



CORE

ALBERTA INFORMATICS
CIRCLE OF RESEARCH EXCELLENCE

newsletter

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STRATEGIC PLAN 2002 - 2010

iCORE sets targets to achieve ICT goals

A minimum of 24 outstanding research teams in information and communications technology (ICT) must be supported each year in order to achieve and sustain the economic impact projected for ICT in Alberta, according to iCORE's newly developed strategic plan for 2002-2010, called *Positioning Alberta Globally*.

The strategy document outlines the rationale for a minimum threshold of activity – renewing four to five major awards each year so that 24 teams are supported at any one time. These figures are derived from the projected economic impact of investment in ICT research, and requirements to

meet the ICT goals of Alberta, as stated in the 1998 publication of the Alberta Science and Research Authority, *ICT: A Strategy for Alberta*. These goals include 140,000 jobs, \$1.5 billion in R&D and \$30 billion in Gross Domestic Product for the sector by 2010.

"By the year 2010, the ICT sector in Alberta will be the size of the energy sector, if you look at economic indicators and project just average growth for the sector," according to iCORE President Dr Brian Unger. iCORE's strategic plan outlines an approach to meet the growth targets.

It updates the government's 1998 ICT strategy

and focuses on two primary activities: identifying high growth segments of ICT in which Alberta can be a global leader; and recruiting and funding the best researchers and graduate students in these segments. iCORE believes Alberta's ICT goals can be achieved through a coordinated commitment to focus on and apply resources to high growth ICT segments. Further, a competitive business climate with strong links between industry development and university research in these segments is seen as crucial. For more information, contact Lynn Sutherland at (403)210-5335 or sutherland@icore.ca.

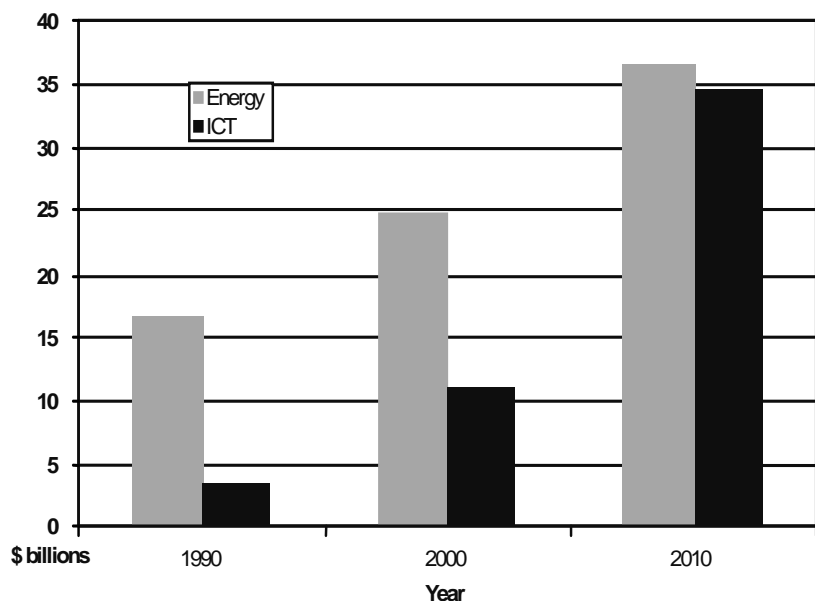
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Projected Alberta Economic Recovery: ICT and Energy



This chart is based on information from: Government of Alberta, 2000: Highlights of the Alberta Economy; TD Bank Financial Group, "The Shape of Things to Come," TD Economics, 30 May 2001; and assumes a 12 percent annual growth rate for ICT.

New lab will support software industry

We are all familiar with the problem – new software that is buggy, late, expensive, and falls short of expectations – but few can offer solutions to improve the process of software development. Dr Guenther Ruhe, one of the newest iCORE award recipients, is trying to do just that. He will be leading a research team at the University of Calgary whose primary aim is to establish and demonstrate scientific excellence in the area of software engineering decision support.

The process of software development and evolution is an ambitious undertaking, involving complex, incomplete, sometimes inconsistent and often fuzzy factors. Variables concerning design, quality, reliability, stakeholder interests and objectives, moving targets, and constraints such as budget and timeline must all be considered throughout a dynamic life cycle. The challenge is to provide sound methodological support for enabling good decisions about processes and products, risks and bottlenecks as well as for selection of tools, methods and techniques.

