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INFORMATION TECHNOLOGY FOR EUROPEAN ADVANCEMENT

PROJECT RESULTS

Service continuity between networks

New architecture offers seamless roaming with guaranteed quality of service

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EASY WIRELESS successfully developed an architecture for smooth handovers between wireless networks, enabling continuity of traffic, continuity of service and quality-of-service (QoS)-level negotiation when moving between different systems. Ad-hoc routing, multi-point QoS measurement and service adaptation have all been integrated. The result is continuous and reliable connections for users as they move between different wireless networks.

The telecommunications market comprises many large networks built on a range of differing technologies. Apart from some proprietary solutions applicable to specific situations, there were no widely accepted methods or standards that ensured seamless and transparent roaming across heterogeneous networks at the start of EASY WIRELESS.

Seamless service continuity
When a customer uses a service for which network access is needed, only one network and one end-

to-end path are used, even when many other appropriate network connections are available. If the access network has to be changed due to, for example, insufficient signal strength, in many cases the connection is first broken and then re-established through a new network. This wastes time and is inconvenient for the user. For a better service and more efficient use of the network, a switch from one network to another should be seamless, while the connection is maintained at the same quality-of-service level.

Without such special provisions, a service – be it a virtual private network (VPN), live video streaming, or whatever – is disrupted when moving from one wireless network to another. A manual intervention by the user is often necessary to continue the service.

An evaluation of the requirements led to the conclusion that a single layer three – the Internet protocol (IP) layer – solution cannot accommodate all use cases. An architecture was developed – Figure 1 – with solutions at different network
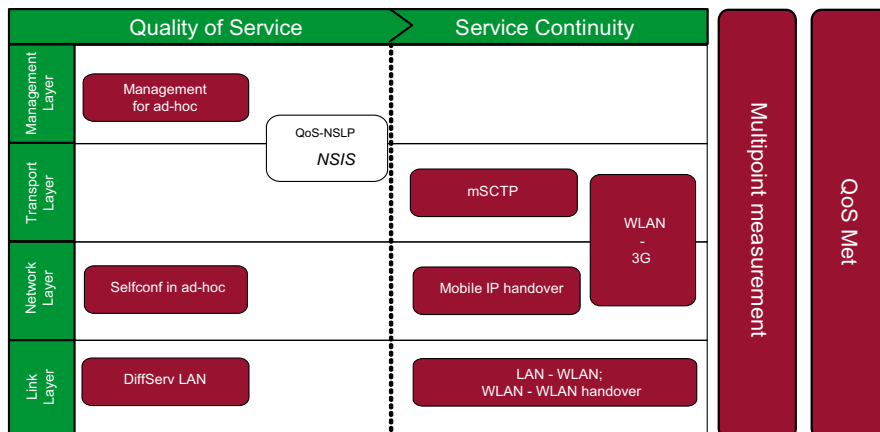
Figure 1: The EASY WIRELESS solution matrix

layers. A solution based on the mobile stream control transmission protocol (mSCTP) was developed at layer four and a new fast vertical and horizontal handover at the data link layer – layer two – demonstrated with only a 50-ms handover time. A meshing layer was introduced between layer two and three for seamless *ad-hoc* networking.

Using the global EASY WIRELESS architecture, solutions are applied to the network, depending on the specific service to be supported.

Quality of service
Current deployed wireless technologies focus on providing connectivity. EASY WIRELESS architecture targets mobile services that will use several of these technologies. Every service has its own requirements in terms of bandwidth, latency, security, etc., jointly called the quality-of-service parameters. EASY WIRELESS architecture provides a mapping of QoS technologies to adapt the end-to-end QoS to the targeted services.

Since QoS provisioning is still an active research area, the EASY WIRELESS QoS framework built on top of it will need to be extended in the future to provide a comprehensive QoS solution. For *ad-hoc* networks, existing QoS were found insufficient and have been improved in EASY WIRELESS.

A clear need for accurate end-to-end QoS measurements existed for all services. End-to-end requires measurements across the different networks; a new passive end-to-end measurement tool was therefore developed. As an alternative approach, an agent-based solution was investigated with agents gathering the distributed measurement data.

In some cases, QoS parameters cannot be maintained across networks – for example, when moving from a home wireless local area network (WLAN) to a general packet radio service (GPRS) mobile

network, bandwidth will decrease. As the focus was on the service and the user experience, service adaptation was integrated in the architecture.

Key project results
Key project results included:
- **Technological advancement**: Development work was carried out on theoretical network modelling, simulation and emulation, and prototype implementation;
- **Technology demonstrators**: EASY WIRELESS architecture offers an extra service on top of existing wireless networks. Three scenarios were realised in demonstrators: a public cellular network, a railway on-board network and an emergency communications infrastructure; and
- **Industrial application**: A business case study was performed to evaluate the feasibility of offering the EASY WIRELESS service in a new service company. In addition, partners confirmed industrialisation of the *ad-hoc* routing algorithms, the end-to-end QoS measurements, and layer two handover in their existing product ranges.

Major project outcomes

Dissemination
- 48 publications on improved network algorithms at link, network and data layer and on improved network measurements
- 11 presentation at international conferences and workshops
- One workshop organised at the IST Mobile Summit 2007

Exploitation
- Three prototypes of new products – as enhanced versions of existing products
- One business case for service offering

Patents
- One patent granted