Nestwave Combines GPS & 4G for Accurate, Low-Power Indoor & Outdoor Geolocation

Challenge & Solutions

As the Internet of Things continues its rapid rollout across much of the globe, geolocation and indoor positioning have become among the IoT's most-used features. One industry forecast says that by 2020, 5 billion devices – a third of connected devices – will rely on geodata to support a wide variety of applications. But one challenge to this optimistic outlook is that IoT devices require small batteries that can supply power for 10 years or more, and current GPS solutions are particularly power hungry. In addition, GPS fails to operate reliably indoors or in dense urban environments. The main barriers for accurate 4G-based positioning have been inaccurate antenna databases, non-synchronized networks, distortions due to Non-Line-of-Sight (NLOS) radio propagation and, of course, high power consumption. Current 4G positioning is only accurate to 20-200m, and still requires full-feature 4G/5G chipsets that are too expensive and too high power for the majority of IoT applications. The Ultra Low Power Geolocation for IoT project (ULPGP5) project team recognized the need for a multi-signal receiver that combines GPS and 4G signals with cloud offloading to achieve low-power, high accuracy indoor/outdoor positioning. Unlike other solutions, the detected 4G signals are not limited to the typical low-accuracy approach of using the 4G base station cell ID. The team's multi-pronged approach achieved high location accuracy: five-to-40 meters typically, and within 70 meters in very challenging environments, such as underground parking garages. This solution is based on advanced signal processing, and the prototype used an off-the-shelf software defined radio (SDR).

EuroCPS Support

CEA-Leti used its extensive experience in radio-frequency (RF) design to optimize a novel 4G radio RF receiver, designed specifically for geolocation purposes, and using different constraints from what is typically used for 4G data transmission. The goal of this first phase of product development was to achieve an approximately 4x reduction in power consumption of the RF component of geolocation devices.

Digital Skills

Nestwave: technology and IP for software in the cloud and a hardware to integrate in IoT devices.

CEA-Leti: IC architecture design, device-level simulations to target the appropriate STMicroelectronics process platform.

Company

Nestwave is developing a novel GPS and 4G receiver with cloud offloading for ultra-low-power, high-accuracy, indoor/outdoor positioning for the IoT (FR) www.nestwave.com

4 full time + 4 part time employees

Since 2014

Partners: CEA LETI

Impact/What's next

Nestwave's system, which is still in the prototype phase, promises to eliminate barriers to energy-efficient, low-cost and accurate geolocation, as well as the more difficult indoor positioning. This project's key innovation, making RF and baseband active for about one-tenth of the time compared to current technology, is the main reason for the 10x reduction in power consumption. The next phases of development will focus on RF design to cover a large number of frequency bands and types of signals, including the GPS signal, and on GPS and 4G baseband design and implementation. The company projects the finished product will reduce GPS power consumption by a factor of 10.

EuroCPS Cyber-Physical Systems

EuroCPS is an European funded project gathering several design centers in order to boost and initiate synergies between innovative companies, major CPS-platforms and CPS-competency providers.