than spreadsheet software.
- Indicators to assess research must be meaningful and fair.
Support actions 2008–2009

- postdoc recruitment campaign of autumn 2008
  (5 international postdocs recruited on 1..2-year positions)
- a number of training events for EXCS members, high-level
  international conferences, industry contact events (IST 2008, IST 2009)
- activity in EU R&D projects
- activity in industry project initiatives, incl the Measure for
  assistance for technology development centers of the EU
  Structural Funds 2007–2013
- popularization activities (translation of a book by D Harel, activities at European Researchers Night 2009)
- general publicity (presence at Research Connection 2009 exhibition, Prague)
Events 2008

- NordForsk researcher network VISPP summer school 2008, Kuressaare, 10–16 Aug 2008
  (N Campell, B Granström, J Local)
  (A Avižienis, R Baeza-Yates, F Menczer, A Rensink)
- EXCS kick-off meeting, Tallinn, 18–19 Sept 2008, with industry and popular CS and fresh PhDs sessions
  (A Ambainis, K Cirulís, R Freivalds et al from Riga)
  (A ter Hofstede, B Kiepuszewski, A Tai)
  (D Clarke, V Danos, M Fränzle, M Veanes)
Events 2009


- Comput Sci Theory Days at Kääriku, 30 Jan–1 Feb 2009 (S Park)


EU R&D projects in execution

- IST coord action TYPES (proof assistants, dependently typed languages) (2004–2007, IoC, partner)
- IST integ project AEOLUS (overlay computers) (2005–2009, CybAS, partner)
EU R&D projects in execution (ctd)

- Infrastructures prep phase project CLARIN (common language resources and technology infrastructure) (2008–2010, UT, partner)

Issues

- Permanent **shortage of people**, esp PhD students, technical personnel (easier to get a highly qualified postdoc from abroad than a lousy local PhD student)
- **Bureaucracy**: tedious cost claim process, rigidly fixed workplan and indicators
- Inconsistent policy, **incompetent governance**: failed research assessment exercise, national programme in ICT has taken a decade to not start, past experience neither analysed nor taken into account (new CoEs measure, new programmes for PhD education)
Technology presentations today

- Einar Meister, IoC, LT WG, Estonian speech technology
- Ahto Buldas, CybAS, Sec WG, attack trees in practical security
- Peep Küngas (PhD, NTNU, 2006), UT (EXCS postdoc), SE WG, analysis of service networks