Wireless Modules Pave Fast Path for IoT Innovators

With applications exploding for IoT devices, reliable and robust Bluetooth connectivity modules can shorten time to market, and may even be a strong product selling point.

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As applications and devices centered on the Internet of Things explode onto the market, global innovators at every level, from garage tinkerers to professionals, are being inspired to create while facing immense pressure to get their idea to market before the window of opportunity closes. Time is of the essence and clear decisions must be made early in the design stage with regard to 'make versus buy' so innovators can focus on where they can truly add value.

For many, however, critical areas such as the wireless connection are hard to leave to a third party. With so much of the user experience riding upon whether or not a device can connect reliably at the lowest power possible, that connection's design must be infallible. Beyond reproach.

Many who choose to design from the ground up learn quickly that embedding wireless is hard. Antenna design and layout, interference mitigation, RF coupling with digital circuits and clocks, EMC, interoperability testing, and of course global standards compliance testing and certification are but a few of the hurdles.

In the 'early days' of wireless short-range and personal area networks, taking on these challenges and 'rolling your own' RF design and layout in many ways made a lot of sense. Standards were barely formed, silicon was expensive and relatively power hungry, and of course every dB of gain or dBm of sensitivity made the difference between success and failure.

Now, thanks to standards such as Bluetooth v4.0, which embodies the latest advances in low-power wireless connectivity for the Internet of Things (IoT), including Bluetooth Low Energy, Bluetooth Smart, and Bluetooth Smart Ready, it has become harder to justify spending any more time than absolutely necessary on the design of the wireless connection.

Now, the pervasiveness and low cost of high-performance, interoperable off-the-shelf wireless connectivity silicon and modules have pushed the line separating 'make' from 'buy' out of the wireless connectivity section to elsewhere in the overall system design. The risks of delays, cost overruns and missed market windows just aren't worth it.
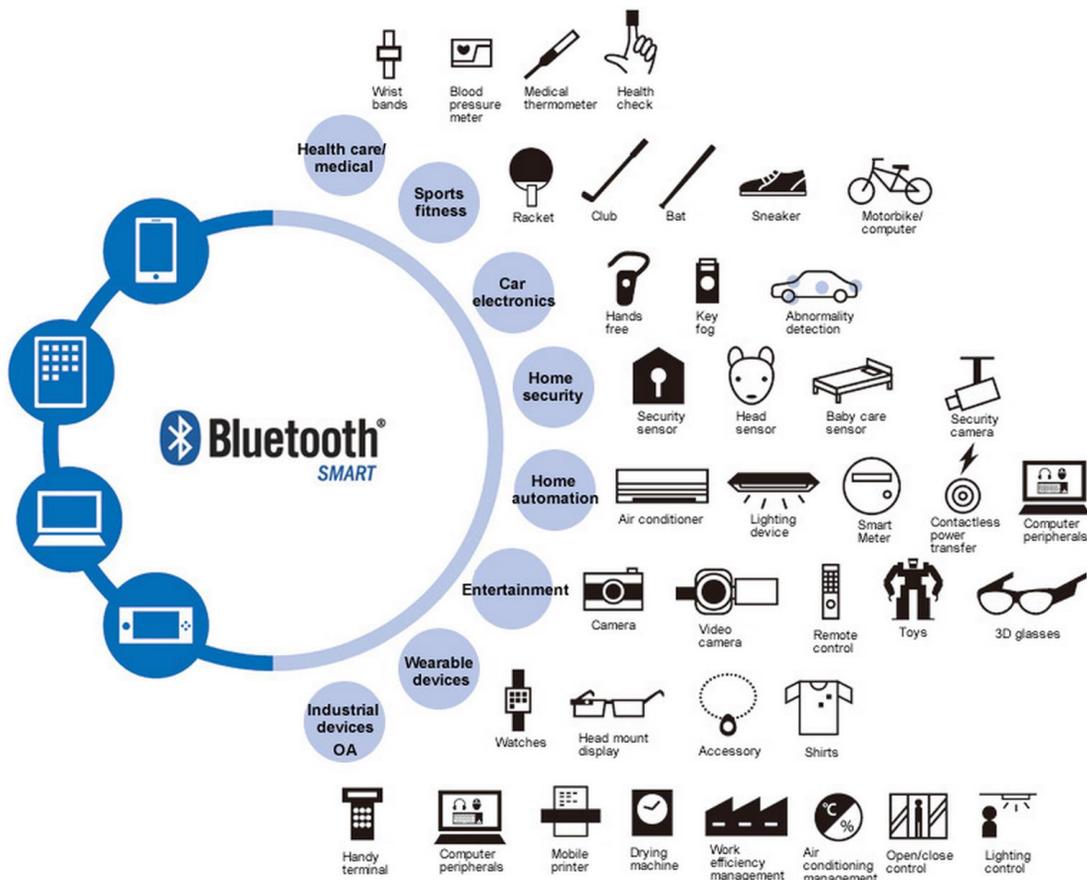
Figure 1: *Fully-developed Bluetooth v4.0 modules, with support for the standard's Smart, Smart Ready and other updates, are a must if innovators are to be time-to-market competitive amid an exploding frenzy of connected device applications, from health and fitness to industrial.*

