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Panasonic Demonstrate a High-Security Communication Service for Building Tenants and a Building Operation and Management System by Private 4G with a 5G Core

Osaka, Japan – Panasonic Corporation joined Mori Building Company, Limited (Headquarters: Minato, Tokyo; President and CEO: Shingo Tsuji. Hereinafter referred to as "Mori Building") and eHills Corporation (Headquarters: Minato, Tokyo; CEO: Hiroo Mori. Hereinafter referred to as "eHills") to build a virtual private network consisting of a private telephone network using sXGP*1 base stations, a private 4G (LTE) standard using unlicensed frequency bands, with a 5G core network (hereinafter referred to as "5G core") and a public LTE network, and conducted a demonstration experiment with the purpose of developing new services for building tenants and facilities, and off-site environments.

In this virtual private network, users of building tenants who use offices in large cities, satellite offices, and shared offices can connect directly to the intranet of their companies securely at anytime from anyplace without being concerned about where they are and without being worried about complicated setup such as VPN connection settings. In addition, by developing sXGP base stations connected to the 5G core as a building infrastructure and utilizing 5G network slicing, the private telephone network will be further expanded as a communication platform for the building operation and management system, etc. This system is designed to go beyond the premises of each building, with an eye toward supporting autonomous driving in an area of several buildings. After extracting the effects and issues of sXGP, we are planning to replace some base stations with local 5G stations and carry out a demonstration to sophisticate the system.

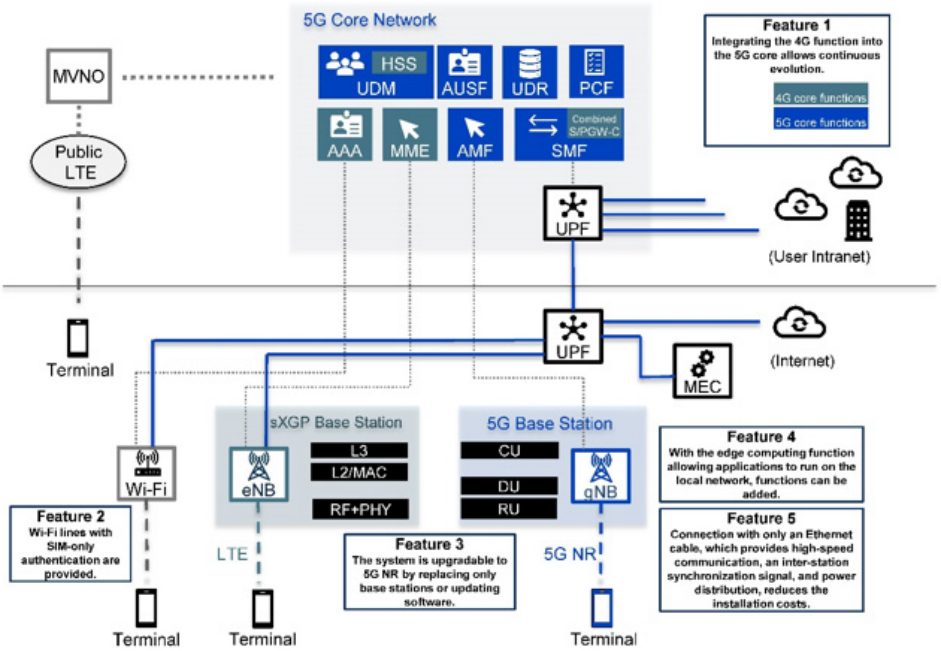

Fig.1 System configuration image

MVNO: Mobile Virtual Network Operator UPF: User Plane Function MEC: Mobile Edge Computing

5G Core Network
UDM: Unified Data Management / HSS: Home Subscriber Server / AUSF: AUthentication Server Function /
AAA: Authentication, Authorization and Accounting / MME: Mobility Management Entity /
AMF: Access and Mobility Management / UDR: Unified Data Repository / PCF: Policy Control function /
SMF: Session Management Function / S/PGW-C: Serving / Packet data network GateWay – C-plane functional group

sXGP Base Station eNB: eNodeB

5G Base Station gNB: gNodeB / CU: Centralized Unit / DU: Distributed Unit / RU: Radio Unit

Background and Purpose

Under today's COVID-19 pandemic, there is demand for a secure, stress-free, and cost-effective business network, which gives the users office levels of work efficiency and information security in any location, including satellite offices, shared offices, public places, homes, and workation spots. Exploring networks for building tenants that respond to the changing business environment and networks for efficient remote management of buildings, this demonstration experiment, which is scheduled from April to December 2021, is intended to verify the network's usefulness, practicality, and cost effectiveness, while further improving its performance. After the end of this demonstration period, we plan to launch commercial services based on the results. The network built for this experiment is based on sXGP, a type of 4G LTE, an international mobile phone standard, that allows device installation without a license. The equipment is shared among the tenants but can be individually connected to the intranet of each tenant company. This technology also allows secure wireless connection of many devices. The experiment will check these functions, and verify the possibility of digital transformation of building operations including tenant services and building management.

