

## EMBEDDED SYSTEMS AND NETWORKS

Information and communication technologies (ICT) form the bedrock upon which tomorrow's innovative solutions are built. Embedded systems and global networks - like the internet and the data and services found there - are two major ICT motors driving technological advances being made in the INDUSTRIE 4.0 and SMART SERVICE WORLD environments.

Embedded systems are the intelligent central control units at work in most modern technological products and devices. Combining hardware and software with programmable or fixed-in capability, embedded systems are designed to manage device-specific functions.

They typically operate as information-processing systems "embedded" within an "enclosing" product for a set range of device-specific applications. These "connect" with the outside world using sensors and actuators; allowing embedded systems to be interconnected with each other and the online world.

Embedded systems already play a central - if almost hidden - role in all of our lives. More than 98 percent of all processors produced worldwide are deployed in regulator, control, and monitor functions in devices for all facets of daily life. For instance, they are there in everything from vehicle ABS and ESP systems, smart phone communication and information services, and ordinary domestic household devices to industrial production plant systems.

### GERMANY – EMBEDDED SYSTEMS LEADER

Germany is an international leader in a number of embedded systems, machine-to-machine (M2M) communication, and intelligent sensor solutions. The country also enjoys a leading position in security solutions and business enterprise software. Germany also boasts an enviable engineering reputation in matters system solutions-related and can call upon considerable semantic technologies and embedded systems know-how.

Germany's economy is still largely defined by the country's strong electrical and mechanical engineering legacy - notable industry candidates including the automotive industry, machine and plant engineering, and medical technology sectors. According to the Fraunhofer Institute for Experimental Software Engineering (IESE), most of the product developments and innovations "made in Germany" owe their success to successful embedded system integration. Germany's thriving industries enjoy the successes they do as a result of successfully integrated, and increasingly interdisciplinary, embedded systems.

Germany's embedded system market currently generates around EUR 20 billion annually, a figure which is forecast to rise to more than EUR 40 billion by 2020. The applications sector alone generates annual turnover in the region of EUR 4 billion, with an estimated value added factor of approximately EUR 15 billion. As such, Germany's embedded systems market is the third biggest in the world behind the USA and Japan markets respectively.

## NATIONAL ROADMAP EMBEDDED SYSTEMS

In 2009 a group of more than 40 decision makers from important companies, research institutes and relevant industry associations came together to create the National Roadmap Embedded Systems for the further development of embedded systems technology.

The National Roadmap defines "embedded systems" as being hardware and software components integrated within a comprehensive product for the realization of product-specific operational features.

Embedded systems are key technologies and innovation drivers in a number of important industry sectors, playing an important role in securing German international competitiveness through product diversification in terms of functionality and quality.

Scenario application areas included in the roadmap include health and an aging society; mobility; safety and security; energy and the environment; the knowledge society; globalization; and urbanization.

Representatives from a number of industry sectors - including auto construction, automation technology, and machine and plant manufacturing - will spend more than EUR 2.5 billion in six research areas over the ten-year lifetime of the project.



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