Huawei eLTE Private Network Solution Is Ready to Transform the Utility Market

An introduction to Huawei eLTE Private Networks solution: A network designed to serve the utility market

Multiple trends, such as the introduction of distributed energy resources to the grid, have necessitated new use cases to ensure the reliable creation and delivery of power. These use cases include distribution automation, load-precise monitoring and control, distributed energy resources (DER) integration, advanced metering infrastructure (AMI), as well as drone inspection and monitoring. They require a network that can deliver on low latency and support an ever-increasing number of devices, but also increasingly high bandwidth requirements.

To serve the specific needs of the utility world, Huawei created a solution branded Huawei eLTE (enterprise LTE) Private Network. Huawei eLTE Private Network Solution is geared towards supporting all use cases shaping the utility of the future, including precise load control, distribution automation, AMI, transmission line inspection, EV charging, sub-station remote and auto-inspection, and grid repair and maintenance.

An essential requirement of any utility is to own the communication infrastructure that it uses to benefit from enhanced control and security. Huawei eLTE Private Network Solution is a dedicated cellular network for the exclusive use of the utility customer. This means that the network is designed to meet the enterprise's specific requirements, delivering high reliability, security and low latency as and when requested. Being private, the enterprise can decide the maintenance, backup options and upgrade expansion cadence for its network based on its own preferences rather than having to compromise with a public network's maintenance or upgrade schedule.

A private LTE or 5G network brings the advantages of mobile broadband to the utility world. This means that the utility can leverage higher throughput and bandwidth, supporting new camera-based use cases such as site security, camera-based inspection and monitoring, or drone and autonomous robot control and video-based recording and monitoring.

The solution's flexibility enables one network to effectively replace multiple existing communications networks, such as Tetra and WiMAX, reducing the utility's opex and capex requirements. It can do so because this one network can serve different types of traffic, including voice, video, SCADA and sensor data uploading.

With utilities looking for future-proof technologies, they must have a network with a clear roadmap for future evolution. The eLTE network is a platform ready for the future adoption of 5G and its innovative features, such as uRLLC; additionally, being part of the 3GPP standard, it benefits from a wide ecosystem of devices.

Selected technical features that enable Huawei eLTE Private Network Solution to serve all utility use cases

The Huawei eLTE Private Network Solution is designed to serve all the use cases of the power utility market. Given the stringent requirements in performance, security and reliability typical of power utilities, the solution has implemented features to meet the utilities' existing challenges. Huawei's solution delivers one-way latency of 20ms to meet the requirements of use cases, such as precise load control or power distribution. This latency is obtained via features such as improved chip processing speeds with dedicated modules and pre-scheduling algorithms to reduce RAN delays.

Huawei's eLTE solution is also designed to isolate traffic coming from different use cases. Data from different devices serving different use cases is sent using varied timeslots and frequencies through the RRU (where the frequency division point and timeslot happen). The traffic then goes through independent transmission boards inside the BBU, including different DH sectors. The traffic can be routed to other core networks, creating logical isolation for non-critical services such as information collection services as well as logical isolation for control services such as distribution and precise control.

Quality-of-service (QoS) is also crucial to utilities. Since different applications have different levels of criticality, Huawei's solution delivers up to nine levels of QoS mechanisms across service and user priority. This means that QoS assurance can be delivered at different priority levels for various services – for instance, delivering the highest priority for precise control compared to a lower priority for AMI. QoS can also be offered to specific users.

Another key requirement for the transformation of any utility is the reliability of its communication network. Huawei's eLTE solution delivers high reliability thanks to equipment-level backup with a 1-1 active/standby core networking design and board-level backup of switching boards, service boards and power modules. This architecture is used to ensure 99.999% network reliability.

Also, with new use cases, such as distributed energy sources, EV charging stations and AMI being increasingly dispersed, to meet these wide coverage needs, the solution counts on multi-antenna technology to reduce signal fading and improve link reliability as well as on-time domain repetition, a data retransmission mechanism where a data block is transmitted multiple times continuously to improve reception success rate. A single base station has a coverage radius exceeding 10km.

Jiangsu Electric Power Corporation and Senelec are examples of companies reaping the benefits of private LTE

Utilities from all over the world are reaping the benefits of deploying private LTE networks to support their smart grid evolution and future use cases. An example of this is Jiangsu Electric Power Corporation, a Chinese utility with 46.2 million customers. The utility had traditionally connected high-voltage substations (35kV or higher). However, it had limited grid coverage for medium-voltage power grids of 10kV, which created a problem for the utility in supporting innovative services such as distributed EV charging stations.

Jiangsu Electric Power Corporation opted to deploy a private LTE network using the TDD 1.8 GHz band in three phases: a pilot phase, a partial area rollout and then a comprehensive rollout.

The private LTE network includes around 4,000 base stations. So far, it has connected over 400,000 devices to the network, supporting applications including remote control of automated power distribution, generation-grid-load-storage integration, distributed PV and power consumption information collection. The private network enabled Jiangsu Electric Power Corporation to reach 40% higher capability in smart remote control and reduced the time spent on power outages by 24% per year.

Thanks to the network, the utility has been able to use applications such as smart load management, fault isolation, and new energy allocation, which were used to protect households from around 24,600 hours of power outages and to enable fault recovery 2.36 hours faster than before on average.

Another example is Senelec (a power company in Senegal), which is also using a private LTE network to evolve from grid manual operation to intelligent automation. The utility's decision was, therefore, driven by its need to future proof its grid to support innovative applications. The private wireless network is used to deliver intelligent inspection of power distribution, improving O&M efficiency by supporting visualization of the network running status. The private LTE network provides secure connectivity, which can also be used by other government agencies, enabling a unified command system that improves emergency response capability.

Senelec's future is based on deploying a private LTE network to support a high-reliability distributed network that boasts distributed connections between sites, supporting smart outage management and other innovative applications.

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