

# GEODES

## Powering success in complex distributed communication systems a success story

The ITEA 2 GEODES project addressed power-consumption issues – namely, power reduction – in complex distributed communication systems, from handheld devices to wireless sensor networks. At the end of the project in 2011, the review pointed a number of highly promising exploitation prospects. So, three years on, has this promise been fulfilled?

The simple answer is a resounding yes. Low-power technologies and energy-efficient protocols investigated and developed in GEODES have been further optimised to improve product power consumption or to propose new features. In some cases they have been already integrated into products while in other cases technologies are still undergoing evaluation before they can be applied on an industrial scale. In short, the results of the project continue to spawn a series of successful spin-

offs, services and products in all kinds of areas, including wireless network communication, TV set-top boxes and video-surveillance systems.

### **Low-power distributed switch**

A typical highlight of the success generated by the GEODES project results is *FIGO*, an independent, self-funded spin-off company. FIGO basically acts as a distributed switch, enabling every device that connects to the FIGO network to communicate with every other device in this network. The network is very transparent so can be easily deployed through plug and play for end-user applications. The result is reliable, secure and easy-to-manage networks. FIGO is applied successfully in diverse use cases, such as investigating car travel time, or pedestrian mobility, and as an efficient solution for tool

tracking. While FIGO applications are very diverse, there is a common denominator in that customers want not only to measure but also to interpret and communicate. This is all part and parcel of the solution that each FIGO application provides, and recent examples include the Bad Boys Buster and Low Cost Tool Tracking. In terms of the power efficiency requirements, FIGO was able to use the results of the consumption for its first version of the FIGO product line whose solution consumed roughly 20W. This consumption level has now been brought down to a level of roughly 12W, for very similar functionality, and the product line was recently extended in the direction of lower-power sensor solutions. The FIGO team of eleven highly-qualified personnel has already achieved sales of nearly 1500 systems to around 20 customers.

### Minus 30%

The SME, *Sensaris*, was able to employ part of the GEODES methodology to optimise microcontroller power consumption in a variety of power modes and the project results facilitated the migration to Bluetooth Low Energy within the *Sensaris* product range. Ambitions for 20-30% power consumption savings are realistic, there is the promise that energy-scavenging techniques can be implemented, for example in solar cells (for powering iBeacons), and take low-power consumption from microcontroller to sensor level.

*Thales* Netherlands benefited from the energy-saving technologies researched in GEODES for the SOTAS communications product line. The technological innovations have been of particular value in terms of the reduction of the SWAP (Size, Weight and Power) requirements of these robust and adaptive versatile vehicle communication systems. Over all, more than 21,000 of these systems are deployed in more than 30 countries. In addition, the personal communication system MOOVE is now entering the market with as particular characteristic its long operational lifetime -- due to its energy efficient operations -- as required for police forces, fire departments, ambulance services and other organisations active in emergency situations. Combining local equipment energy reduction techniques and smart routing aspects a significant increase (100% and more) in network lifetime can be obtained. For the French

parent company, GEODES contributed to an increase in the technology readiness level (TRL) of these techniques for radio-communication and video-surveillance products. The GEODES demonstrator represented a full end-to-end deployable security/disaster management solution that can be applied in many segments such as the protection of critical infrastructures like nuclear plants or for border surveillance. Thales also used the work of the project to improve autonomy and energy efficiency at both node and network level while sensing capabilities and processing have been extended to cater to customer needs and the identification of new threats. Finally, Thales C&S is also making significant progress in thermal dissipation reduction whereby, in some cases, a temperature reduction of 15°C could reduce the mean time between failures by some 30%.

### From energy-saving to energy-scavenging

*Philips* activities in low-power wireless lighting control have benefited from the lower weight and increased lifetime of battery-powered sensors in medical, lighting and other areas while off-grid lighting (wireless communication with energy storage/generation systems) and medical sensors on the body have been enabled through the technology and innovation developed within the GEODES project. In the consumer market, in 2012, Philips launched the Hue system, based on the low-power ZigBee Light Link standard, for wirelessly controlled consumer LED lamps. A couple of years later, in 2014, Philips began the introduction of the Hue Tap, an energy-scavenging light switch, again based on the open ZigBee standard.

*Technicolor* brought strong expertise in smart energy management, which is a real differentiator compared with companies simply acting as integrators, and new features such as remote control (on/off) that have been incorporated in their new Set Top Box products. Equally important to Technicolor was the creation of new perspectives, with a new openness and 'culture' related to energy management that can lead to better low-power products and the retention of technological leadership and employment within the EU.

*Enea* learned from the project how to handle major power-related issues in low-level software. A new product derived from work in the GEODES project, the Spartan Scheduler, offers an advanced scheduling component that simplifies the design of advanced and complex hard embedded systems, dynamically scheduling online any activity/task in real-time and saving significant amounts of energy. Furthermore, QoS management provides a system for the optimum management of resources (especially energy resources) within a system, enabling the ability to trade performance with power consumption.

### A spring of technological innovation

All the knowledge and expertise gained in GEODES continue to be used not only to extend R&D in this field of power-consumption in complex distributed communication systems but also in other related issues or topics such as energy scavenging or the low-power wireless control needs of the energy saving LED retrofit market and for large buildings. The success of the project is clearly measurable by the business successes, new products and a number of patents that can be traced back to this spring of technological innovation.