



Smart City Wireless IoT Solution

HUAWEI TECHNOLOGIES CO., LTD.





Requirements and Challenges of Smart City

With any Smart City solution, information and communications technologies (ICT) are used to collect, analyze, and integrate key information about the core systems for city operations. This solution enables intelligent response to various urban demands in the aspects of people's livelihood, environmental protection, public safety, city services, and manufacturing and commerce activities. Cutting-edge ICT technologies facilitate smart city management and operation, which creates better lives for citizens and promotes sustainable development for the city.

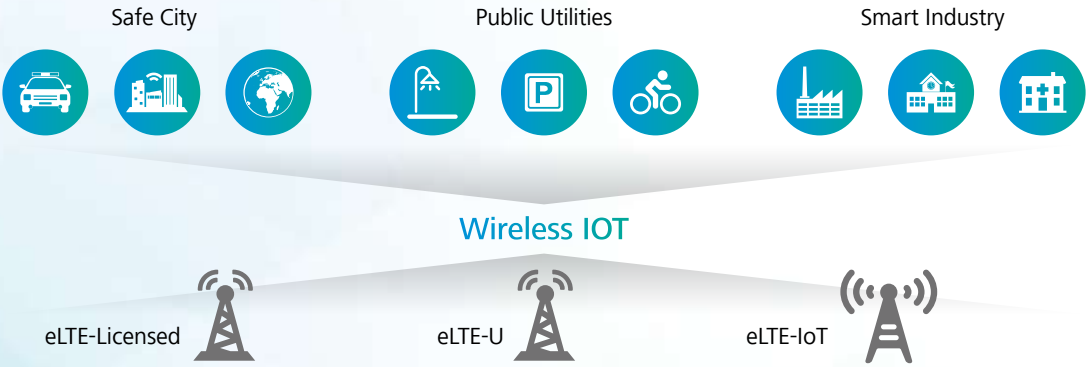
Smart city information collection depends on ubiquitous sensors and data collecting equipment. Wired connection is difficult to deploy and the cost is high. GPRS is an obsolete technology that has high power consumption and limited coverage. ZigBee, bluetooth, and other technologies are not suitable for wide area coverage. A wireless network that can adapt to a variety of scenarios is required for a smart city.

Smart City Wireless IoT Solution

Huawei's Smart City Wireless IoT solution provides a network integrating broadband and narrowband to resolve common issues during urban development, such as lack of security, high energy consumption, traffic congestion, and pollution.

The Smart City Wireless IoT solution provides three access methods, which can be used independently or combined flexibly in accordance with services and spectrum:

- eLTE-IoT: The unlicensed sub-GHz Industrial Scientific & Medical (ISM) bands are used for information collection for mass industrial devices. Advanced coverage enhancement, anti-interference, and energy conservation technologies are utilized to build a private narrowband IoT network.
- eLTE-U: A private broadband IoT network is deployed on the unlicensed bands of 2.4 GHz and 5 GHz when enterprise customers cannot acquire private licensed spectrum. 4.5G LTE technologies are used to provide improved coverage (more than two or three-fold), better mobility, and more reliable and stable wireless connection than Wi-Fi.
- eLTE-Licensed: A private broadband IoT network is deployed on the licensed bands. When enterprise customers have private licensed spectrum, eLTE-Licensed provides high-performance broadband data access and allows voice scheduling services. This meets the requirements of industrial IoT and production scheduling.



Smart City Applications



Smart meter reading

Smart meter reading involves real-time data collection, fault detection, and data transmission for water, electricity, and gas meters. It reduces labor costs by substituting wireless backhaul for manual meter reading and other short-range backhaul methods. Real-time and efficient data collection realizes reasonable energy allocation and increases energy utilization.

Smart parking

With a growing number of vehicles in modern cities, parking becomes an increasingly burning issue. As a priority, real-time detection of parking space status and data backhaul must be realized to improve the usage of parking lots. To this end, eLTE-IoT modules are integrated into underground parking space sensors to transfer parking space information to the IoT network real-time information backhaul.



Smart lighting

Densely distributed on roadsides in smart cities, street lights have to meet communication requirements such as remote control, status monitoring, and fault locating. With eLTE-IoT modules integrated, street lights can be remotely controlled and maintained, which saves energy and reduces labor costs.

Smart garbage can

Garbage collection and disposal can undoubtedly bring citizens a clean and tidy city as well as a comfortable living environment. Wireless IoT technology is applied to observe and backhaul garbage cans' load, which helps realize proper assignment of garbage trucks and garbage collection workers. This reduces the operation cost of public utilities in smart cities while ensuring prompt disposal of garbage.



Smart City Applications

Video surveillance

Governments tend to focus great attention on building and renovating safe and smart cities. In addition, people increasingly focus on their personal safety and property security. There emerge extensive and booming demands for video surveillance and applications in different industries such as finance, energy, transportation, healthcare, and education. Traditional wired backhaul is difficult and expensive to deploy. In contrast, eLTE-U wireless backhaul optimally utilizes the sufficient bandwidth of unlicensed spectra to reduce deployment costs as well as provide backhaul for considerable videos.



Wildlife protection

Wildlife is the creation of nature but the ecosystem of nature is sustained by both humans and wildlife. In wildlife areas, infrared cameras are installed to trigger real-time photo backhaul using eLTE-U based on wildlife activities. This can capture wildlife habits and help related organizations develop wildlife protection measures.

Environment monitoring

The eLTE-IoT solution integrates IoT modules into environment sensors and transmits information about soil, temperature, humidity, and sunlight to the environment monitoring data platform. Realization of automatic environment monitoring is particularly significant to management, decision-making, enforcement, and supervision of environmental protection departments as well as precaution, prevention and control of environment pollution.



