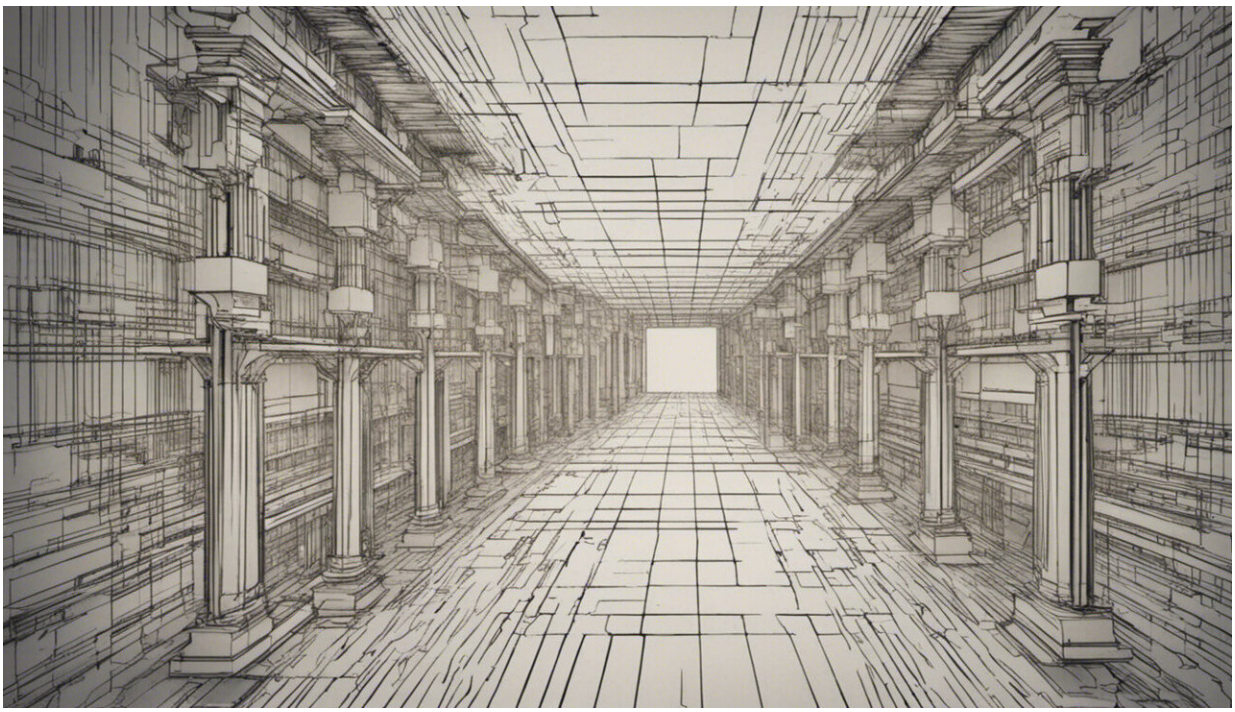
Novel architecture boosts energy and spectrum efficiency for Internet of Things wireless communication

August 30 2018



Credit: AI-generated image (disclaimer)

The collection of data that will benefit societies relies on the wireless connections of billions of low-cost battery-powered sensors. An EU initiative has developed a novel architecture that combines energy and spectrum efficiency for Internet of Things (IoT) wireless

communication.

The explosive growth of the Internet of Things (IoT) is helping to improve industrial processes, energy and city management, transportation and healthcare. This is thanks to the collection, analysis and exploitation of massive physical data. But amassing such data depends on the wireless connection of billions of cost-efficient battery-powered sensors. The scale at which this massive collection of data is envisioned is challenged by the limited energy and spectrum efficiency of today's IoT wireless communication solutions.

The EU-funded project HEASIT "dealt with the development and commercialisation of GreenOFDM, a disruptive innovation that will bring high data rates at a high-energy efficiency to wireless low-power wide-area networks (LPWANs) for the IoT," says project coordinator Loic Lietar. "It aimed at defining, developing and introducing to the market a modem in the form of an integrated circuit that will be the heart of low-power high-data-rate networks." Overall, the objective was to deliver an integrated circuit that embeds a breakthrough patented algorithm.

Unique processor

"Interestingly, it turns out that the architecture we adopted and developed for this implementation proved to have more value in an adjacent market – that is the analysis, mostly in the form of artificial intelligence inference of image, sound and motion, at ultra-low power," explains Lietar. "So the outcome of HEASIT is GAP8, a processor that is uniquely positioned in the market, with an energy efficiency that is 20 times superior to anything else available."

There's a consensus among experts regarding the explosion in the number of connected objects in coming years. IoT services increasingly

call for wireless connectivity that ensures Mb/s data rate in addition to kilometres of range, years of autonomy and low cost.

Starting with the GreenOFDM algorithm, one of the project partners developed a fully programmable solution in the form of a multicore processor with a unique energy efficiency. The architecture built on two world-class open-source projects (RISC-V and PULP), which is a very novel approach in the semiconductor industry. At system level, they combined an emulation of GreenOFDM with the open-source protocol stack long-range wide-area network to successfully realise point-to-point radio communications.

Significant cost savings

HEASIT's strategy was to offer a high-data-rate radio interface – GreenOFDM – to LPWANs. GreenOFDM offers a considerable cost advantage and more autonomy than wifi and long-term evolution technology alternatives. It also maintains the existing network architecture and functionalities of LPWANs, which neither wifi nor long-term evolution technology alternatives can do. "The HEASIT innovation dramatically reduces the cost of deploying and operating rich sensors in the field," the coordinator adds. "Consequently, this enables a much larger number of those sensors and ultimately significantly enriches the spectrum of IoT use cases."

The first customer had a working prototype in July 2018. "We have sold to prospective customers more than 100 development kits with our GAP8 processor, and are on track to be in volume production in the first quarter of 2019," concludes Lietar.

Provided by CORDIS