Heart disease is the number one cause of death in Europe and early diagnosis is essential to save lives. Sixty million men alone aged 50 years and above are at risk of developing the disease. Monitoring the heart’s rhythm and electrical activity in real time using an electrocardiogram (ECG) provides vital information about abnormalities and gives clues to the nature of a problem. Some cardiac conditions need long-term monitoring - inconvenient for a patient as it requires him to be away from his everyday environment for indeterminate periods of time. Additionally, most ECG monitors are designed for use by trained medical staff in a specially equipped hospital environment. Portable ECG machines are available, but the data collected have to be delivered to the hospital for processing and interpretation.

Six years ago, Latvian company Integris Ltd, a specialist in the development of mobile wireless telemedicine ECG recording devices, came up with the concept of an inexpensive, real-time heart activity monitor for personal use. Initially, the wireless technologies available were not a practical option for the device Integris had in mind, but when hybrid chips came onto the market EUREKA project E! 3489 HEART GUARD was born.

Safe, reliable and easy to use
The HEART GUARD system comprises a lightweight, simple to use, matchbox-size device with five electrodes that are strategically placed on the wearer’s chest. The wireless device transmits data in real time directly to the patient’s pocket computer or desktop PC for instant interpretation by the system’s unique software. The low-cost device is discreet enough to be worn 24 hours a day, recording, analysing and reporting not only the rhythm and electrical activity of a patient’s heart but also his physical activity and body positions, as he goes about his daily life.

HEART GUARD uses a simple green-amber-red traffic light system to keep the wearer informed about the status of his condition. Green denotes everything is normal; amber that he should be careful and keep monitoring his heart activity; red that there is some cause for concern and he should either rest, take prescribed medication or see his doctor. Depending on the nature of his condition, the wearer is given tailored instructions for a number of possible scenarios.

“Effectively, it is an early warning system,” explains Juris Lauznis, Director of Integris, the project’s lead partner. “If HEART GUARD detects a problem it alerts the patient to check his PC for further information and advice. At the very least, the device will help to manage his condition – and it could even save his life.

Juris Lauznis - Integris Ltd, Latvia

One of the world’s first real-time heart monitoring devices for personal use, developed by the Latvian and Lithuanian partners of EUREKA Project E! 3489 HEART GUARD, allows people with coronary heart disease or who are at risk of it to monitor their heart activity as they go about daily life and alerts them if there are any abnormalities.
An effective collaboration

Working with Integris on the design and development of the system hardware and software were Lithuanian company UAB Kardiosignalas and Riga Technical University’s Institute of Automation, Computer Engineering and Control. Developing the unique real-time analysis and decision-making software proved quite a challenge, and expertise was provided by the three other project partners, the Institute of Cardiology of Kaunas Medical University, the Lithuania Academy of Physical Education and the Research Institute of Cardiology, University of Latvia. They advised on the range of coronary heart diseases requiring long-term, real-time monitoring – angina and myocardial infarction, for example – and therefore most suited for monitoring by HEART GUARD’s automatic recognition and analysis software.

The device employs a simple green-amber-red traffic light system to keep the wearer informed about the status of his condition. Depending on the nature of an abnormality, the wearer is given tailored instructions for a number of possible scenarios.

Juris Lauznis - Integris Ltd, Latvia

In the meantime, HEART GUARD has applications in a number of other areas, including telemedicine, sports medicine, patient rehabilitation following cardiac surgery or a heart attack and as a low-cost ECG monitoring system in hospitals and clinics with limited budgets. Additionally, the technology is applicable to other situations in which wireless heart monitoring could be an advantage, such as monitoring elderly or disabled people and in intelligent cardio-synchronising or electro-stimulating systems.

With the 30-month project completed and clinical trials of the prototype successfully concluded by Kaunas Medical University’s Institute of Cardiology, the Lithuania Academy of Physical Education and the Research Institute of Cardiology at the University of Latvia, the next steps are to satisfy the EU’s strict compliance requirements for medical devices and then source a company to manufacture and distribute the system. If successful, the first commercial HEART GUARD devices could be on the market and saving lives by the end of 2008 or early 2009.

The partners faced other practical challenges in the project’s early stages of development, according to Juris Lauznis. “Ensuring that data could be transmitted reliably was paramount. We also had to work on reducing the power consumption of the battery-operated device – we had originally envisaged using a battery that gives 24 hours of power, but this proved too heavy. However, because the device will be relatively inexpensive it is very feasible for a patient to have two systems and keep one on charge.”

A variety of applications

Currently HEART GUARD is being developed for home use only, with the patient monitoring his own condition and only contacting his doctor or hospital if the system identifies a cause for concern. Subject to obtaining the necessary funding, the project partners’ longer-term plan is to set up commercial monitoring centres which would monitor patients remotely.