But buying is another art form. Designers have to think hard about what it is they are trying to achieve and if it matches what something like Bluetooth v4.0 is capable of helping them accomplish. In addition, they must evaluate the level of support they can expect from the module vendor. Some vendors have been known to go so for as to take small startups 'under their wing' if the design is intriguing enough, as it may have good marketing potential for them.

Also, while it is tempting to overlook any 'bought' parts when marketing the end design, letting users know that the RF module inside their device is tried and proven from a trusted source that worked closely with the product design team can go a long way toward reassuring them of a good investment with reliable wireless connectivity.

What's so smart about Bluetooth v4.0?
Launched in 1994 and now embedded within every mobile handset, smartphone, laptop and tablet, Bluetooth has finally reached its intended goal of being a pervasive, short-range wireless connectivity scheme. Its core elements that apply to IoT are Bluetooth Low Energy (LE) announced in 2010 in v4.0, as well the more recently added Smart and Smart Ready features.

Bluetooth LE is a highly interoperable, ultra-low-power feature with ultra-low peak, average and idle mode power consumption, short duty-cycle options, and bit rates of 1 Mbit/s at ranges of up to 15m. It can run at between 1% and 50% of earlier Bluetooth iterations, allowing it to run for years of small cell batteries or even harvested energy.

Bluetooth Smart and Smart Ready functionality allows for the development of what are called 'appcessories', or smart, simple devices that can be used in a smartphone's (or other 'hub's') local ecosystem. Smart devices are the clients, Smart Ready refers to the hub. For a product to qualify as Bluetooth smart, it must incorporate Bluetooth v4.0 (or higher) with Generic Attribute (GATT)-based architecture; feature a Bluetooth low-energy radio, and use the GATT-based architecture to enable particular functionality of the device.

A "Bluetooth Smart Ready" qualified product must also be compliant with Bluetooth v4.0 (or higher) with a GATT-based architecture; feature a Bluetooth v4.0 radio (BR/EDR + Bluetooth low energy) where both radio modes may be activated, individually or simultaneously, and provide a means by which the end user can choose to update functionality for a Bluetooth Smart device on the Bluetooth Smart Ready device.

Modules take bite out of Bluetooth design
Given the time to market challenges for innovators on the leading edge of IoT device ideation, it may be a good idea to leverage the intellectual property and the many man (or woman) hours of design expertise that go into creating a Bluetooth Qualified module. One such module is Taiyo Yuden's EYSFCNZXX, which measures 9.6 x 12.9 x 2mm and may be used with or without a host controller.
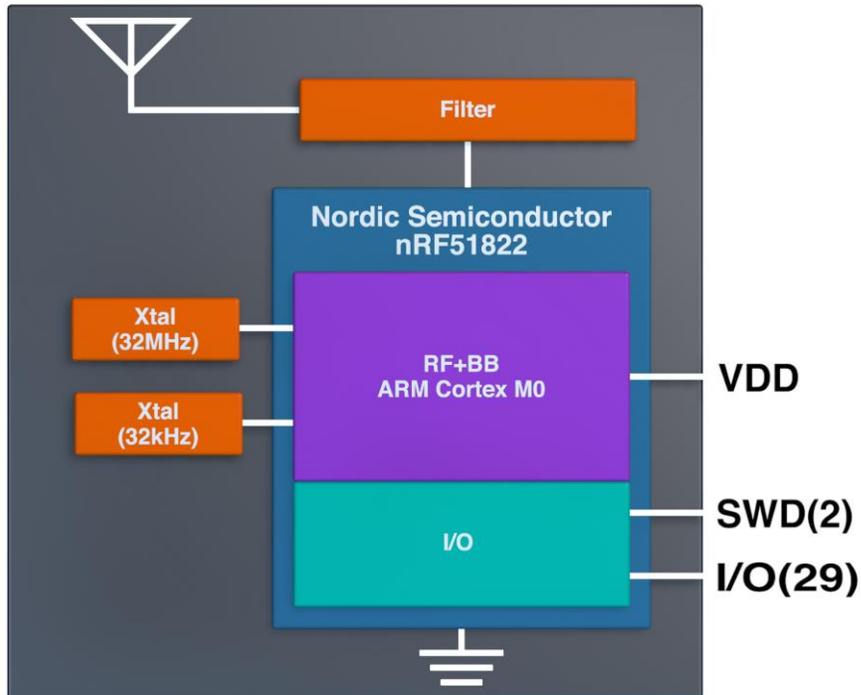
Figure 2: *Taiyo Yuden's EYSFCNZXX Bluetooth Qualified module gets innovators and designers up and running quickly with the connectivity portion of their IoT design with a trusted RF module solution and plenty of software support.*

