

SAMSUNG



Public Safety LTE Solution

For a reliable, fast and secure network

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Public Safety LTE is a global trend

LTE for public safety is now a global trend and advanced telecommunication markets such as Korea and the US are planning to deploy nationwide PS-LTE networks. As a result, the worldwide PS-LTE market is expected to grow over 12 billion dollars in 2020. In order to meet these high demands, Samsung is taking a leadership role in the establishment of global PS-LTE standards based on 3GPP and the provision of end-to-end public safety solutions.

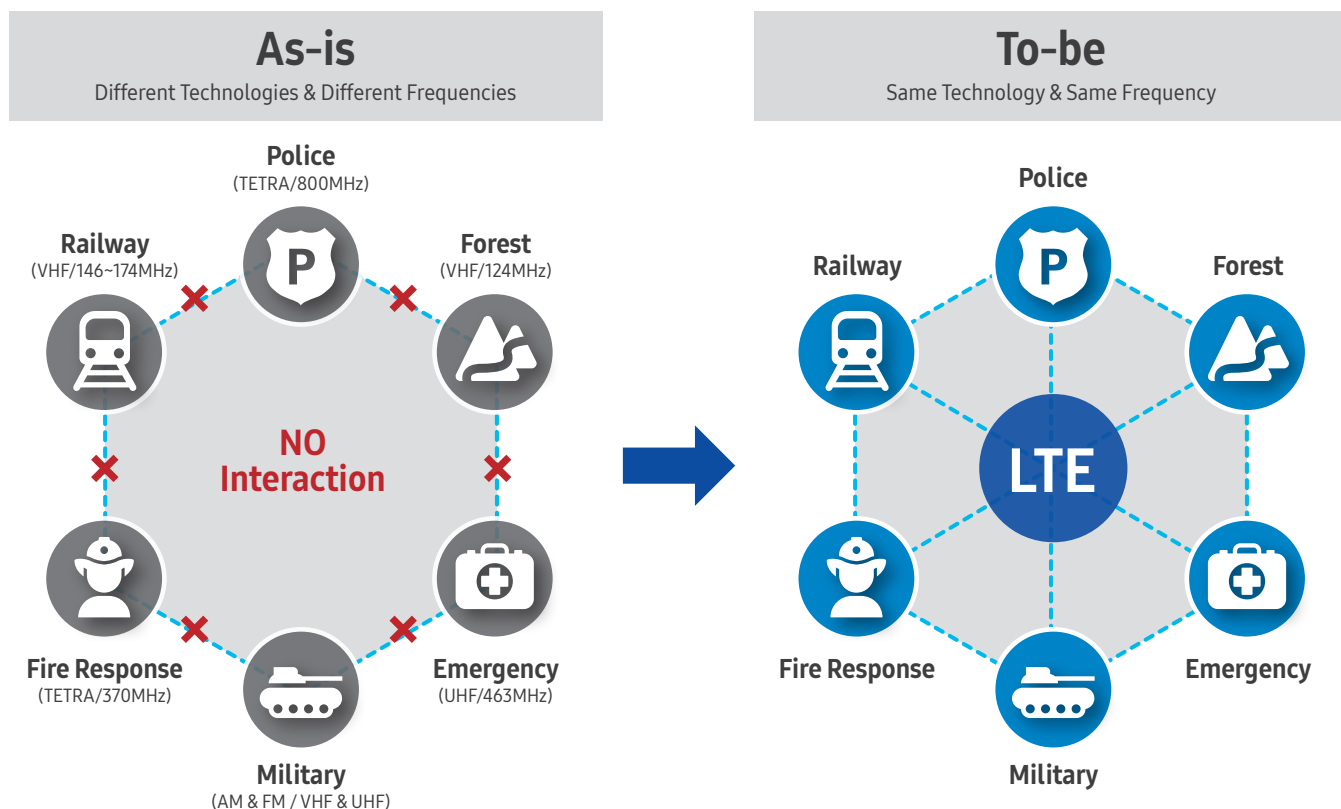
Why LTE for public safety?

One of the biggest advantages of public safety-LTE networks is data connectivity. While previous public safety networks could only support very low data rates and usage was mostly voice-oriented, PS-LTE can transfer high volumes of data instantly. This means that high quality images and video can be sent enabling the use of various applications such as live streaming during emergency situations or the use of mapping software for locating or directing mission-critical assets or concerns.

LTE can also be leveraged to unify existing disparate public safety networks. Before, disaster response institutions utilized different frequencies and technologies such as VHF, UHF and TETRA. With so many different networks, inter-agency communication was difficult. Faster response can be achieved when these different networks are unified through LTE. Another advantage is that LTE networks satisfy the rigorous requirements set out for public safety networks such as resilience, security and quality of service.

LTE for public safety has the added benefit of broad organizational standards support. Many functions and requirements for public safety networks are defined in the newly established 3GPP Release 13 such as Mission Critical PTT (MCPTT).

