Radiocrafts
Embedded Wireless Solutions

WP011

A new LPWAN IoT solution utilizing 169 MHz for outstanding performance

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LPWAN (Low Power Wide Area Network) has become an important part and enabler of the IoT (Internet of Things). What separates LPWAN from other technologies in the IoT space, are the range and the geographical coverage. The Idea behind LPWAN is to cover a large area, even a city or a country, with a radio network using very low power radio technology enabling many years of battery lifetime. This so that sensors and actuators can be spread over a large geographical area, or even being mobile. Typically the amount of data to be transmitted is very small, usually only a few bytes such as a sensor reading. This is quite the opposite of the high bandwidths offered by the latest generations of cellular phone technologies (3G and 4G). In order to reduce the cost of the infrastructure (reducing the number of gateways), the communication range for LPWAN is important. Ultra-narrowband radio technology is a solution to achieve this.

The main three players in the LPWAN market we see today are Sigfox, LoRa and NB-IoT (LTE). The first two use license-free bands at 868/915 MHz, while NB-IoT is using a part of the 4G licensed spectrum. Although the term “Narrowband” (NB) is used for the new LTE standard, it is not narrowband in the strict sense. By using 200 kHz wide channels, it is more “narrow” than the full LTE bandwidth, but much more than the real narrowband (10-25 kHz) which is now often referred to as “ultra” narrowband.

Also, LoRa is not using narrowband technology, but a kind of spread spectrum based on frequency chirps. The bandwidth is typically 100 – 200 kHz, depending on the data rate used. Among these three it is only Sigfox that use a true narrowband radio. The uplink is 100 bps (in Europe), using a 10 kHz bandwidth.

However, all three technologies require either some special base stations with signal processing (as for LoRa), or using a subscription based cellular network operated by a telecom provider (as for Sigfox and LTE). For some applications, this can be an advantageous solution, but for other it is not. When the application requires a country wide, or city wide coverage, the Sigfox technology can be an optimum solution.

However, if the area is limited, and operation cost is essential, an interesting alternative to these solutions is the use of long range narrowband radio in some newly opened license-free bands at VHF frequencies.

Radiocrafts has been a pioneer in the standardization and development of radio solutions using the 169 MHz band. The 169 MHz band was originally used for paging services in Europe, but when the cell phones were introduced as a mass market product, the frequency band was freed up for other services. First it was opened up for meter reading applications. The relatively low frequency (VHF band) combined with high transmission power (up to 500 mW), enables radio communication at long range. In addition, narrow band radio (12.5 or 25 kHz) is used to get the best radio receiver sensitivity. A communication range of 3-4 km in urban environment has been demonstrated using ultra-narrowband radio modules at 169 MHz (see Radiocrafts Application Note AN021).

The Wireless M-Bus standard (EN 13757:2013) was expanded with the new N-mode (narrowband mode) at 169 MHz to take benefit of the newly freed band. The N-mode provides the best alternative for radio communication from water and gas meters installed in hard to reach places, such as basements and pits underground.

However, the M-Bus standard is not only limited to metering (water, gas, heat and electricity), but also other types of sensors can take benefit of this technology. Industrial wireless sensor networks can use this technology to improve the robustness and reliability of the radio link.

The 169 MHz frequency band is relatively new, and the use of narrowband radio limits the application to the industrial and professional use due to the somewhat higher cost of a high performance radio. Therefore, it is not likely to see the same congestion of license free radios as at 433 and 868 MHz where keyfobs, toys and headphones can make interference.

The main advantages of the 169 MHz band as a LPWAN solution are

- Longer range due to the lower frequency
- Longer range due to higher transmission power
- Longer range due to ultra narrowband modulation
- Improved communication reliability due to the improved link margin
- Improved robustness and reliability due to better selectivity and blocking properties
- Improved reliability due to less use and less interference in the frequency band

In addition to the Wireless M-Bus product line (RC1701HP-MBUS4 and RC1701HP-MPC1), Radiocrafts offer a proprietary point-to-point and point-to-multipoint radio modem (RC1701HP-RC232). This is an easy to use cable replacement protocol with a very robust radio link for industrial grade communication.

The 169 MHz band is no longer limited to utility meter reading, but is now open to all kind of license free “short range” devices SRD (CEPT 70-03). Or actually, not so “short” range in this case. For an introduction to the regulatory requirements for using the 169 MHz band, please refer to the Radiocrafts White Paper WP010.

Document Revision History

Document Revision	Changes
1.0	First release

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