Forest conservation

Forest conservation can prevent and eliminate forest destruction and disasters. Instead of costly and laborious deployment of cable networks in forests, the wireless IoT solution is applied to backhaul forest monitoring information in real time. In case of fire or other disasters, the danger can be detected through monitoring of the air, water, and soil to prevent or minimize the loss of forest resources.

eLTE-IoT: Unlicensed Narrowband IoT

eLTE-IoT is a 3GPP-compliant wireless narrowband IoT solution tailored for industrial IoT markets. Unlicensed sub-GHz bands, which are 470-510 MHz, 863-870 MHz, and 902-928 MHz, can be used in different regions. Lightweight devices are easy to deploy and can be connected to enterprises' existing application platforms in accordance with standards and protocols. These features make eLTE-IoT an ideal solution for enterprises to set up their private narrowband IoT networks.

Advanced anti-interference technologies to ensure reliable connections

- Frequency hopping is used to avoid external interference and improve reliability.
- Advanced error-correcting codes enable quick error correction.

Broader coverage

- Sub-GHz ISM bands
- Power spectrum density (PSD) boosting
- Time domain repetition

Mass connections

- A single channel occupies less frequency resources, increasing

capacity with the same bandwidth.

- Slotted ALOHA reduces the conflict probability, improves transmission efficiency, and increases system capacity.
- Multiple channels can be used in parallel to increase system capacity.

Low power consumption

- Power saving mode (PSM) and discontinuous reception (DRX) decrease power consumption.
- Small-packet fast transmission reduces the time required for data transmission, improves transmission efficiency, and reduces power consumption.

eLTE-IoT AirNode eAN3710A



- 470-510MHz/863-870MHz/902-928MHz
- 290*210*60mm
- POE
- IP65

eLTE-IoT AirNode base station, eAN3710A, supports PoE, and can be mounted on a pole or wall, high-gain external antenna can be configured for wider coverage.

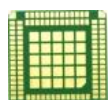
eLTE-IoT Terminal



DAU

- 902~928MHz
- UL: 10Kbits/s DL: 17Kbits/s
- POE
- IP65

The eLTE-IoT DAU (eA300) is a narrowband data access unit. It can connect to the existing concentrators or frame meters through the RJ45 port.



Module

- 470-510 MHz/863-870 MHz/902-928 MHz
- UL: 10Kbits/s DL: 17Kbits/s
- UART interfaces

The eLTE-IoT module (eM300) can be integrated into electricity and water meters and other terminals and report data through the eLTE-IoT network.

eLTE-U: Unlicensed Broadband IoT

eLTE-U is a wireless industrial broadband IoT solution that meets 3GPP standards. Reliable and stable industrial connections are provided on the unlicensed bands of 2.4 GHz and 5 GHz. eLTE-U base stations and service engines are compact and lightweight, which facilitates enterprise customers' network construction. Wireless modules with standard Mini-PCIe bus interfaces can be easily integrated into TOS terminals of ports, video surveillance cameras, wildlife protection cameras, and a multitude of third-party devices for eLTE-U data backhaul.

Reliable industrial connections on unlicensed bands

- The unlicensed bands of 2.4 GHz and 5 GHz comply with rules and regulations on unlicensed bands in various regions.
- Listen before talk (LBT) and dynamic frequency selection (DFS) are supported to effectively decrease inter-RAT interference.
- Leading LTE technologies, such as inter-cell interference coordination (ICIC) and interference rejection combining (IRC), are utilized to coordinate intra-RAT interference.
- Centralized scheduling is performed to maintain network performance when there are multiple users.

High-performance industrial connections

- Two or three times greater than the Wi-Fi coverage radius. This helps decrease the number of sites.
- A latency of 50 ms and zero packet loss fulfill the requirements of industrial control signal transmission on wireless systems.
- A powerful handover mechanism ensures services continuity in a high-mobility (160 km/h) scenario.
- Nine classes of quality of service (QoS) parameters guarantee the prioritization of data for secure production.

eLTE-U AirNode eAN3810A



- 2*2 MIMO
- 2.4G/5GHz
- 3.7L
- IP65

eLTE-U AirNode base station , eAN3810A, supports PoE, and can be mounted on a pole or wall, high-gain external antenna can be configured for wider coverage.

eLTE-U Terminal



DAU

- 2.4G/5GHz
- IP67
- PoE



Module

- 2.4G/5GHz
- UART interfaces
- USB

The eLTE-U DAU (eA680-950) is a broadband data access unit. It can connect to the existing concentrators or frame meters through the RJ45 port.

The eLTE-U module (eM680-950) can be integrated into AGV, camera and other terminals and report data through the eLTE-U network.

eLTE-Licensed: Licensed Broadband IoT

eLTE-Licensed is the most advanced in terms of wireless communications. By utilizing top technologies such as orthogonal frequency division multiplexing (OFDM), multiple-input multiple-output (MIMO), and flat network architecture, the eLTE-Licensed system achieves a peak throughput of 400 Mbit/s in the downlink and 150 Mbit/s in the uplink. Compared with LTE, eLTE-Licensed can accommodate software and hardware that match the attributes of industrial IoT, and therefore features better scalability. For example, industrial customers can integrate Mini-PCle modules for secondary development. Networking that allows for various bandwidths (minimum 1.4 MHz) can be adopted by industrial customers that use different bands. Voice scheduling and other communication services can be added on eLTE-Licensed solution.



eA280



eA380



eA680



eA880

eA280/380/680/800 series are the Long Term Evolution (LTE) customer premises equipments (CPEs). As the wireless gateway, the CPEs support built-in or external antennas. The CPEs can be deployed in various scenarios, such as indoors, outdoors, and for industrial uses.





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Version No.: M3-038477-20170302-C-2.0

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