

PROJECT PROFILE

CA118

Next-generation, fully integrated transceiver for emergency services
[FITNESS]

The FITNESS project is developing a high-performance, professional mobile radio architecture based on long-term evolution, with key new functionalities (demanded by mission-critical markets), while preserving backward compatibility with existing PMR systems.

Today, the global professional communications community's requirements for mission-critical voice and data services are addressed by various professional mobile radio (PMR) technologies, which are all narrowband digital systems sufficient to provide secure voice, as well as, limited data services. However, there is a growing demand for access to high-performance broadband services and functionalities, such as the ones currently provided by commercial 3G or 4G mobile radio. This calls for a new platform with broadband capabilities.

Highly integrated, low-cost 3D platform

FITNESS will study all technical avenues needed to develop a low-cost and versatile PMR multi-standard platform with additional PMR-dedicated functionalities. This includes platform architecture specification; the design of intellectual property (IP) reusable blocks; chipset demonstrators; and a system-in-package (SiP) which integrates the main silicon components designed and developed in the project.

While preserving backward compatibility with existing narrowband PMR systems, FITNESS, with its PMR broadband capability, supports the European effort to deploy state-of-the-art PMR wireless applications that will go a long way to improve the capacity of local police, fire-fighting and ambulance services, and provide them with fast and highly secure and reliable communications.

The project also involves important advanced research on both architecture and processes. The final goal is to have all critical components integrated in a single 3D platform. Regarding integrated circuit (IC) technologies, the project intends to use CMOS 65nm for narrowband PMR; BiCMOS, CMOS 140nm and CMOS SOI 130nm for broadband PMR; CMOS 130nm for geolocation and silicon interposer for 3D SiP.

Looking at the project in some detail, key activities (and challenges) will include:

- Investigating an innovative architecture for a CMOS low-cost, narrowband, multi-standard PMR chip. This IC will be a transceiver fully compliant with all existing narrowband PMR standards (TETRAPOL, TETRA, TEDS and P25), and will address both 400MHz and 800MHz bands. In addition, critical building blocks, ensuring system re-configurability, will also be designed and validated in standalone test chips;
- Integrating a radio frequency (RF) transceiver and a high power reconfigurable CMOS PA fully compliant with long-term evolution (LTE) broadband and PMR standards, addressing both 400MHz and 700MHz bands;
- Integrating a chipset that caters to indoor and outdoor positioning and locating;
- Designing a 3D platform that combines heterogeneous technologies that allow high-level integration of different systems-on-chip (SoCs) dedicated to PMR in a single, low-cost SiP.

CATRENE's goals and close European collaboration

FITNESS is run by a well-balanced project consortium comprising large companies, small and medium sized enterprises and laboratories from four European countries. This project relates closely to CATRENE's work area 'Communication & Digital Lifestyles'. Flexible and energy efficiency design architectures able to support multi-band, multi-mode and multi-standard cognitive applications are all in line with CATRENE's Grand Challenge 3: Self Organizing Network. Furthermore, in developing components in CMOS ultra-low-power technology compatible 3D processes (which are able to sense

PROJECT CONTRIBUTES TO

- ✓ Communication
- ✓ Safety and security
- ✓ Digital lifestyle

PARTNERS

Airbus Defence&Space
 NXP Semiconductors
 BeSpoon
 Mikroelektronik (MKR-IC)
 CEA-Leti
 IMS Bordeaux
 ISEP Paris
 Telecom Bretagne

COUNTRIES INVOLVED

-  The Netherlands
-  France
-  Germany

PROJECT LEADER

Serge Delmas
 Airbus

KEY PROJECT DATES

January 01, 2014 - December 31, 2016

external environment such as interferers to adapt themselves and save energy), FITNESS supports Grand Challenge 4: Short-range convergence.

Furthermore, this project also completes CATRENE's roadmap with secured radio communications applications that push technologies to their limits. These challenges include RF specifications, multi-standards architecture, frequency bands, innovations in CMOS and SOI processes, and packaging.

Due to historical and policy reasons, professional radio markets were country-bound, and with national actors and standards, making Europe unattractive to the semiconductor industry. But thanks to FITNESS, there is now a real opportunity to federate national approaches, creating the critical mass needed to justify a chip market. Crucially, this means a move from the current approach of using a mix of integrated circuits and discrete components, to proper chip integration. And all of this requires investment and cooperation between European industrials and universities.

How FITNESS will benefit and impact European business

In addition, FITNESS is expected to secure competitive power and leadership in several European industry and application sectors. In PMR and secured radio communications, the worldwide market directly related to public safety is currently worth €5m per year, with an annual growth potential of 5%. The deployment of broadband technology and the know-how of products in the US 700MHz band, as well as in the European 400MHz band, creates an opportunity for European companies to increase their business strength and secure competitive power.

In the field of indoor and outdoor geolocation, this project will deliver the very first radio to deploy this technology, providing European emergency services with state-of-the-art locating functionality, combined with extended operational ranges. Notably, the European Telecommunications Standards Institute (ETSI) has

acknowledged the wide potential of deploying impulse-radio, ultra-wide band (IR-UWB) networks for positioning in emergency situations, underscoring this technology's importance. Furthermore, several European countries have expressed an urgent need for such a facility, including Belgium, which is planning on spending €1m annually on such devices. Based on fire-fighting statistics, this represents a European market of €45m and a worldwide market of €200m. And there is a spin-off. The smartphone market, an adjacent segment, also has the potential to reach US\$1 billion, with a very steep ramp up over five years. But that is not all; some project outcomes could also be applied to public mobile radio for multi-mode navigation-related terminals.

Additional developments in CMOS and SOI processes associated with 3D SiP could generate potential benefits. One member of the project consortium is proposing an innovative approach to a 3D SiP on high-resistive silicon for the LTE module, together with 3D integration. This will provide consistent technology and address a clear growing interest in SiPs in various types of packages, especially for RF and power-related modules.

To sum up, FITNESS will provide Europe's emergency services with state-of-the-art communications, and its business community with a competitive edge in the field of professional mobile wireless communications. The project consortium will enable the link between application, system and design knowledge on the one hand, and process technologies on the other. Future development and evolution of wireless PMR communications will depend on the timely availability of advanced high-performance RF IC and silicon packaging solutions. The realisation of these wireless systems, in turn, highly depends on the availability of suitable advanced RF IC components, and on the early collaboration between system, design and technology teams.

