



DFI

Shaping LPWA IoT Network with The Smallest Computer

Although the 5G era has begun, low-power wide-area networks (LPWA) are essential for IoT applications that need long-distance, low-data, low-power, and low-cost transmission. With DFI's complete single-board computer (SBC) product line and rapid customization capabilities, DFI assists Japanese customers in creating wide-area IoT transmission services with a transmission distance of more than 100 kilometers.

Region: **Japan**

Industry: **Internet of Things Communication Service**

Application: **Low-Power Wide-Area (LPWA) Network Gateway**

Solution: **Customized SBC (based on SU253)**

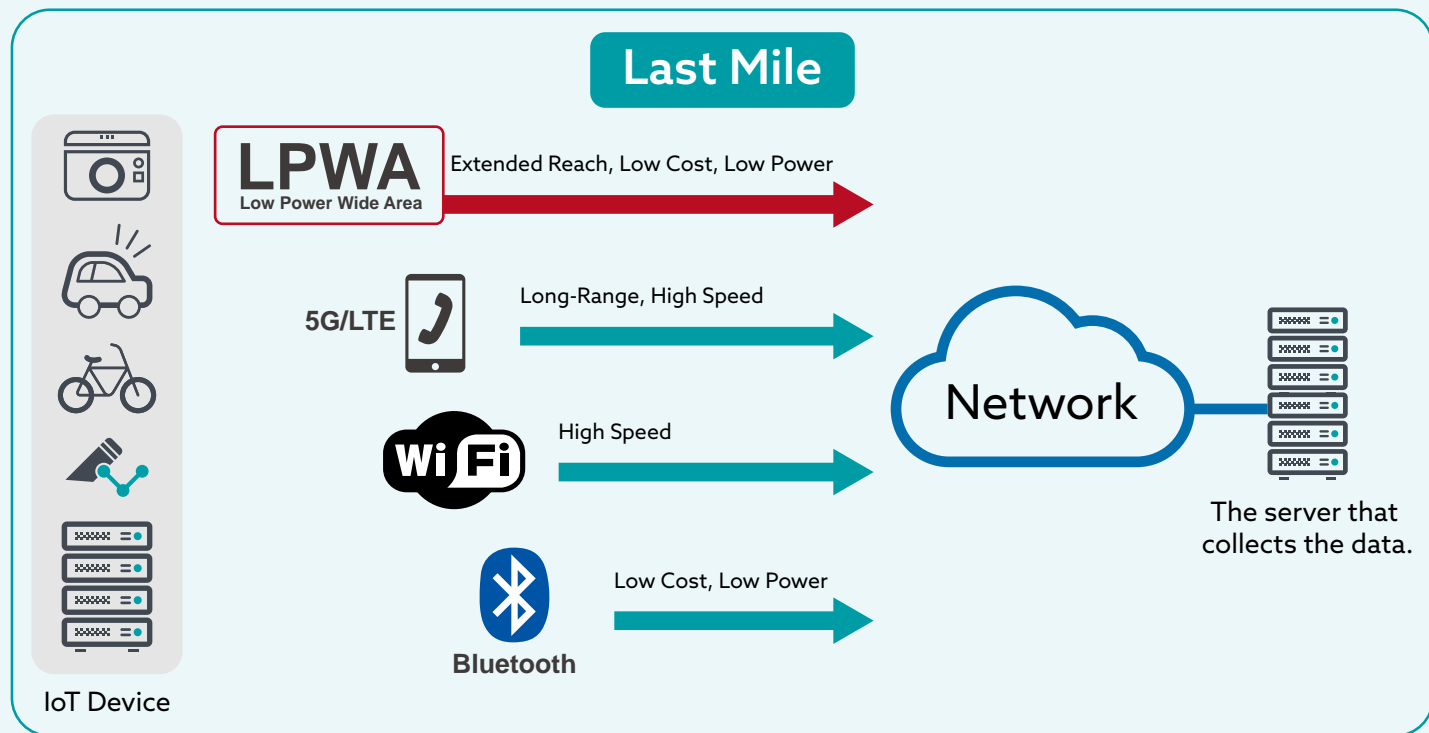
The large-scale IoT deployment have a large number of low-complexity devices, which does not require intensive communication, high performance, and low transmission latency. Typical applications include low-cost sensors, meters, wearable devices, and rackers. Many of them are deployed in harsh radio environments, such as building basements or mobile machines, and will occasionally rely on sending signals for more than ten years without battery replacement. This factor makes power consumption and energy-saving crucial.

