PROJECT PROFILE

2A202: Universal platforms for power efficient reconfigurable mobile systems and terminals (UPPERMOST)

NETWORKED ICE TERMINALS

Partners:

Agilent Technologies
AsicAhead International
CEA-LETI
IMEC
Motorola
Philips
STMicroelectronics
Target Compiler Technologies
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Countries involved:

Belgium
France
Romania

The next generation of mobile terminals will be personal portals into an exciting new world of information, entertainment and peer-to-peer communication on the move. They will incorporate considerable computing power, advanced multimedia software and display technology, whilst being connected and interacting with their immediate environment through a range of wireless technologies. If the products are to gain popular public support, connectivity must be provided seamlessly and reliably. The main technical objective of the MEDEA+ UPPERMOST 2A202 project therefore is to investigate and design the novel architectures, building blocks and tools that will provide this highly complex functionality.

More than 500 million mobile phones were sold in 2003, and subscriber levels reached one billion in 2004. Continuing growth is expected to boost this number to a worldwide figure of almost two billion by 2008.
Europe has enjoyed huge success in this field, especially with GSM technology. But next generation mobile phones will have to support a wide variety of applications, from Internet to broadband multimedia. This mobile terminal market will be much more sensitive to segmentation, so the challenge to chipmakers and handset manufacturers will be to develop and manufacture competitive differentiated solutions with short time to market.
The MEDEA+ 2A202 UPPERMOST project intends to provide the enabling platform for ubiquitous communications in this wireless world of tomorrow. A consortium of equipment and terminal manufacturers, system-on-chip (SoC) suppliers, tool creators and research institutes is collaborating to investigate, build and demonstrate advanced technical solutions, tools, architectures and building blocks for future generations of mobile terminals characterised by high performance and computing power, flexibility and adaptability for multistandard and multimode connectivity together with the lowest cost and power consumption.

Speed and bandwidth

Currently, the majority of mobile phones are so-called 2G (second generation) such as GSM and 2.5G — e.g. GPRS/EDGE — types, although the roll-out of 3G systems such as universal mobile telecommunications service (UMTS) is now well underway. Despite an increase in capacity offered by 3G, the data rate will not be more than 2 Mb/s, and will be achieved only with low mobility and by a few users per cell. In order to provide users with higher data rates up to 10 Mb/s, extensions to UMTS — such as high speed downlink packet access (HSDPA) — are being added to the standard.
The few 3G terminals that are available also have a GSM capability, and to this extent are multimode devices. However, they are only dual mode — and the main radio parts are not yet exploited to a significant extent. This is one reason why 3G terminals are still relatively expensive.
Wireless local area network (WLAN) standards based on orthogonal frequency div-

ision modulation (OFDM) — the method used for carrier modulation in digital transmissions — already offer broadband wireless access with data rates up to 54 Mb/s. These services are being extended from office and home environments to include local outdoor 'hot spots'. Other high bit-rate services such as broadcast and/or multi-cast envisaged for the future will also be delivered via the digital video (DVB, DMB) and digital audio (DAB) broadcasting standards.

Preferred gateways

Today few, if any, mobile telephones incorporate a WLAN capability; current technology solutions are too costly and limited in capability. Similarly, electronics for the reception of DVB and DAB signals do not as yet permit sharing of the same radio resources of the terminal. Ideas are already developing on the ways in which users can access the various WLAN, wireless local loop (WLL) and DVB/DMB/DAB services. This may be via what is becoming known as a 'preferred gateway' — the wireless access medium that offers the best compromise between quality of service, price and availability.

The preferred gateway could be the user's home wireless network, one of the available cellular networks, a WLAN, a terrestrial broadcast network or a satellite-based network. However, such gateway concepts are in their infancy.

In summary, low-cost products are available for single- or at most dual-mode devices. At present, these make relatively little re-use of components. They have extremely limited scope for reconfiguration, and even less for autonomous adaptation of their internal resources. Enabling technologies needed to provide the highly adaptable performance capabilities of a mobile multistandard, multimode terminal simply do not exist.

Taking Europe ahead

UPPERMOST aims to make substantial advances in the state of the art on a number of fronts. It targets the development of a universal platform to support:

- Mobile multimedia terminals with totally dynamic, transparent wireless connectivity;
- Multimode and multiband terminals featuring access possibilities to a wide range of wireless networks;
- Terminals capable of adapting their internal radio resources to suit the quality of service requested, and to the operating conditions prevailing at the time — e.g. battery energy could be conserved by varying the dynamic range and selectivity of the receiver when operating close to the relevant access point and/or when relatively few interfering signals are present;
- Very high data-rate terminals using techniques such as diversity and multiple input, multiple output (MIMO); and
- Terminals that can be reconfigured or upgraded via the core network by software download.

By conducting studies at component, subsystem and system levels, UPPERMOST will research, develop and demonstrate cost-effective, low-power, highly adaptive and reconfigurable technical solutions. These will embody functionality ranges more than an order of magnitude greater than those of existing terminals. At the same time, the goal is to maintain costs at current levels, or even lower, by means of the new architectural concepts, maximising re-use and employing the latest chip and circuit-integration technologies.

The work divides into four broad areas:

1. Translate user and air-interface requirements into a set of terminal resource definitions for the physical and medium access control layer;
2. Identify, investigate and validate new architectures, block designs and technology solutions;
3. Develop new design flows, methodologies and tools; and
4. Research flexible and reconfigurable hardware platforms with which to verify the system integration of the new architectures, blocks and technologies.

In parallel with this effort, consortium members are liaising closely with the standards authorities relevant to cellular communications (GSM, UMTS, IS95, etc.), WLAN (IEEE 802.11x, etc.), wireless short-range communications (IEEE 802.15x, etc.), fixed wireless access (IEEE 802.16x, etc.) and broadcasting (DVB-x, etc.).

Through close co-operation between the partners, and with close links to other MEDEA+ projects in this area, UPPERMOST will make a strong contribution to sustained European leadership for the next generation of wireless systems. Achievement of the project's objectives will reduce the time to market, non-recurring engineering costs and production costs for terminal manufacturers and their semiconductor suppliers. For the end-user, benefit derives from the availability of affordable, portable appliances with extended multistandard, multimode connectivity and increased operating autonomy.

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