LTE for public safety is expected to be adopted by various governments and is recognized as a global standard. LTE assures the reliability and security needed for a public safety network.



Public Safety LTE in Korea

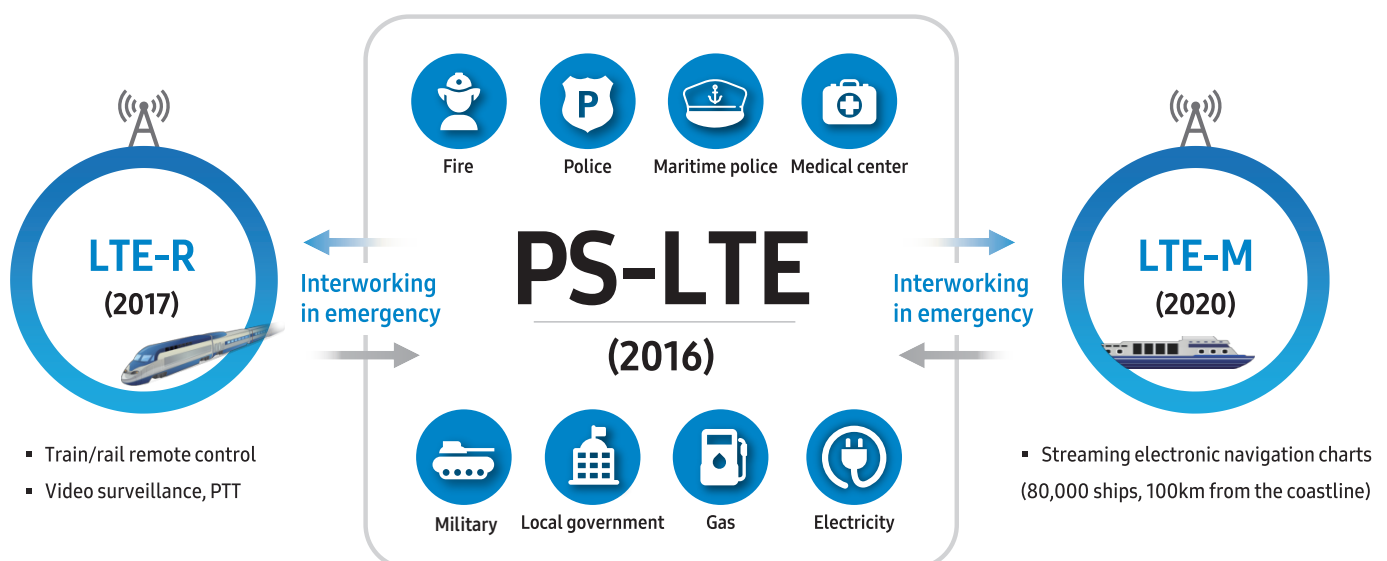
Korea's ongoing effort to deploy the public safety LTE network represents a major leap forward. The Korean government is undertaking a nationwide rollout, which is expected to trigger large-scale investments in PS-LTE across the globe.

The network will be rolled out in three phases, culminating in a nationwide PS-LTE service by 2017. The Korean government is planning to invest around 1.5 billion US dollars for the network, which includes the commercial pilot, deployment and operational costs. Not stopping here, the Korean government also plans to establish both LTE-Railroad (LTE-R), the world's first LTE-based railroad and subway wireless network and the world's first LTE-Maritime (LTE-M) wireless communications network.

Busan, Korea's second largest city, has already deployed a commercial LTE-R network in 2015 and the government is planning to set up and install LTE-R base stations throughout the country's entire rail network by 2025 - about 4,800km long in total. Investments for LTE-R are expected at 1.6 billion US dollars.

LTE-M, or "e-navigation", will be a comprehensive safety system to assist the prevention of maritime accidents and will offer tailored safety measures based on past statistics. It will enable high-speed data communications for up to 80,000 ships as distant as 100km offshore. The ministry of Oceans and Fisheries will invest 112 million US dollars to develop the system by 2020.

In emergency situations, it is crucial that inter-organizational communication is both accessible and highly functional. This means that a converged communication network for public safety agencies is necessary. With this in mind, the Korean government plans to integrate PS-LTE, LTE-R and LTE-M networks using a single 700MHz frequency band in order to seamlessly ensure a reliable communication path.



Why Samsung

Samsung is incorporating our very best technologies and services into a dedicated PS-LTE solution in order to provide one of the most advanced PS-LTE solutions across the globe. Samsung has actively participated in the establishment of global standards for PS-LTE and is the world's first end-to-end provider based on 3GPP standards with a virtualized core, enabling IoT in the public safety networks.

Samsung's Public Safety LTE Solution

01

Leading the global standard

Samsung is, a forerunner in the development of LTE standards, holding 17% of standard essential patents related to LTE and LTE-Advanced.¹⁾ In this regard, Samsung ranks at the top of 35 major telecommunication businesses.

