

FUNDING INITIATIVES FOR RESEARCH & DEVELOPMENT IN IRELAND

Science Foundation Ireland (SFI)

Ireland is now making some of the largest grants in the world to academic research leaders in the fields underpinning Information and Communications Technology and Biotechnology. These new funding opportunities are available from Science Foundation Ireland (SFI). SFI has a budget of €646m to invest under the National Development Plan 2000-2006.

Since establishment in 2000, SFI has committed €234m to research projects using international peer review to recruit and retain in Ireland 128 internationally renowned researchers and their teams—totalling more than 700 scientific or engineering researchers.

In wireless research, SFI has invested in scientists and engineers working on:

- Modelling techniques and simulation algorithms for high-frequency/high-speed electronic circuit and system design—Prof. Tom Brazil, University College Dublin (UCD).
- Nonlinear Circuit Design—Prof. Michael Peter Kennedy, University College Cork.
- Resource allocation and network control—Prof. Douglas Leith, National University of Ireland, Maynooth.
- Performance modelling—Prof. John T. Lewis, Dublin Institute of Technology.
- Computation of signal propagation—Dr. Conor Brennan, Dublin City University (DCU).
- Nonlinear effects in communications circuits and systems—Dr. Orla Feely, UCD.
- Optical frequency division multiplexing—Dr. Conor Heneghan, UCD.
- Adaptive wireless sensor networks—an SFI investigator award cluster, including Prof. Mark Keane, UCD; Prof. Dermot Diamond, DCU; Prof. Alan Smeaton, DCU; Prof. Barry Smyth, UCD; Mr. Gregory O'Hare, UCD.

Ireland already has a strong base in the following wireless research areas:

1. *Low power sensor design and development*
2. *Protocols for cellular (3G,4G,Wi-Fi), ad-hoc and sensor networks*
3. *Signal processing*
4. *Circuit design*

Wireless research areas that SFI would be interested in investing in the future include:

- Fundamental aspects of wireless networking—application of information theory to multi-user wireless communication; state-of-the-art coding and modulation techniques – turbo codes, space-time codes; resource allocation in wireless networks—routing, power and rate control, spectrum allocation; areas with potential for greater research and standards impact (3G,4G,Wi-Fi).
- New antenna technologies.

SFI is helping Irish research institutions to develop a stronger research culture that will underpin advances and entrepreneurial efforts.

As stated in their Vision statement, “Effective research and development requires a combination of resources and talents to drive ideas forward rapidly. SFI will, within its strategic remit, seek out and support effective collaborations and partnerships with agencies, institutions and industry in Ireland and around the world that can best advance Ireland’s research, technological and economic competitiveness.”

These sentiments hold true in both wireless research and in their other fields of interest.

For more information on SFI and their funding programmes, see www.sfi.ie.

The IDA R&D Capability Grant scheme

The key aim of the R&D scheme is to encourage companies to build up their R&D function in Ireland.

To qualify for the R&D Capability Grant Scheme companies have to put forward R&D programmes that represent a clear and substantial step change in the development of their R&D function in Ireland. They will have to establish a permanent R&D unit, or substantially expand an existing one. The expansion of an existing R&D unit would have to incorporate significantly increased expenditure on at least one of the following: capital equipment, research personnel, or annual current expenditure. Other criteria for qualification would be to acquire formal responsibility for some clearly defined element of overall **Corporate Level** R&D activity or carry out an R&D project/projects that **substantially** upgrade the technological capability and competitiveness of the Irish operation.

EUROPEAN UNION

Framework Programme for Research – Sixth Framework Programme

The Sixth Framework Programme (FP6) is the Union's main instrument for the funding of research in Europe. Proposed by the Commission and adopted by the Council and Parliament in co-decision it is open to all public and private entities, large and small.

The overall budget covering the 4 year period 2003/6 is €17.5bn and ICT is one of the seven key areas listed for the advancement of knowledge and technological progress.

Further information: http://europa.eu.int/comm/research/fp6/index_en.html

Research Technology and Innovation (RTI) Competitive Grants Scheme

The Scheme supports commercially focused, industry led projects in product and process development. There is a particular focus on established companies who are planning to undertake their first R&D projects and those who are significantly developing their existing R&D activity.

Applications are accepted from individual Irish based companies in manufacturing and international services, or from companies acting in collaboration with other companies or with third level colleges/research institutes, either on a contractual basis or within consortia or joint ventures.

The RTI Scheme is co-funded by the European Regional Development Fund (ERDF).



