Passive RFID using LoRa modulation achieves a distance of 2.8 kilometers

In the long-range backscatter system developed by UW researchers, this sensor uses reflected radio waves to encode and communicate information using almost zero power. It can “talk” to a receiver up to 2.8 km away.
In the long-range backscatter system developed by UW researchers, this sensor allows devices that run on extremely low power for the first time to communicate over long distances..Dennis Wise/University of Washington

University of Washington researchers have demonstrated for the first time that devices that run on almost zero power can transmit data across distances of up to 2.8 kilometers — breaking a long-held barrier and potentially enabling a vast array of interconnected devices.

For example, flexible electronics — from knee patches that capture range of motion in arthritic patients to patches that use sweat to detect fatigue in athletes or soldiers — hold great promise for collecting medically relevant data.

But today’s flexible electronics and other sensors that can’t employ bulky batteries and need to operate with very low power typically can’t communicate with other devices more than a few feet or meters away. This limits their practical use in applications ranging from medical monitoring and home sensing to smart cities and precision agriculture.

By contrast, the UW’s long-range backscatter system, which uses reflected radio signals to transmit data at extremely low power and low cost, achieved reliable coverage throughout

4800-square-foot house, an office area covering 41 rooms and a one-acre vegetable farm. The system is detailed in a paper to be presented Sept. 13 at UbiComp 2017.

Photo of flexible epidermal patch
The research team built this flexible epidermal patch prototype — which could be used to collect and wirelessly transmit useful medical data — that successfully transmitted information across a 3,300 square-foot atrium.Dennis Wise/University of Washington

“Until now, devices that can communicate over long distances have consumed a lot of power. The tradeoff in a low-power device that consumes microwatts of power is that its communication range is short,” said Shyam Gollakota, lead faculty and associate professor in the Paul G. Allen School of Computer Science & Engineering. “Now we’ve shown that we can offer both, which will be pretty game-changing for a lot of different industries and applications.”

The team’s latest long-range backscatter system provides reliable long-range communication with sensors that consume 1000 times less power than existing technologies capable of transmitting data over similar distances. It’s an important and necessary breakthrough toward embedding connectivity into billions of everyday objects.

The long-range backscatter system will be commercialized by Jeeva Wireless, a spin-out company founded by the UW team of computer scientists and electrical engineers, which expects to begin selling it within six months.

photo of LoRa backscatter system on farm
The communication range of many low-power devices is limited to several feet. The UW’s long-range backscatter system’s sensor (shown in the foreground) was able to communicate with a receiver (held in the distant background) throughout a one-acre farm, a 4,800-square-foot house and an office area

covering 41 rooms.Dennis Wise/University of Washington

The sensors are so cheap — with an expected bulk cost of 10 to 20 cents each — that farmers looking to measure soil temperature or moisture could affordably blanket an entire field to determine how to efficiently plant seeds or water. Other potential applications range from sensor arrays that could monitor pollution, noise or traffic in “smart” cities or medical devices that could wirelessly transmit information about a heart patient’s condition around the clock.

“People have been talking about embedding connectivity into everyday objects such as laundry detergent, paper towels and coffee cups for years, but the problem is the cost and power consumption to achieve this,” said Vamsi Talla, CTO of Jeeva Wireless, who was an Allen School postdoctoral researcher and received a doctorate in electrical engineering from the UW. “This is the first wireless system that can inject connectivity into any device with very minimal cost.”

The research team, for instance, built a contact lens prototype and a flexible epidermal patch that attaches to human skin, which successfully used long-range backscatter to transmit information across a 3300-square-foot atrium. That’s orders of magnitude larger than the 3-foot range achieved by prior smart contact lens designs.

Photo of long-range backscatter system
The long-range backscatter system uses a source that emits a radio signal, low-power sensors that encode information in reflected signals and an off-the-shelf receiver.Dennis Wise/University of Washington

The system has three components: a source that emits a radio signal, sensors that encode information in reflections of that signal and an inexpensive off-the-shelf receiver that decodes the information. When the sensor is placed between the source and receiver, the system can transmit data at distances up to

475 meters. When the sensor is placed next to the signal source, the receiver can decode information from as far as 2.8 kilometers away.

The advantage to using reflected, or “backscattered,” radio signals to convey information is a sensor can run on extremely low power that can be provided by thin cheap flexible printed batteries or can be harvested from ambient sources — eliminating the need for bulky batteries. The disadvantage is that it’s difficult for a receiver to distinguish these extremely weak reflections from the original signal and other noise.

photo of contact lens prototype
The UW team also transmitted information across a 3,300 square foot atrium using this “smart” contact lens prototype.Dennis Wise/University of Washington

“It’s like trying to listen to a conversation happening on the other side of a thick wall — you might hear some faint voices but you can’t quite make out the words,” said Mehrdad Hessar, an Allen School doctoral student. “With our new technology we can essentially decode those words even when the conversation itself is hard to hear.”