A Low-Power Wide-Area Network Has Become A Necessary Foundation For Large-Scale Internet-Of-Things

Generally speaking, IoT devices use network connections to directly transmit data to the cloud, or through Wi-Fi and Bluetooth, to complete the transmission within a minimal distance. The applicability of the LPWA solution is more expansive, and it allows IoT products to achieve a small amount of data exchange over longer distances with lower power consumption.

Therefore, LPWA has also become a battleground for the application of the Internet of Things. Since 2017, many different LPWA specifications have sprung up. The development of LPWA-related technologies is conducive to deploying many Internet of Things devices and can create a brand new market. For example, with the assistance of LPWA, it is possible

IoT System



to "locate friends conveniently, even on the top of the mountain." It is also a practical solution to wildlife tracking, rental vehicle monitoring, and limited-area ships.

ELTRES From Japan With A Transmission Distance Of Up To 100 Kilometers

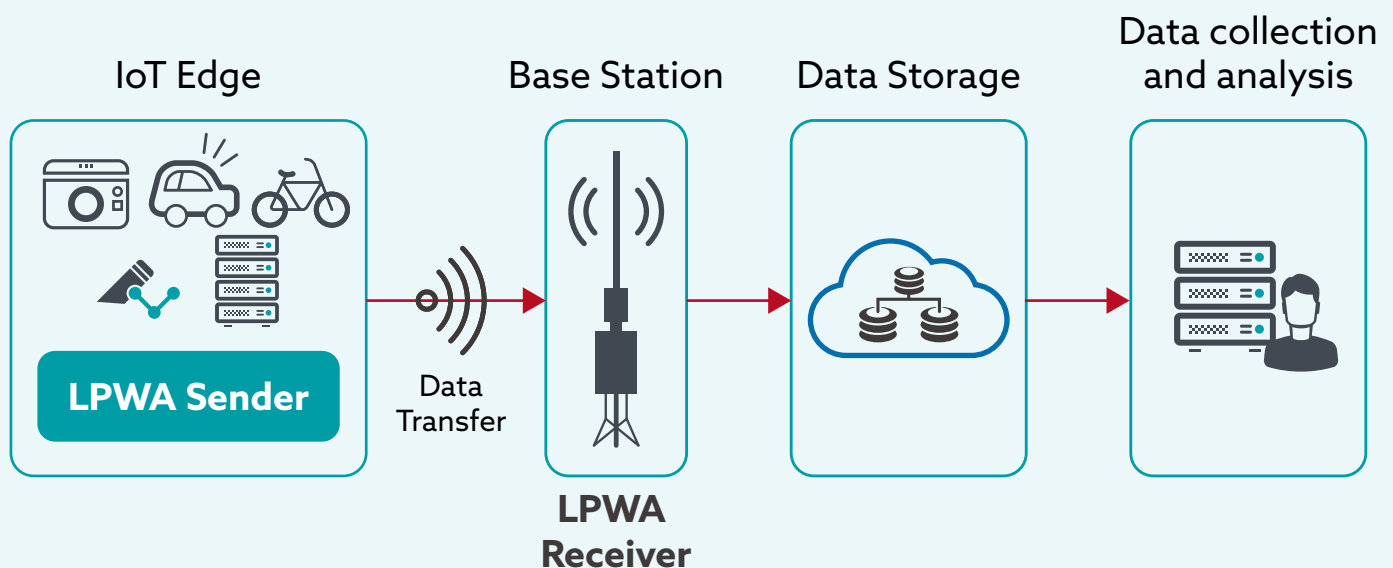
Among these LPWA specifications, the one with the longest transmission distance is ELTRES and is originated from Japan. This technology was experimented in April 2017. It has the characteristics of low power consumption and long-distance. The transmitter output power is 20mW. It transmits signals in the 920MHz band and has a transmission distance of more than 100 kilometers. Communication is possible even when moving at a speed of 100 kilometers per hour. In May 2017, the transmissions of "Fujisan 5 Gome to Nara Prefecture's Mount Ōdaigahara (274 kilometers)" and "Atsugi City to Tochigi Prefecture's