This leadership and drive for innovation is well-applied to PS-LTE with Samsung contributing greatly to the 3GPP's Release 13 standards for PS-LTE. One of the features Samsung most actively participated in defining is the Mission Critical Push-to-Talk (MCPTT) feature. This function enables thousands of devices to be connected at once to transfer video, images and voice simultaneously using multicast technology. This type of feature is so critical to enabling a truly superior public safety service that the 3GPP established a separate working group (Service and System Aspects, WG 6 - Mission Critical Applications) devoted to defining such standards, with the full support of Samsung who currently chairs the group.

In addition to MCPTT, Samsung's PS-LTE also provides Device-to-Device (D2D) and Isolated eUTRAN Operation for Public Safety (IOPS) features, which are all part of the Release 13 standards. D2D, or enhancements to proximity-based services (eProSe), supports direct communication between nearby devices in the case of infrastructure power outages or other accidents. IOPS is technology for a portable, independent base station as needed in situations where communication is needed in places with no extant public safety network infrastructure.

1) Patent trends in the telecom industry report 2014, Taiwan Intellectual Property Office (TIPO)

02

End-to-End PS-LTE Solutions Provider

From infrastructure to device, Samsung is ready to provide a full end to end solution for PS-LTE.

The device is a user-friendly smartphone type and is based on world-renown Samsung smartphone technology. The smartphone is designed additionally to carry out the optimal PTT function by adding a Push-to-All (PTA) button on the side. Durability is a paramount focus of the device, including both waterproof and dustproof ratings.



Radio Unit



Baseband



Smartphone for Public Safety

The infrastructure offering includes base stations, a virtualized core and virtualized PTT server. Samsung's PS-LTE baseband supports two platforms, the existing commercial type and an outdoor type. The outdoor baseband is compact and, like the device, completely waterproof and dustproof. This allows flexible installation, as the baseband unit is able to be deployed both indoors and outdoors. Samsung has also reinforced redundancy for the baseband unit, increasing the resilience of the base station.

Samsung's virtualized PTT server is unrivaled in the industry. In June of last year, Samsung successfully demonstrated the first push to talk solution through eMBMS technology. The solution sends multimedia, such as video or high quality images, to thousands of devices simultaneously using a single transmission channel. Each device seamlessly receives the incoming data at the same time, allowing real-time video communication among thousands of users. In contrast, when relying upon traditional unicast methods, in order to send multimedia to different devices, a single channel for each device is needed, consuming unnecessary air link capacity, significantly degrading the quality of video and potentially causing video buffering or stuttering issues.

Testifying to Samsung's readiness, in Korea, Samsung was selected as a vendor for the nationwide PS-LTE network. Among participating vendors, Samsung is the only E2E vendor and sole core equipment vendor.

Virtualized Core



03 Flexible and Scalable Core

Samsung is utilizing its very latest technologies to provide a virtualized PS-LTE core. One, single rack comprises an IMS, eMBMS, virtualized EPC and PTT server. The compact size allows for more flexible installation and the core equipment can be deployed in small spaces, reducing overall footprint. The core is able to support a maximum of 400,000 subscribers at once while fully redundant for high survivability. Depending on where or in which situation it is deployed, the core can be formed differently. In high traffic areas or situations, Samsung's in-house server is preferred due to its higher performance and capacity over commercial of the shelf (COTS) hardware. And, by default, in low traffic areas, COTS servers may be preferred to minimize cost when capacity is of less concern.

The virtualized core also enables the division of a single physical network and different public institutions are able to use their own private and independent virtual networks. And because the networks are logically separated, errors or disruptions localized to one network will have negligible impact on the network overall, maintaining smooth and stable communication service on each other virtual network.

04 Encompassing Internet of Things

In the foreseeable future, PS-LTE networks will need to accommodate the Internet of Things. Sensors such as smoke alarms and motion detectors, security cameras, wearables for emergency workers and other such devices will all be connected to the network.

Samsung's PS-LTE solution is equipped to support this evolution. The baseband unit is unique in its readiness to support NB-IoT. Samsung is also preparing to deploy ultra-compact, standalone base stations specifically intended to support IoT devices, and which are suitable for places where conventional PS-LTE base stations are not desired or cannot be deployed, such as in rural mountainous or woodland areas. During natural disasters or other emergency situations, communication may be necessary even in these sparsely populated areas and with the virtualized core, the network can be virtually separated (or "sliced") across different IoT services in order to provide more efficient operation.



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About Samsung

Samsung is recognised as one of the leading and most enduring names in the world of mobile technology. For more than 3 decades we have championed developments in the industry and played an integral part in the evolution of the mobile telecom sector. Our strong track record in innovation and manufacturing is matched with a history of financial stability, and an extensive globally-distributed, skilled employee base. This combination of factors has lead to Samsung being the preferred partner of top-tier operators around the world. We are committed and active participants in key leadership bodies, helping to shape and regulate the industry.

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