Microelectronic Design in Ireland

In Ireland, approximately 1,000 people are involved directly in Microelectronic Design, establishing it as one of the world's leaders in the field. The average revenue per employee is 500,000 dollars per annum.

The industry is projecting doubling in size over the next five years. In order to capitalise on this, blue-chip high-tech companies and universities in Ireland have formed a consortium – The Microelectronic Industry Design Association (MIDAS) Ireland. Their mission is to realise the full potential of Microelectronic Design as a golden opportunity for sustained growth and prosperity in Ireland. MIDAS Ireland is leading five up-skilling initiatives, including continuing professional development and postgraduate research, to realise our vision of Ireland as the Silicon Valley of Europe.

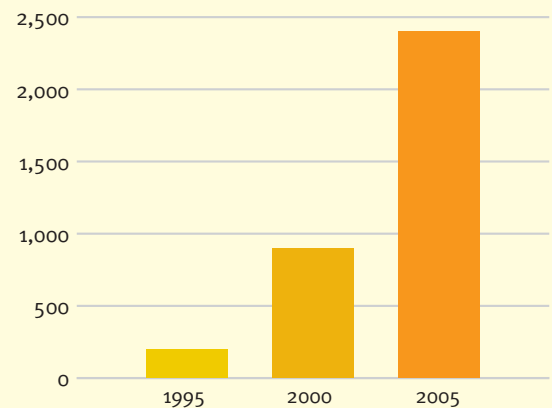
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Microelectronics Designers in Ireland



Wireless Networks – TecNet

Wireless Research Networking



Operational since September 2000 and located in Cork, TecNet is an organisation dedicated to promoting research co-operation between industry and the country's Institutes of Technology* (IoT), thereby enhancing the R&D capability of the Institutes of Technology.

Tecnet can assist companies in the funding and management of the project. Among TecNet's early successes in establishing virtual research groups is the CSSN (Communications Software, Systems and Networks) Group. This group is comprised of researchers who among other matters have a specific interest in Wireless technologies. The CSSN is well regarded for running **Ireland's primary academic Annual Telecommunications Research Conference, IT&T Information Technology and Telecommunications**, which is now regarded as a significant source of new research output and a useful and interesting meeting place for researchers from academia and industry. Details of the Conference held in October 2003, can be found on <http://www.ittconference.com>.

Collaborative Research

A good example of collaborative research is the **NOMAD** Consortium formed in 2001 that combines research groupings from three Institutes of Technology. The Centres involved are: The Centre for Creative Technologies and

Applications (CCTA) in Dun Laoghaire's Institute of Art, Design and Technology (IADT); the Telecommunications, Systems and Signals Group (TSSG) in Waterford Institute of Technology (WIT) and the Software Technology Research Centre (STORC) in Dundalk Institute of Technology (DKIT). The rationale behind the consortium is to address new wireless application areas where there is a strong emphasis on supporting creative activities at a time and place of the user's choosing.

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**From the early 1990s Ireland's Institutes of Technology have become become fully-fledged third level educational institutions providing R&D services to Irish industry. Each of the Institutes is required to appoint a Head of Development as part of their management team. The function of the Head of Development is to liaise with industry and take responsibility for research and development activity within their Institute.*

Some of the projects currently underway in Irish colleges in conjunction with industry:

28-31 GHz RFICs in Silicon Germanium HBT* Technology for LMDS Applications

(University College Cork/Motorola SPS, Cork)

Local Multipoint Distribution Service (LMDS) is a wireless, two-way broadband technology designed to allow service providers to quickly and inexpensively bring a wide range of high-value, quality services to homes and businesses. Low installation costs, ease of deployment and large bandwidth coupled with recent advances in RFICs are key factors pushing LMDS as a viable solution for broadband service delivery.

A joint research project between a UCC RFIC Design Group, led by Prof. Patrick Murphy, and Motorola SPS Cork will involve the design, fabrication and testing of innovative LMDS circuits using Motorola's advanced SiGe BiCMOS technology. SiGe offers low cost since it leverages mature silicon process technologies. In addition, high cut-off frequencies and low noise performance make it an attractive option for receiver front-end applications.

*Silicon-Germanium Heterojunction Bipolar Transistor

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Quality of Service for Next-Generation Heterogeneous Wireless Networks

(University College Cork and University of Limerick/Comnitel Technologies)

The Mobile & Internet Systems Laboratory (MISL), part of the Department of Computer Science conducts basic and applied research in the design and performance of computer networks and systems, with a special emphasis on applications of computing to mobile and multimedia communications.