To overcome the problem, the UW team introduced a new type of modulation — called chirp spread spectrum — into its backscatter design. Spreading the reflected signals across multiple frequencies allowed the team to achieve much greater sensitivities and decode backscattered signals across greater distances even when it’s below the noise.

photo of research team
The long-range backscatter research team includes former UW electrical engineering doctoral students Bryce Kellogg (left), Vamsi Talla (center) and Allen School doctoral student Mehrdad Hessar (right).Dennis Wise/University of Washington

“We basically started with a clean slate and said if what we really need to enable smart applications is long-range communication, how could we design the system from the ground up to achieve that goal?" said Bryce Kellogg, a co-founder at Jeeva Wireless who was a UW electrical engineering student.

The research was funded by the National Science Foundation.

Co-authors include Joshua Smith, professor in the Allen School and the UW Department of Electrical Engineering, and UW electrical engineering doctoral student Ali Najafi.

For more information, contact the research team at longrange@cs.washington.edu.

[whohit]Passive_RFID_en_post[/whohit]

Everynet New Firmware Over the Air Capability Simplifies IoT Device Upgrades

Everynet this week debuted a new update capability for LPWA networks that will allow manufacturers, operators, and users to update Internet of Things devices without a truck roll.

The company said its new Firmware Over the Air (FOTA) feature is an industry first for LPWA networks, which are not traditionally designed for large data transfers. This has made routine bug fixes and new feature installations a chore, placing a strain on bandwidth and sometimes requiring manual updates for each device in the field. Update lengths can also place stress on IoT device batteries by requiring longer than normal "awake" times.

Everynet said its patent pending technology solves this problem with a new class of compile-time optimization, which the company has dubbed "output difference minimization." The technology forces the compiler to come up with a "minimum difference" between the old version of the device's firmware and the new one. Used alongside another patent-pending technology – this one a compression algorithm – can "significantly" reduce the number of messages sent to a device as part of an incremental update sent over the air via the low-speed channel, the company reported.

According to Everynet, upgrades that previously would take hours can be reduced to minutes or even seconds. By way of example, the company noted that a traditional 35 Kb update sent over a LoRaWAN network would require about 150 messages to be sent over the course of about 90 minutes. With Everynet's solution, that would be cut to 31 messages over only about 20 minutes.

"The set of challenges surrounding firmware updates is one of the biggest obstacles holding back the growth of LPWA networks today," Everynet's Managing Director Lawrence Latham commented. "Everynet's bespoke FOTA algorithms remove this obstacle, providing a simple and effective way for device manufacturers, chip manufacturers, and operators to push firmware updates to IoT devices."

The company's FOTA solution is available today through LoRaWAN semiconductor manufacturers and will be available soon for all LPWA networks.

[whohit]EVerynet_FOTA_en_post[/whohit]

Orange continues focus on LoRa

Orange has continued its efforts to create an IoT network based on LoRa technologies with the objective of national coverage of metropolitan France by the end of the year.

Speaking at the Viva Technology show, Orange made a couple of big claims. The ambitions of national coverage is only the tip of the iceberg, as it also announced the first test of the LoRa Alliance standardised roaming, as well as more than 100 enterprise customers have chosen LoRaWAN connectivity with the Datavenue offer from Orange Business Services, covering almost 4000 towns across the country.

The team has also outlined plans to test interoperability of its LoRa network with that of another European operators by December, many of which have favoured the NB-IoT side of things. Vodafone in particular has been particularly vocal in its support of NB-IoT, which does beg the question as to whether Orange has backed the wrong horse. Is it persisting with the role out of LoRa out of stubbornness or has it spotted something the rest of the industry has missed?

Alongside this announcement, a partnership with Actility has also been formed with Orange batteries to secure France's electricity grid during demand peaks and associated power surges.

"These successful interventions on over 7000 sites in a matter of minutes, clearly demonstrate the power of a Smart Grid enabled by the intelligence of the IoT to enhance the capabilities and resilience of the electricity transmission system and to protect its customers," said Actility CTO Olivier Hersent. "We're also creating a new opportunity for Orange to create value from its back-up capacity, which is normally a rarely-used ‘insurance policy’.”

the post is copy from http://telecoms.com/482732/orange-continues-focus-on-lora/

[whohit]Orange_en_post[/whohit]

Discover IoTNET

IoTNET is headquartered in Sofia, Bulgaria, and runs nationwide LoRaWan Network.
IoTNET aims at offering IoT connectivity solutions and services to government, municipalities, NGOs, business and residential customers, based on the latest IoT infrastructure solutions and technologies.

[whohit]IoTNET_en_post[/whohit]