# Will RUNES rule the world?

**Computers are everywhere. You can't see them, because they're embedded. But they are there. And now there is a plan to let them start talking to each, potentially unleashing phenomenal processing power. Science fiction? Pipe dream? No, this is the RUNES project.**

Today is not just computers that have computing power. Virtually every modern electrical and electronic device has an embedded microprocessor. There are dozens in the average home or office, and hundreds in most factories. Just think what might happen if all of those embedded systems talked to each other.

World domination by a distributed computing system made up of millions of mobile phones, coffee makers, variable speed drives and sundry office equipment? Digital cameras that, without your knowledge, stealthily record and report your every move? These scenarios are probably not quite what those behind the RUNES project have in mind, but creating large-scale networks made up of linked embedded systems most certainly is.

So what is RUNES? The name is an acronym for Reconfigurable Ubiquitous Networked Embedded Systems. And it's certainly not science fiction. It's a 32-month project supported by research funding from the European Union, and the list of 22 organisations involved with the project includes impressive names like Kodak, SIRA, Ericsson, University College London, University of California Berkeley and the University of Queensland in Australia.

**Flexible Links**

The project aims to allow embedded systems to be linked in flexible way, using either current communication and networking technologies, such as Bluetooth and the Internet, or new technologies. The networking will, however, be implemented in such a way that it can organise itself to suit the operating environment and requirements.

The key to achieving this is something called middleware. Essentially, this is software which sits in each RUNES-enabled device, and enables it to communicate with, and understand, other RUNES-enabled devices. The middleware is being developed to have a clearly defined application interface, making it easy for product developers use it in conjunction with their own product-specific software and hardware.

An important benefit of this middleware approach is that it should make product development faster, easier and, therefore, less expensive. The use of standardised middleware will also help to guarantee the interoperability of RUNES-enabled devices from different manufacturers, an essential requirement for the project's success.

**Making an Impact**

The RUNES team is not reticent predicting the impact of its new technology and, in fact, claims that it will eventually affect every aspect of our lives.

For example, in the field of healthcare, patients could be fitted with sensors which monitor their well being. While the patient is in hospital, these sensors could communicate with the hospital's systems but, after the patient had been discharged, the same sensors could adapt themselves to talk to systems in a doctor's surgery, or even in the patient's own home. The transitions between the hospital, surgery and home networks would be completely automatic, as would the handling of security, privacy and data integrity issues.

What benefit can RUNES offer in a manufacturing environment? The answer, according to the RUNES team, is flexibility. It's no secret that today's production plants have to be more flexible and versatile than ever before, to satisfy the needs of rapid product evolution and to respond to the whims and fancies of customers.

RUNES could greatly aid this flexibility by allowing control systems to be reconfigured and restructured with a minimum of cost and effort. Sensors, drives and even controllers could be added to the installation quickly and easily, secure in the knowledge that they would immediately be recognised as part of the system, and that communication between them and existing components would be dependable and transparent.

If wireless networking were used, even greater flexibility would be possible, as the only wiring needed would be that used to supply power to the field-mounted devices.

Since RUNES-enabled devices are, by definition, intelligent, an additional benefit would be easy implementation of distributed control, with local devices able to handle many control functions without recourse to the network, and able to continue working autonomously – perhaps to allow a controlled shutdown – in the event of a communications failure.

Clearly the RUNES project has enormous potential, but let's leave the summing up to Steven Hailes, RUNES technical director and computer science lecturer at University College London. "Invisible or pervasive computing, in the form of embedded computers, is already all around us, and networked pervasive computing is about to happen," says Hailes. "The challenge now is to connect it all together and to find standard ways of getting different types of devices working across different networks to perform functions in an "always-on" way. That is what RUNES is setting out to do."

University College London
T: 02076793433