The module combines the latest nRF51822 Bluetooth Smart system-on-chip (SoC) from Nordic Semiconductor, along with an optimized ceramic antenna. Users of the module also get to use Nordic's proven software and demo applications.
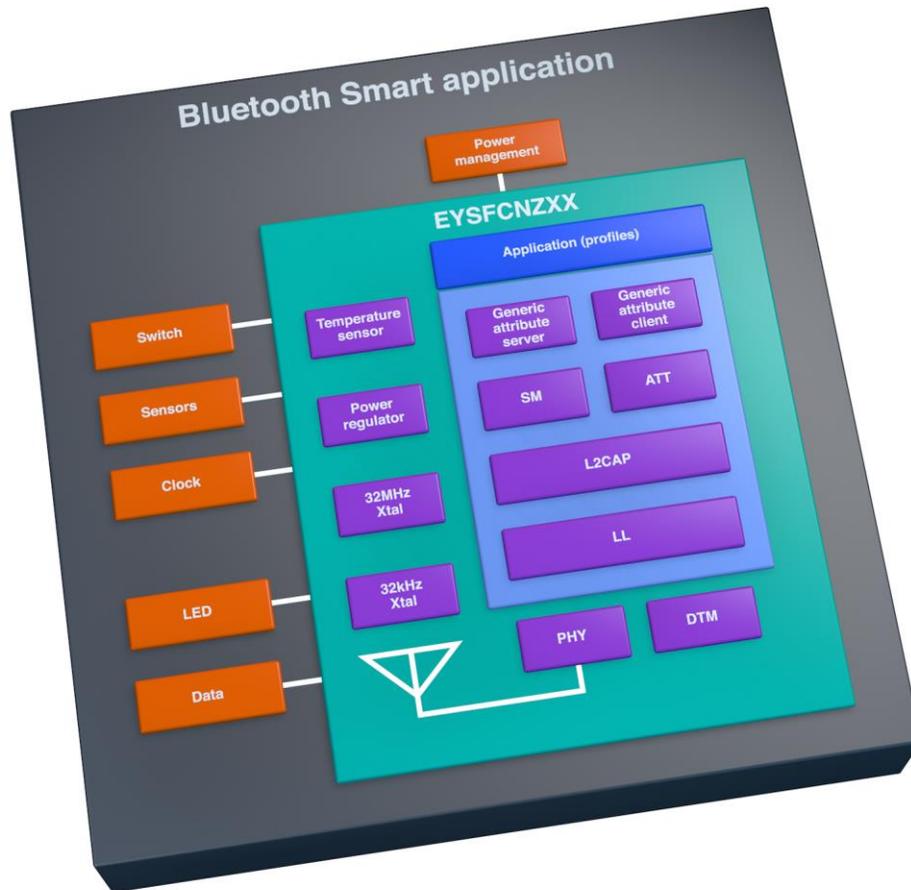
Figure 3: *The EYSFCNZXX has almost everything needed to get a Bluetooth Smart Device off the ground, but at its heart is the nRF51822 MCU and radio from Nordic, a company with a proven track record in Bluetooth design and software support.*

At the heart of this is an ARM Cortex M0 processor, which runs the Bluetooth protocol stack, plus 256KB of flash memory and 16KB RAM. Access to the remaining processor and memory resources is via 29 I/O pins. Some of these may be configured as SPI, I2C or UART interfaces, or as connections to the 8/9/10-bit, 6-channel analog to digital converter so that sensors can be linked directly to the module. A filter is also built-in, along with the ceramic antenna. I/O pin access can eliminate the requirement for an external microcontroller and memory in simpler designs. As a result, space, cost and design time can all be reduced.

Access to Nordic's Bluetooth Qualified profiles and demo applications is a further time saving feature. Typical applications for the module include temperature sensors, proximity tags, beacons, and a heart rate monitor.

Other key features of the module include an output power of +4 dBm (typical) and operation off a single 1.8- to 3.6V power supply. True to the promise of RF modules, it's also Bluetooth and Japan, FCC, and IC qualified.

Armed with modules such as the EYSFCNZXX, designers and innovators can get the next round of IoT ideas and products to market fast and with the confidence and assurance that only a reliable, robust wireless connectivity solution, designed by experts, can provide.

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