Project result

Cluster for Application and Technology Research in Europe on NanoElectronics

CA101 | Attending to core technological issues helps ensure future success of mobile communications [PANAMA]

As the use of mobile phones, especially the smart variants, grows from strength to strength with increased subscribers chasing even more functionality, capacity and performance, behind-the-scenes issues relating to networks and handsets need to be addressed if this momentum is to be sustained. That's where PANAMA comes into its own. This project has successfully exploited the expertise and experience of leading European partners from the semiconductor, test tools, electronic design automation industries, and academic institutions in dealing with critical issues. This collaboration between industry and academia also demonstrated the value universities, with their wealth of knowledge and research resources, can bring to a partnership, something entrepreneurs on both sides are taking advantage of.

PANAMA brought together a large consortium of project partners with specialist expertise, from various industries, such as semiconductor, test tools and electronic design automation, but also from academia. They focused on a wide range of advanced application areas and systems (integrated, discrete and distributed), such as multi-band, multi-mode and more efficient power amplifiers and transmitter systems for mobile handsets, as well as, base transceiver stations, avionics, mobile satellite communication and home networking.

Project activities included:

- Designing and developing key components,
- Improving system efficiency,
- Developing standards and design methodology,
- Developing models and simulation and characterisation tools,
- Promoting PANAMA and disseminating project results/achievements through the internet, scientific publications, and workshops and conferences.

Surpassed initial goals

Clear project goals were assigned at the start:

- 20% efficiency improvement for integrated systems,
- 30% efficiency improvement for discrete systems,
- 10% efficiency improvement for distributed systems.

All tasks were completed on time, deliverables achieved and initial goals met. What is more, techniques (developed or optimised) relating to integrated and discrete systems – 2G/3G mobile applications, home networking, base stations, airborne and satellite communications – even surpassed initial targets.

Good project-participation mix

A fine example of pan-European collaboration, PANAMA was a strongly industry-focused project that attracted more than 20 participants from five countries, and where universities played an important role in resolving 'roadblocks'.

In line with other CATRENE projects, PANAMA's activities, tasks and deliverables were divided into 'work packages' (WPs), to which project partners were assigned based on their skills and expertise. Notably, WP4 provided the tools essential to the activities in other WPs.

Internal collaboration was excellent, ensuring a smooth and successful operation. A sign of good co-operation and engagement among partners was reflected in the high attendance at project review

ENERGY-EFFICIENT DEVICES AND ENERGY CONTROL SYSTEMS

Partners:

Agilent Technologies Belgium
Amcad Engineering
CEA-LETI
ELTA Systems
ESIEE Paris
Gigle Semiconductor
IEMN
IMS
Institut Telecom
KU Leuven
MC²
NXP Semiconductors FRA, NLD
OMP
ST-Ericsson Belgium
STMicroelectronics
THALES Communications
TNO
TU Delft
TU Eindhoven
UPC-HiPICS

Project leader:

Philippe Meunier
NXP Semiconductors

Key project dates:

Start: January 2009
End: September 2012

Countries involved:

Belgium
France
Israel
The Netherlands
Spain

PROJECT CONTRIBUTES TO

Communication	✔
Automotive and transport	
Health and aging society	
Safety and security	
Energy efficiency	✔
Digital lifestyle	✔
Design technology	
Sensors and actuators	
Process development	
Manufacturing science	
More than Moore	✔
More Moore	

meetings. This was also reflected in the number of joint publications (many involving partners from industry and academia) and patents, as well as, workshops organised by and for project members.

Putting PANAMA's deliverables to good use

Most importantly, PANAMA will offer mobile users handsets with batteries that are even more energy-efficient, as well as, faster, higher-capacity internet connections, with even more access-points. This also means that service providers will have satisfied clients with an even greater appetite for mobile and web services.

Behind the scenes, PANAMA delivered, first and foremost, tools needed to support its own project activities. The nonlinear characterization tools led to faster and more automated and accurate measurement-taking and harmonic matching, as well as, support for low- and high-power for devices under test, new measurement possibilities and with higher frequency. Importantly, these tools did not require the normal high-level of expertise to operate them.

Nonlinear models developed were more accurate. Thanks to improved extracted models, a Power-added Efficiency increase of 10%-15% was achieved and model extraction simplified. Simulation tools increased functionality and performance, surmounting current limitations.

Then there were deliverables whose benefits went beyond the project boundaries. A new architecture and design methodology developed in PANAMA will lead to future improvements in transmission efficiency. From an academic point of view, universities and research laboratories increased their expertise through the 15 PhD students trained in PANAMA, the three patents issued, and the 137 papers published in prestigious journals or presented at international conferences. And standards established during joint-development work developed by NXP and TU Eindhoven on Beamformer and down-tilt antenna for base stations have been submitted for acceptance to the international Antenna Interface Standards Group, AISG, of which NXP is member.

Some deliverables and contacts even had commercial consequences outside the actual project. Firstly, a start-up, Anteverta-mW BV, was created by TU Delft to commercialize the active harmonic load-pull test setup developed in the project. And the first customer was a PANAMA partner, NXP.

Next, the transfer of expertise from academic partner to industry is also going well. More generally, there are several cases where architectures and circuit components developed through the collaboration between university and industry are being deployed by the industry partner.

Finally, to quantify the accuracy of the measurements using the nonlinear characterizations tool benches, IEMN developed a nonlinear reference component called the 'Golden Device'. It is capable of quantifying the accuracy of nonlinear measurements, and is currently being used by other European laboratories.

Looking to the future, PANAMA's innovative deliverables and other project output are also available to European integrated circuit (IC) manufacturers and system providers, for example, and can be deployed as part of their defence against external competition.

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CATRENE (Σ! 4140), the EUREKA **C**luster for **A**pplication and **T**echnology **R**esearch in **E**urope on **N**ano**E**lectronics, will bring about technological leadership for a competitive European information and communications technology industry.

CATRENE focuses on delivering nano-/microelectronic solutions that respond to the needs of society at large, improving the economic prosperity of Europe and reinforcing the ability of its industry to be at the forefront of the global competition.