Mount Nantai (140 kilometers)" was publicly announced as a technical proof of concept.

In June 2018, ELTRES was selected as an international specification by the European Telecommunications Standards Institute (ETSI). In September 2018, the Japanese company that developed ELTRES announced the launch of the early trial service of ELTRES IoT Network. In October 2018, it cooperated with multiple companies to promote the ELTRES IoT Network service, which can be used to monitor facilities such as gas and natural gas meters, and the management of the real-time information of a car, such as the location of the bus, and the application of the location confirmation of climbers or ocean transportation.

DFI Provides Fast Customization and Services Across Both Software and Hardware

LPWA Scenario



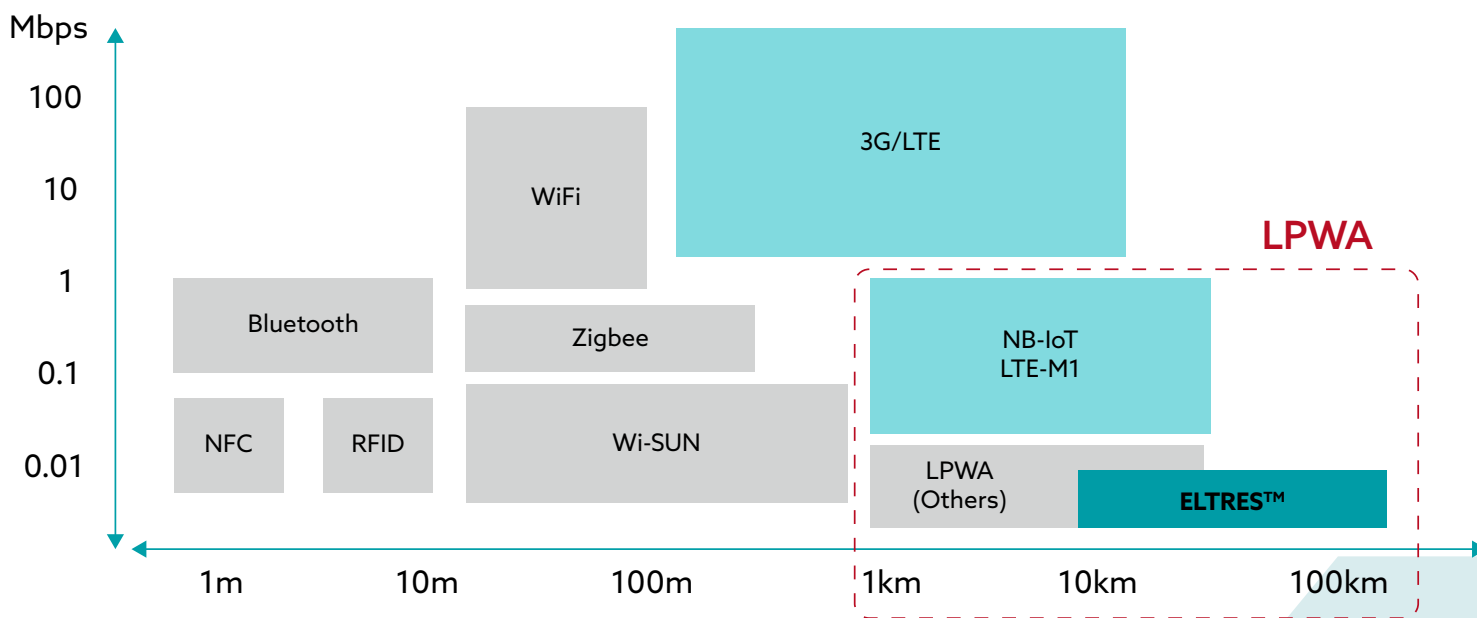
In the process of developing the ELTRES technology, DFI was present. In 2018, DFI participated in the proof of concept of ELTRES technology. DFI quickly customized single-board computer (SBC) based on the SU253. The network port was increased to four ports. The onboard memory was changed to dual SO-DIMM module. And DFI was able to provide the system motherboard required by the ELTRES gateway. In addition, this project supports LTE modules of Japanese partners, along with supporting data encryption, DFI helped integrate the well-known Linux distribution CentOS at the software level to provide both software and hardware services.