Features

The experimental network will inherit the features of the Personal Handy-phone System (PHS), which is a low-cost reliable private telephone system with many years of service history. In a disaster situation, PHS communication in premises can be maintained without being affected by the state of the external network. The new network will serve as a company IoT network with PHS's high reliability. Through this network, multifunctional smartphones and personal computers, and IoT devices can be securely connected under robust security management, integrating the conventional private telephone network and the private IP information network. The sXGP base stations are operated with the 5G core network we have developed. By updating the software, the system allows continuous infrastructure investment for future deployment of 5G-specific applications such as a more interactive CPS*2 environment, sophisticated building automation, and auto valet parking*3 in the building's car park. A system with such an architecture has the following features.

1. With the 4G sXGP system with a fully inter-node synchronous 5G architecture, which consists of distributed units (DUs), a central unit (CU), network switches, and a core network, a completely separated (sliced) network can be configured for each SIM card*4 attribute, maintaining the security and integrity of the connection to the intranets of several companies.
2. An sXGP base station has a dedicated Wi-Fi 6 wireless access function, which allows only the devices having registered SIM cards to use high-speed wireless access through Wi-Fi 6.*5 This allows large-capacity data traffic, such as that of a secure Web conference system, to be diverted (local breakout) through the public Internet line, rather than the intranet line within the base station, which reduces the physical load of the intranet server, line costs, and transmission delay.
3. In an area where applications requiring local 5G*6 performance are used, the sXGP base station can be replaced with a local 5G base station, or updated to a small-capacity local 5G base station by software update*7. Therefore, phased migration to local 5G is possible without replacing hardware or conducting large-scale construction work.
4. An edge computing function is provided, which allows the computing resources in base station equipment to be used for IoT applications. Using this feature, user IoT applications such as building management functions can be introduced to a building without requiring large-scale servers and cloud lines, enabling the business to continue even if the private network is isolated from the external network due to disaster.
5. To reduce the initial introduction costs, base station equipment can be connected with a single Ethernet cable, which provides a high-speed communication backhaul function, power distribution function, and a precise time synchronization signal from the master base station.

Outline of the Demonstration Experiment

Duration: April to December 2021

Places: Panasonic Tokyo Shiodome Building, Toranomon Hills Business Tower ARCH, eHills headquarters, and Work Lab Yatsugatake (Chino, Nagano)

Demonstration: Verification of the business use of the constructed sXGP network and its effectiveness as a tenant service

Role sharing:

- Panasonic: Developing network equipment, constructing and operating the private networks
- Mori Building and eHills: Building planning, business operation, and network service operation

Through this demonstration experiment, we will work toward the automation of building management, remote monitoring of building facilities from home, etc., and creation of healthy, secure, and safe business spaces for building tenants, and will support the digital transformation of the building operation business.

Notes:

*1: sXGP: A cordless telephone system using the 1.9 GHz frequency band, which does not require a license. It is compatible with TD-LTE, the time division duplex system for the 4th generation mobile communication system. The maximum throughput is approximately 12 Mbps (uplink) and 4 Mbps (downlink) under a bandwidth of 5 MHz and 2x2 MIMO. Since the system does not require a license, it is not necessary to pay a spectrum user fee and the system can be used at low cost. However, it uses the same frequency band as PHS and home cordless telephones. The system has to have a frequency sharing function with carrier sensing, in which the system can be used only after the base station has confirmed that the current frequency is not being used by other systems.

*2: Cyber Physical System (CPS): Solving unsolved issues by extending human capability to access the vast amount of information and experience that are not available at the place and time where a person exists, by merging the physical world where people live and the cyber space created with digital data. On the other hand, digital transformation is a concept of changing services and even the way industrial society is run by digitizing things, ideas, and behaviors.

*3: A system in which when a driver stops the car in front of the entrance of a building, the car autonomously moves and enters the car park.

*4: SIM card: An IC card used for a mobile phone system that contains the subscriber's number, etc.

*5: EAP-AKA is used as a mechanism for identifying and authenticating users.

*6: Local 5G: A 28 GHz and 4.7 GHz-band frequency system in Japan, mainly intended for industrial use within premises. The available 5th generation mobile communication system is the time division duplex (TDD) system following the specifications defined in Release 15 from the 3GPP.
A bandwidth of 100 MHz is provided. Using an array antenna, large effective radiated power is obtained, enabling high-speed large-capacity and low-latency communication, suitable for industrial use.
Since it is a licensed station, it requires management by the licensee and the payment of a spectrum user fee. Despite such operating costs, the system can provide high-quality wireless communication by using the entire frequency in the premises.

*7: Since a local 5G station is a licensed station, administrative procedures are required.

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About Panasonic

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