PROJECT RESULT

High speed communications systems

MEDEA+

2AI05 Short range radio (SR2)

Linking the human body to its immediate surroundings

Future communications networks are likely to extend into areas hitherto little explored in the mainstream. Personal area networks and body area networks could be the next step in linking the human body to its immediate environment. Yet the technologies, Bluetooth, ultra-wideband wireless, WiFi and even magnetic induction, do not co-exist easily, with inter-spectrum interference common. The MEDEA+ SR2 project, which focused on short-range, low-power wireless, aimed to overcome these issues by developing integrated circuit design solutions able to manage the variety of protocols and standards required.

Communications networks today are ubiquitous. Everyone now expects to be able to consult the web, email or a wiki while either at the desk or travelling. Yet future networks are likely to be microcosmic in their nature; so-called personal area networks (PANs) and body area networks (BANs) are expected to play a key role in tomorrow's smart environments. PAN and BAN devices will be used in applications ranging from multimedia and video connectivity to home or health monitoring, as well as in sensor networks in general. Yet there is an obstacle barring their progress – the multiplicity of communications technologies and standards involved. Bluetooth, Bluetooth ultra-low power (ULP), Zigbee and Wimedia all have a part to play, yet these differing technologies do not always work well together.

The MEDEA+ 2A105 SR2 project therefore set out to overcome these issues by developing semiconductor design solutions which are able to manage the variety of standards and protocols involved. As well as semiconductor chips, the project examined new aerial designs, especially for use near the human body, ultra-wideband (UWB) applications and home automation systems.

Low-power technologies

SR2 focused on low-power wireless technologies – that is Bluetooth, IEEE 802.15 wireless PANs, UWB and magnetic induction. The target was to design, fabricate and test the main building blocks and system-on-chip (SoC) solutions for these areas. A central task, because of known interference issues in past, was to design these solutions so that they could coexist without interfering with each other.

The MEDEA+ project paid special attention to testing devices working in the 2.4 Ghz frequency band, mainly Bluetooth, ZigBee and WiFi, to develop strategies for avoiding interference. Bluetooth has a significant market share in short-range wireless applications, and the newer Bluetooth ULP standard will extend the technology even further.

The IEEE 802.15.4 wireless PAN interface is designed specifically for ultra-low power applications where the battery needs to last for years, for example in home automation. UWB was included because of the technology's ability to offer a very broad spectrum of bandwidths, which makes it more resistant to interference. Magnetic induction was added at a later stage as a result of market developments and the technology's suitability for implementing BANs.

Underpinning new networks

Overall, SR2 achieved its key objectives. It successfully developed a new ultra-low power approach with a very competitive

silicon footprint for Bluetooth. This technology advance is expected to underpin the next step in linking mobile devices, and should deliver a significant competitive advantage for project partner ST-Ericsson in particular.

The markets which can benefit from this new Bluetooth standard include healthcare and fitness, proximity applications, remote control, industrial automation and gaming. A low-power Bluetooth capability which is easily incorporated into mobile phones makes possible a range of potential new applications, for example the mobile phone as a hub for BANs and their links to external communications networks.

For the IEEE 802.15.4 wireless BAN interface, SR2 delivered a transceiver demonstrator with remarkably low power requirements, offering a quiescent power consumption of just 5 nA. In the process, project partner ADD also developed a high-performance, low-power processor ideal for control applications. And SR2 investigated potential smart-appliance applications for this interface, an effort which is likely to benefit FAGOR in particular.

The MEDEA+ project's work on UWB technology building blocks resulted in the development of a new indoor positioning system. New SoC solutions are likely to make the provision of people-sensing systems for smart buildings and local-environment controls that much cheaper to produce.

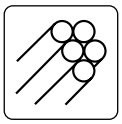
While participating in SR2, NXP Semiconductors decided to focus more effort into the magnetic induction field. It was able to develop within the project some very low cost, very low power chips which offer significant advantages over standard RF technologies for near-field communications. Magnetic-induction signals are well-suited to BANs because the signals are not absorbed by the human body. The technology developed within SR2 will suit applications which require low power, moderate bit-rates and short range – for example hearing aids, wireless headphones and certain medical apparatus.

Standardisation work

SR2 devoted considerable effort to standardisation activities as well as the dissemination of results. Standardisation work focused mainly on UWB and smart appliances, headed by CISC and by FAGOR respectively.

The MEDEA+ project played an important part in UWB, with members attending 13 of the working group meetings and SR2 making 11 contributions to the standardisation process. In the smart appliances area, the SR2 contribution was carried out within the framework of CECED – the European association of household appliances manufacturers. SR2's work has made possible significant advances in specifying smart-appliance interconnections within smart-grid architectures from the architectural and functional points of view.

Some 85 communications were also published during the MEDEA+ project; 75 technical papers – 12 of which were in the last project year, and 10 contributions and presentations within industry workshops. Finally, the results from SR2 have driven application for three new patents, the processing of which is now underway.



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2A105: Short range radio (SR2)

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