It is worth mentioning that this gateway may be deployed in a harsh environment. In response to the needs of customers to keep track of the system temperature at any time, DFI has specially developed a driver through the Super IO chip connected to the LPC bus, and the sensors on the

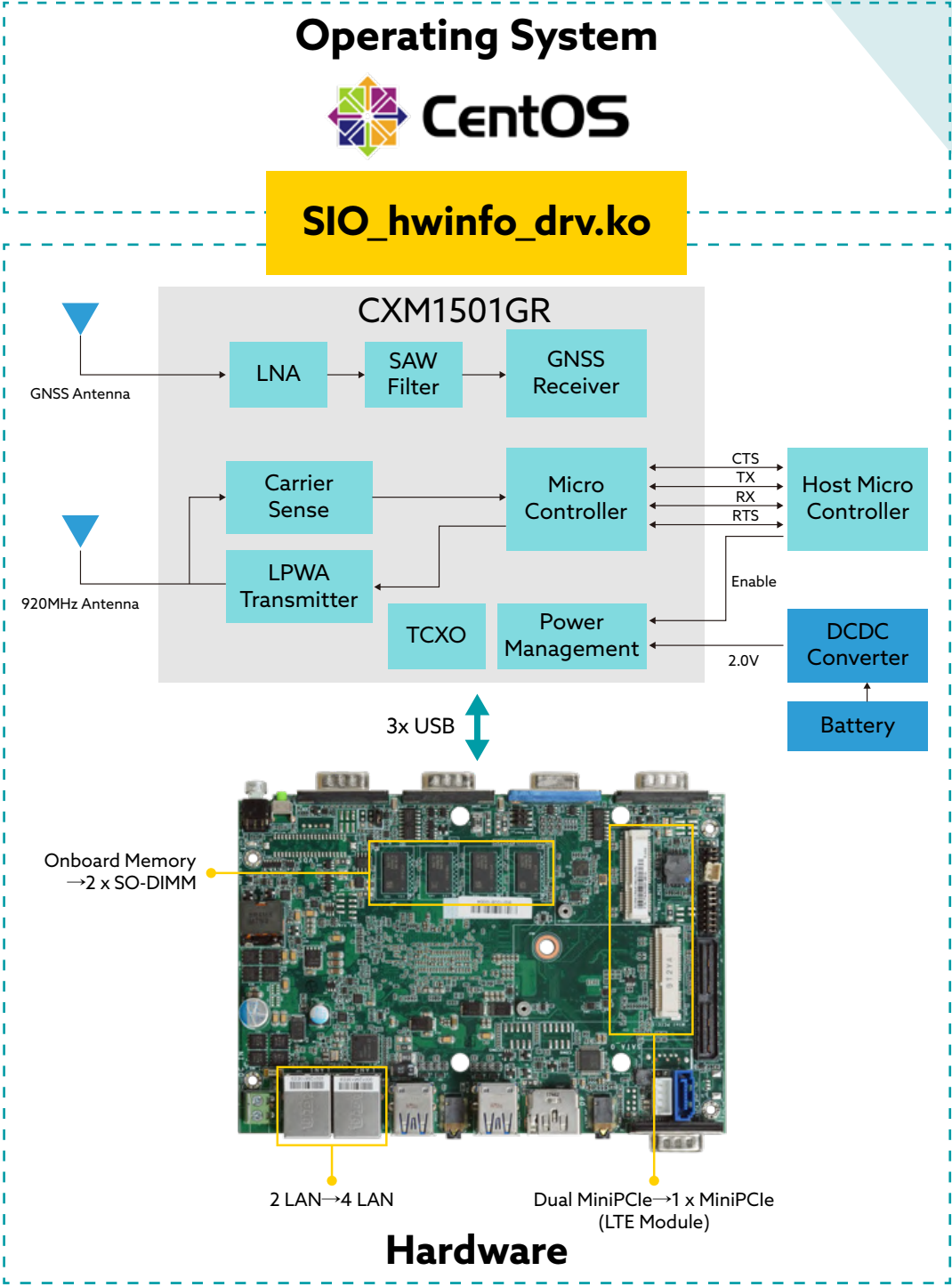
periphery can obtain information such as the ambient temperature of the hardware and the temperature of the processor core.

