

BUILDING VALUE IN INVISIBLE COMPUTING

A consortium of European scientists is setting out to enable the billions of electronic devices in everyday use to be networked together. This will create vital new applications from healthcare and transport systems to manufacturing and disaster recovery.

The goal is to create systems that join up the 'invisible' computers around us, and make their power available for multiple new applications.

The RUNES project aims to expand and simplify existing and future networks of devices and embedded systems. It will create a standardised computing infrastructure that can adjust itself to different environments and different demands placed upon it.

The project is motivated by several critical technology developments over the past few years.

- The growth in power and reduction in cost of microprocessors has made them pervasive. Only around 2% of the billions of processors produced each year become the brains of personal computers - most of them go into embedded systems that are the essence of every modern electronic device, from toys to traffic lights. They run factories and enable worldwide communication and the flow of information, products, and people. Every European home contains multiple embedded systems and most people carry several around with them, from phones and watches to portable computers and music devices.
- Cheap and low-powered radio technologies like Bluetooth, and the rapid expansion of the Internet, make it practical to network these devices and systems, and the market for networked embedded systems is expected to grow exponentially.
- Europe's sophisticated communication infrastructure and strength in embedded systems makes it well placed to develop new applications and exploit emerging new markets.

RUNES aims to assess and overcome barriers to exploitation of these technologies and to create standards which make it easy and practical for programmers to develop practical and profitable applications.

RUNES (Reconfigurable Ubiquitous Networked Embedded Systems) is a research project supported by research funding from the European Community's Sixth Framework Programme. It has 22 partners from six European countries, plus Australia and the US. Major industrial partners include Kodak and Ericsson.

Part of the consortium's strength lies in the broad range of technical and scientific expertise of academic and industrial partners; plus the smaller companies which can bring innovative solutions and ensure early exploitation of results.

RUNES: what it means?

Reconfigurable: This refers to computer processors that can adapt to changing circumstances and demands upon them, giving a device flexibility to provide multiple functions.

Ubiquitous – Literally, being present everywhere at once. Ubiquitous computing, also known as pervasive computing or invisible computing, refers to multiple electronic devices communicating with each other through the Internet and other networks.

Networked – joined together by new or existing communication systems, from the Internet, mobile phones and short-range radio to satellite and fibre-optic networks. Networkable devices are found in everything from domestic appliances and mobile phones to medical devices, engines, cameras, pacemakers and traffic lights.

Embedded System – a special purpose computer built into a larger device. Embedded systems can be found in virtually every electronic device designed and manufactured today. They are having a profound impact on society.

“RUNES will affect how we live and do business,” says EU project officer Franck Boissiere. “By joining up existing devices and creating opportunities for multiple new applications, we are enabling the era of wearable computers, smart homes and a whole new generation of health monitoring.”

The RUNES vision is to enable the creation of a large-scale network of devices that work with each other and can adapt to changing requirements or commands. The project will provide a standardised architecture that can organise itself to suit its environment.

One of the project's main outcomes will be adaptive and intelligent middleware systems that make it easy and profitable for programmers to develop new applications. As the programming that connects programs to each other, or mediates between them, middleware is critical to the networking of multiple devices.

"We are in the middle of the revolution but people don't yet know it's happening," says Steven Hailes, RUNES technical director and computer science lecturer at University College London. "Invisible, or pervasive, computing is already all around us – it's the pervasive networked computing that is about to happen."

"The challenge now is to connect it altogether and find standard ways to get different types of devices working across different networks to perform different functions in an 'always on' way. That is what RUNES is setting out to do."

For further information or to arrange interviews with project partners, please contact

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Potential applications

Healthcare

Provision of healthcare in the home, with a continuous stream of clinical patient information transmitted to doctors. A network of sensors could monitor a patient – blood pressure or glucose levels, for example – and automatically provide alerts if their condition changes.

Emergency services

Rapidly-available information can save lives and reduce damage during and after disasters such as hurricanes, earthquakes, chemical spills and terrorist attacks. A wide area network of sensors and embedded devices could give fire fighters accurate maps, alert emergency officials to new dangers, and target rescue efforts to where they are most needed. A self-configuring network of water sensors could, for example, indicate where water supplies were still available in an emergency.

Factory automation

Global competition drives lower manufacturing costs and more efficient processes, with flexibility a critical factor in factory automation. RUNES will enable factories to rapidly reconfigure and adapt control and information systems to improve performance, or completely alter production processes to meet changing demands.

Retail

Sensors and embedded systems already proliferate in shops and enable inventory tags, price checking and security systems. RUNES will enable the automated shop where shelves report their own inventory to centralised purchasing systems and warehouses.

Domestic security

Home security is often already networked to security companies, with a move towards wireless networks and security monitoring via the Internet. Networked embedded systems will enable other safety and security applications such as smoke detectors which communicate with emergency services and home owners' mobile phones, or surveillance systems based on motion sensors which deliver images via wireless networks to phones or computers.

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Questions and answers about RUNES

What is it?

RUNES is a research project supported by research funding from the European Community's Sixth Framework Programme. It has 22 partners from six European countries, plus Australia and the US. Major industrial partners include Kodak and Ericsson.

What will it do?

Research and development by RUNES is setting out to enable the billions of electronic devices in everyday use to be networked together. The goal is to create systems that join up the 'invisible' computers around us and make their power available for multiple new applications.

What are the benefits?

By creating a standardised computing infrastructure that can adapt to different demands, RUNES is working towards multiple new networked computing applications, from healthcare and transport systems to manufacturing and disaster recovery. The project is laying the vital groundwork for technologies that will be commonplace in the future.

What has prompted you to do this research now?

There are a number of factors underpinning RUNES:

- The growth in power and reduction in cost of microprocessors
- The availability of cheap and low-powered radio technologies like Bluetooth, and the rapid expansion of the Internet
- Europe's sophisticated communication infrastructure and strength in embedded systems

What will the project actually produce?

One of the main outcomes of the project will be development of programming that connects other programmes to each other (middleware). This will make it easy and profitable for programmers to develop new applications that take advantage of a network of tiny computers.

When does RUNES end?

RUNES is a 32-month project scheduled to end in April 2007.

Who is involved with RUNES?

- Kodak Ltd (UK)
- Sira Ltd (UK)
- University College London (UK)
- University of Lancaster (UK)
- Ericsson AB (Sweden)
- Ericsson Hungary (Hungary)
- Industrieranlagen-Betriebsgesellschaft mbH (Germany)
- ConnectBlue AB (Sweden)
- Swedish Institute of Computer Science AB (Sweden)
- Virtutech AB (Sweden)
- LiPPERT Automationstechnik GmbH (Germany)
- Kungliga Tekniska Hogskolan (Sweden)
- Rheinisch-Westfaelische Technische Hochschule AACHEN (Germany)
- Lund Institute of Technology (Sweden)
- Politecnico di Milano (Italy)
- University of Patras (Greece)
- Università di Pisa (Italy)
- University of California, San Diego (USA)
- University of California, Berkely (USA)
- University of Queensland (Australia)
- Victoria University (Australia)
- National ICT Australia

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