Dr Ruhe's research is geared towards better understanding, controlling and managing the software development process, in different stages of software analysis, design, construction, testing and evolution, with an emphasis on delivering support for all kinds of human decision making. The research will include measurement, modeling and

simulation, which greatly support proactive decision-making by conducting experiments in a virtual world. This laboratory will provide research results designed to transfer strong software engineering skills, methods, tools and techniques to companies.

Dr Ruhe moved to Calgary from the Fraunhofer Institute for Experimental Software Engineering in Germany, where he was Deputy Director since 1996. He holds an Industrial Research Chair in Software Engineering at the University of Calgary, as well as the iCORE award. He brings an interdisciplinary approach to his research that is widely recognized by peers for its strong combination of both in-depth fundamental knowledge and broad applied research experience. Dr Ruhe has been teaching and training in both university and industry settings for 18 years, and also has significant R&D project management experience.

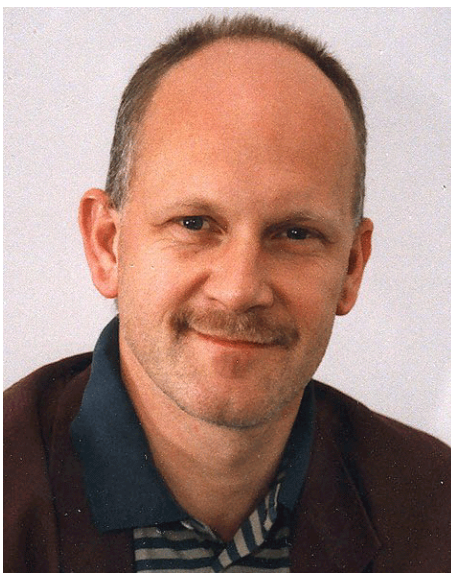
He has initiated and conducted research collaboration and technology transfer with a variety of organizations including IBM, Daimler Chrysler, Siemens, Robert Bosch, Schlumberger, Ericsson and Nokia. He has published over 80 papers in computer science, software engineering and operations research journals and is the author of three books.

iCORE has committed \$350,000 per year for five years, for a total of \$1.75 million dollars to establish this team. This represents approximately 50 percent of the total budget of the Software Engineering Decision Support Laboratory being established in Computer Science and Electrical and Computer Engineering at the University of Calgary. The iCORE research team has ten additional key team members already in Alberta.

For more information, contact Dr Guenther Ruhe at (403) 220-7692 or ruhe@ucalgary.ca.

TOP CANADIAN ACADEMIC JOINS UNIVERSITY OF CALGARY

Leading researcher in communications security setting global standards



*Dr. Guenther Ruhe
iCORE Senior Research Fellow
Software Engineering Decision Support Laboratory*

The security of communications systems has never been more important than it is today, increasing the relevance of work that forms the foundations of communications security – mathematical number theory and cryptography.

One of iCORE's most recent award recipients, Dr Hugh Williams, is setting up a research team in pure and applied cryptography to investigate the high-end theoretical foundations of communications security.

This research, which lies within the mathematical realm, particularly number theory, is aimed at the eventual development of protocols that can become standards for communications security. Dr Williams' research is specifically aimed at the development, improvement and implementation of mathematically based cryptosystems, including cryptanalysis to test and benchmark the

resulting schemes. This latter activity is an essential component because assuring the security of almost any cryptosystem is both an analytic and an empirical process involving extensive testing.

Dr Williams comes from the University of Manitoba where he was Associate Dean of Science for Research and Development and Adjunct Professor for the Department of Combinatorics and Optimization at the University of Waterloo. He has an extensive research and leadership background and a strong international reputation for his work in cryptography and number theory, and is considered the top academic in this field in Canada. He was one of the first to use modern mathematical techniques for securing and authenticating communication, and has developed one of the most widely used public key cryptosystems.

He is the recipient of numerous awards including a Killam Fellowship, prestigious NSERC awards and an Australian Research Council IREX grant. He has authored over 130 referred journal papers, 20 refereed conference papers, 20 books or chapters, and is an associate editor of *Mathematics of Computation*.