In collaboration with *Comnitel Technologies* and the University of Limerick, MISL are exploring next-generation (4G) wireless networks composed of a heterogeneous mix of local, metro and wide-area access networks. A new approach to quality of service-based handoff between different networks is being developed, using a decision model for evaluating the benefit of initiating vertical handoffs in these challenging heterogeneous environments.

For details visit www.cs.ucc.ie/misl or contact:
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Automotive Applications of Bluetooth

(University College Galway/Connaught Electronics Ltd.)

In 2001 Connaught Electronics Ltd. (<http://www.celeurope.com/>) became involved in a research project with University College Galway. The proposal was to investigate the Bluetooth wireless technology standard with the aim of assessing its suitability and capabilities in an automotive environment.

The evolutionary development of in-vehicle electronic systems allows a significant increase in the number of electronic systems within modern vehicles. Apart from replacing the wires between devices, the scope of Bluetooth in automotive environments allows wireless connectivity between mobile devices (e.g. PDAs or mobile phones) and in-car computer systems.

The main principle is to allow devices to co-operate and share resources, and to allow the user to access in-vehicle systems without having to physically connect wires. The exchange of data between car and stationary devices provides the basis for a variety of exciting new applications, some of which are within the scope of this project, e.g.

- Access to traffic information or maps at public data stations
- Download of software upgrades for in car electronic systems from main dealerships websites
- Infotainment (In-car information and entertainment)
- Vehicle Diagnostics

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Incorporating Photonics in Future Wireless Networks

(Dublin City University/ESAT BT)

As the demand for broadband mobile services such as video-on-demand and mobile computing increases, so does the need to develop high capacity mobile networks capable of delivering broadband signals to remote areas “over the air”. These mobile networks of the future will probably use high frequency microwave signals as the access medium (15 – 60 GHz), as this offers a large bandwidth for data transfer.

To develop an optically fed microwave wireless network requires the amalgamation of many different technologies. On the transmission side, the main technical challenge is to generate the microwave optical data signals using semiconductor laser diodes. The simplest technique available to generate optical microwave signals involves direct modulation of the laser with the microwave data carrier. Some of the main problems encountered here are due to the limited bandwidth of the laser transmitters, and the distortion introduced into the

overall system due to electrical-to-optical and optical-to-electrical conversions. The Radio and Optical Communications Laboratory of the Research Institute for Networks and Communications Engineering in conjunction with ESAT Telecom, has been exploring new techniques to overcome these problems and develop highly efficient and flexible broadband wireless systems using hybrid fibre/radio technology. They have demonstrated the distribution of RF data signals in many different formats, and over a range of operating radio frequencies, using this technology.

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Investigation of GPRS Cell Dimensioning

(Dublin City University/Ericsson System Expertise)

With an increasing demand for multimedia services, the design of high-speed data networks that can give Quality of Service (QoS) differentials is an important task in the wireless mobile environment. GPRS (General Packet Radio System) is the next step in the evolution of the Global System for Mobile (GSM) offering a packet data bearer within a GSM network. This project was undertaken in collaboration with Ericsson Systems Expertise, Ireland to examine the effects of QoS differentiation in GPRS and how to predict the radio resource requirements within a range of cell types to facilitate this.

A simple, effective model of a GPRS/GSM cell has been developed that can give a clear insight into the behaviour of MAC layer scheduling algorithms

for a definable cohort of users. Users are defined in terms of their QoS class, their mobility characteristics and their traffic characteristics. The channel model is a C/I statistical model that has a variable mean value that is generated from a two state Markov model for each user.

Several scenarios have been analysed within this simulated environment to predict traffic flow and user perceived network performance. Results show that the scheduling algorithm can simply and effectively implement QoS differentiation and reduce the perceived delay for real time streaming users, thereby improving the user perceived performance of the network.

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Lightweight multimedia wireless streaming platform to allow remote access

For the conference organiser, presenter and attendee

(Touch Ltd. and Athlone Institute of Technology)

Athlone Institute of Technology and Touch Ltd. (<http://www.3touch.com>) have teamed up in a collaborative partnership to develop a lightweight multimedia wireless streaming platform, which will revolutionise the way in which we give PowerPoint presentations. The system is designed to get rid of all the wires we have now become used to as the norm.

The solution is primarily aimed at the large conference centre, hotel and the Audio Visual hire market and will be all backed up by a hosted event management suite which will allow all conference set-up to be handled remotely. The system will be capable of streaming data over a localised area of up to 5 km in range, which will be popular in the large conference arena where several screens are deployed to show the information. The system is capable of distributing the information to any number of projectors or screens in real time.

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INVESTMENT AND
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