In May 2019, with the first IoT chip corresponding to ELTRES and built-in GPS / GNSS sensor to obtain positioning, the customized SBC provided by DFI had also become the brain of the ELTRES gateway. The ELTRES network is used for data transmission within the range of 100 kilometers, and it will not be affected too much in an urban environment with a lot of signal interference. It is also applicable to objects moving at high speed of 100 kilometers per hour. In September 2019, ELTRES IoT Network officially entered the commercial operation. Starting in September 2020, a service that transmits one signal per minute and a maximum of 1440 signals per day is provided. In November 2020, the coverage rate in Japan covered 90% of the population.

ELTRES: Up To 100km



Overall Architecture





DFI's Complete SBC Product Line Is The Cornerstone Of The Rapid Development Of Industrial-Grade Systems

When it is necessary to use the development schedule of consumer products to achieve the reliability of the industrial computer level, it is an extreme test on whether industrial computer manufacturers have time-tested off-the-shelf product designs as the basis for launching customized projects. DFI has long enjoyed the advantages of product line integrity and wide operating temperature in SBC, covering 2.5 inches, 3.5 inches, and 4 inches, and includes a variety of different hardware platforms.

As the saying goes: opportunities are always reserved for those who are ready. Based on the rich experience of SBC, the complete SBC product line, and the customization capabilities along with the mission to complete, DFI has successfully assisted Japanese customers in building the Internet of Things LPWA with a transmission distance of more than 100 kilometers, creating more potential new business opportunities.

What's LPWA

A low-power wide-area (LPWA) network or low-power wide-area network (LPWAN) or low-power network (LPN) is a type of wireless telecommunication wide area network designed to allow long-range communications at a low bit rate among things (connected objects), such as sensors operated on a battery. The low power, low bit rate, and intended use distinguish this type of network from a wireless WAN designed to connect users or businesses and carry more data, using more power. The LPWAN data rate ranges from 0.3 kbit/s to 50 kbit/s per channel.

An LPWA may be used to create a private wireless sensor network, but may also be a service or infrastructure offered by a third party, allowing the owners of sensors to deploy them in the field without investing in gateway technology.

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DFI

Founded in 1981, DFI is a global leading provider of high-performance computing technology across multiple embedded industries. With its innovative design and premium quality management system, DFI's industrial-grade solutions enable customers to optimize their equipment and ensure high reliability, long-term life cycle, and 24/7 durability in a breadth of markets including factory automation, medical, gaming, transportation, smart energy, defense, and intelligent retail.

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