*Dr. Hugh Williams
iCORE Chair
Algorithmic Number Theory and Cryptography*

The algorithmic number theory and cryptography research group also includes senior team member Dr Renate Scheidler, a researcher whose current work on secure key exchange systems and protocols using various mathematical devices is considered to be leading the field. Dr Scheidler comes from the University of Delaware, where she was Assistant Professor in the Department of Mathematical Sciences. Ten additional faculty members, several postdoctoral fellows and up to fifteen graduate students from mathematics and statistics, computer science and electrical engineering at the University of Calgary, as well as from local industry partners, are expected to be added to the team.

The Alberta Informatics Circle of Research Excellence (iCORE) has committed \$600,000 dollars per year for five years to establish the iCORE Chair in Algorithmic Number Theory and Cryptography at the University of Calgary. Total iCORE funding of \$3 million dollars represents roughly 50 percent of the total budget of the research group to be developed around this Chair.

For more information, contact Dr Hugh Williams at (403)220-6322 or williams@math.ucalgary.ca.

iCORE Distinguished Lecturer Series launched

iCORE is inaugurating its annual lecture series this winter with monthly presentations by top researchers working in information and communications technology (ICT) in Alberta.

The lecture series will present highlights of excellent research and is designed to bring together university, industry and other research community members.

Live video link: lectures will be delivered in both Edmonton and Calgary
Web cast: lectures will be posted within 24 hours at www.icore.ca

Schedule

All lectures are at 4 pm. Reception at 5 pm in the host location.

University of Calgary

January 16, 4 pm
Dr Norman Beaulieu
Modelling and simulation of wireless channels
Biosciences 587, U of C
Video link: Telus Centre 134, U of A

April 17, 4 pm
Dr Jonathan Schaeffer
The games computers (and people) play
Biosciences 587, U of C
Video link: Telus Centre 134, U of A

May 15, 4 pm
Dr Michael Brett
On the surface of things in nanotechnology
Biosciences 587, U of C
Video link: Telus Centre 134, U of A

September 18, 4 pm
Dr Mark Freeman
The physics of small in nanotechnology
Biosciences 587, U of C
Video link: Telus Centre 134, U of A

University of Alberta

February 13, 4 pm
Dr Graham Jullien
System-on-a-chip: Expanding the challenges
Telus Centre 134, U of A
Video link: Biosciences 587, U of C

March 13, 4 pm
Dr Gerard Lachapelle
Space and time with global navigation satellite systems
Telus Centre 134, U of A
Video link: Biosciences 587, U of C

October 16, 4 pm
Dr Carey Williamson
The future of broadband wireless
Telus Centre 134, U of A
Video link: Biosciences 587, U of C

November 13, 4 pm
Dr Hugh Williams
The mathematical foundations of communications security
Telus Centre 134, U of A
Video link: Biosciences 587, U of C

Everyone welcome!

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Alberta Research Grid to coordinate development of new research tools

Advanced tools for research and learning are taking shape as a grid of high-end facilities for all Alberta researchers.

Developed by a strategic alliance of partner organizations including iCORE and Netera Alliance, the interconnected resources include high-end computing resources, collaboration facilities, and digital content, all connected by a very high-speed research network. Users are key to the grid – the researchers and innovators who require and are supported by these instruments.

"The development of a grid of advanced research tools in Alberta will benefit iCORE researchers both directly – as tools that they can use – and indirectly, by elevating the appeal of Alberta research infrastructure to others worldwide," explains Brian Unger, iCORE President and CEO. Unger has been an active leader in the

Components of the Alberta Research Grid

- people
- research facilities
- networks giving people/researchers access to advanced facilities

development of infrastructure resources in Canada over the past decade.

The grid gives people access to high performance computers, network storage resources, digital content repositories, visualization and multimedia resources, video conferencing work-stations, cyberports, and video classrooms. Facilities are connected by advanced, ultra high-speed networks, woven together with user support and communications.

NINE RESEARCHERS LAUNCHED WITHIN A YEAR

Ruhe and Williams join U of C



Two new iCORE awards were announced at the University of Calgary Rosza Centre, October 30, 2001. Dr Hugh Williams, (second from left) is now iCORE Chair in Algorithmic Number Theory and Cryptography. Dr Guenther Ruhe (third from left) is iCORE Senior Research Fellow, Software Engineering Decision Support Laboratory. Joining them here are Dr Brian Unger, iCORE President (left) and Dr Robert Church, Chair, Alberta Science and Research Authority.