Publishable Summary
of the MULTI-BASE project

Project number:	216541
Project acronym:	MULTI-BASE
Project title:	Scalable Multi-tasking Baseband for Mobile Communications
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WPs contributing to the deliverable:	All
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1 Publishable summary

Introduction and General Technical Goals

Overall flexibility and the ability to address a multitude of segments with a general architecture and design approach in the area of mobile communications is the major focus of the MULTI-BASE project.

In order to strengthen Europe's leading position in high-speed, end-to-end, mobile network systems technology, the MULTI-BASE consortium identified three main areas where research will have a major impact on the advancement of state-of-the-art technology of handheld terminals and the emergence of a sound competitive and innovative environment for the European communications and services industry:

a) multi-tasking radio – capable of supporting the reception/transmission of several communication standards concurrently as well as with dynamic reconfigurations.
b) scalable reconfigurable multi processor technology – an architecture allowing for both high bit-rate use cases and low bit-rate use cases with similar performance as low complex implementation specifically targeting only these use cases.
c) algorithm/architecture co-design for maximum energy efficiency – from the early developmental stages of algorithms both maximum and average power consumption will be taken into account.

The MULTI-BASE project objectives target the elimination of key technical and commercial barriers to ubiquitous broadband access by enabling efficient and sustainable disposition of operation and production factors as spectrum, power engineering cost and silicon process technology.
Drawing on project research in these three areas, the MULTI-BASE consortium will demonstrate new handset baseband architectures that enable end-to-end interconnection of humans and devices, with ability to support tenfold scaling in the number of interoperating connectivity links at the same cost and power consumption as today's technology.

Description of the work done and the results in the first two project years

The MULTI-BASE project started in January 2008 and it is going to run for 36 months. During the first project phase corresponding to the first project year the focus was put on the analyses of requirements and the specification and the selection of the overall functional architecture. All work packages started their work and produced altogether eight deliverables spread throughout the first project year. At the beginning of the project a public project website with internal IT communication functionalities was published and a dissemination plan for the entire project duration was compiled. The technical work packages also started and all partners participated in the definition of specification and requirements for the MULTI-BASE system from the beginning of the project. The first version of the specifications and requirements was provided by WP1 after the first six months and at the end of the first year a further iteration of the deliverable was finalised based on the outcomes of the project work and new findings for the multi-stream scenario, the impact of the chosen standards on the functional architecture and further specified system requirements in terms of information transmission and reception and energy and complexity constraints. In the next step work package 4 provided specifications for the functional architecture considering also the hardware/software co-design and presenting the partitioning of the baseband part of the receiver into a set of functional blocks. Some of these blocks could already be considered as relatively mature while others are expected to pose a challenge for the project.

At the end of the first project year the key building blocks for the implementation were identified in WP4 innovative architectures for these blocks were suggested. After describing the different concepts and methodologies Matlab was chosen as the preferred methodology for algorithm development by WP2, which will allow for simple sharing of code and results by the partners. WP2 already identified the different algorithms that need to be explored further, offering a good starting point for the final decision on what will be implemented even if work still remains. The proof-of-concept work package

started in the second half of the first project period and the preliminary version of the process design kit was launched at the end of the first project period.

All work packages continued their work and produced altogether 9 deliverables spread throughout the 2nd project year. At the beginning of the 2nd project year an interim report on the standardisation activities of the consortium were established which comprises the standardisation landscape in mobile communications and in identifying standardisation groups relevant to the work done in MULTI-BASE. After the successful 1st review meeting the project website has been updated with all public available outcomes from the 1st project year.
After the successful requirements specification in the 1st project year WP1 shifted its work to the simulation based system evaluation. The evaluation, which was done in close interaction with algorithm/architecture co-design studies in WP2, platform features with respect to functionality in WP3 and architectural studies in WP04 leads to the determination of boundary conditions for mobile terminal integration with respect to power, co-existence and data interfaces and architecture, by the end of the 2nd project year.
Work package WP2 started to include architectural refinement for blocks targeted for implementation (DFE-Tx and DFE-Rx), where also data-type refinement was included. Moreover, important focus was on the multi-stream support in the different blocks design solutions, for which main results were reported at halftime of the 2nd period and work was continued until the end of the period.
The issue of WP3 was the design and implementation of the platform framework. Integration protocols and implementation of several units like, platform core including the RTL code, Alpha version of interrupt controller and DMA as well the timer, RTL code of OCN (On Chip Connection Network), and a behavioural model for the transmit DFE (Digital Front End) are ready and coded.
The major work for WP4 has been carried out in order to place both DFE-Tx and Rx in silicon. Even though the main focus in this period has been on the silicon, there was also work in other parts of the functional architecture. At the 1st project year it was decided to use the C65nm CMOS technology for test chip implementation. During the 2nd project year the access to the designs system was finalized for all partners, who directly interact with the design flow in order to implement the test chip.
WP5 also setup specific trainings and a collaboration workspace for an efficient usage of the design environment, covering semi custom digital design and full custom analog design. At the end of the 2nd project year the test chip area estimations and time lines for the 3rd project year tape out of the test chip have been aligned between the partners.

MULTI-BASE project partners

The MULTI-BASE consortium consists of two leading European mobile communications chip and platform developers together with three universities and a large applied research institute in the area of telecommunications. The seven project partners come from three different European countries.
The consortium guarantees the fundamental innovative character of the research and the applicability in further industrial applications, initiating a major technical leadership in the design and implementation of digital baseband processors for mobile platforms. The knowledge is stretching from basic research to the design and marketing of products, including the production, evaluation and standardisation of all parts targeted by the project as well as intimate knowledge of the end-user market. The project partners are: Technikon Forschungsgesellschaft mbH (AT), Infineon Technologies Austria (AT), Ericsson AB (SE), Lunds Universitet (SE), Linköpings Universitet (SE), Interuniversitair Microelectronica Centrum VZW (BE) and Katholieke Universiteit Leuven (BE).

The MULTI-BASE consortium
The total volume of the project is going to be € 4.9 Million Euro, with the funding of €3.25 Million by the EC. For more information about the MULTI-BASE project please visit the project's website www.multibase-project.eu or contact:

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Figure 1: The MULTI-BASE consortium

The MULTI-BASE logo

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