

Introducing the UNIVERGE RV1200, All-in-one Integrated Compact Base Station, and Managed Services for Private 5G

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Abstract

As digital transformation (DX) expands, growing attention is being directed towards private 5G (dedicated 5G networks in Japan hosted by entities outside the communication service sector is referred to as private 5G in this paper). While the use of radio waves has been exclusively restricted to mobile network operators so far, government authorities have recognized the need to attract private investment for effective use of radio resources and for the creation of social value. As a result, new players are entering the market. Because of the complexity of the technology and the high cost of system construction, however, it has been difficult to popularize this promising technology. To address this issue, NEC has now developed a private 5G system and managed services called UNIVERGE RV1200, which enables system construction at a reasonable price range. This paper introduces the features and usage scenarios of the NEC UNIVERGE RV1200.

Keywords



private 5G, small base station, integrated base station, managed service, portable trial packages

1. Introduction

Private 5G, in which companies build their own 5G networks on their premises or in their buildings and use them for their business, has raised various expectations because it enables the private sector to monopolize a network with high speed and stability. Verification tests of private 5G started around 2019, and its use is now underway in various fields including manufacturing, construction, and the public sector. The manufacturing industry is making use of 5G networks to take on various challenges, such as updating the networks in factories from wired to wireless. This results in increased network flexibility and the automation of inspections during the production process by utilizing high-definition images and videos. However, the effectiveness of private 5G is not limited to these fields. By leveraging the advantages of having a dedicated 5G network superior in stability and transmission speed, private 5G offers the potential to solve the challenges that the private sector faces in a wide range of fields.

2. How the Integrated UNIVERGE RV1200 Small Base Station Was Created

One of the challenges that must be addressed for the proliferation of private 5G lies in the equipment. The installation of base stations is essential to utilize 5G. However, until now, the only equipment available was that used by mobile network operators (MNOs) — which, although high in performance and sophisticated features, it was complex and expensive, making it difficult for many ordinary companies to use. In fact, some customers have said that they would take on the challenge of private 5G if it were easier to use.

It is against this backdrop that we at NEC launched a project to overcome these issues. Leveraging years of experience in developing base stations for MNOs and a wealth of expertise gained through these efforts, we focused on developing new base stations that would contribute to promoting the utilization of private 5G. This project involved a wide range of people, from engineers who develop equipment for MNOs to sales representatives who are in charge of accounts for regular companies and government agencies. Everyone who

participated in the project objectively evaluated what kind of equipment could be used by many customers from a variety of perspectives. Finally, through repeated discussions and trial and error, the integrated UNIVERGE RV1200 small base station for private 5G was completed and put in production (**Fig. 1**).

3. Features of the NEC UNIVERGE RV1200

The NEC UNIVERGE RV1200 is an all-in-one compact base station that houses the private 5G base station's radio unit (RU) and control unit/distributed unit (CU/DU) in a single enclosure. In addition to keeping the price of the individual devices low, the new system reduces the overall introduction costs, reduces the time and work hours required for the introduction of a new system and any related construction, and improves the ease of installation because it can be conveniently installed in previously difficult locations thanks to its compact size and light weight. In particular, the UNIVERGE RV1200 supports all Sub6 band frequencies (4.6 GHz to 4.9 GHz) for private 5G and its size has been reduced to being smaller than an A4-sized sheet of paper. Also, the product weighs only 3 kg and has a protection rating of IP66, meaning that it's dustproof and waterproof — so it can

be installed indoors or outdoors. In response to users who wish to start small, the system also was verified as having the potential of private 5G with a single base station as well as the scalability to later seamlessly expand to a large system of 100 or more units by simply adding more base stations. These features make it possible to take advantage of the high-quality communication characteristics of private 5G in a wide range of environments and still have a product that is as easy to install as a Wi-Fi access point.

The UNIVERGE RV1200 adopts an architecture specialized for private 5G based on the concept of minimal configuration for a minimal price. The UNIVERGE RV1200 not only integrates the CU, DU, and RU but it is also downsized from using four CPU-FPGAs — which were used for the CU, DU, and RU — to using only two CPUs carefully selected for their low power consumption. Also, by limiting the transmission output to 250 mW per antenna and by using two antennas, the power consumption, the external dimensions, and the weight are reduced in addition. In addition, the reduced power consumption enabled the use of Power over Ethernet (PoE)+, and the aforementioned IP66 rating that ensures the product is dustproof and waterproof have made it possible to improve the workability of the power supply and installation.

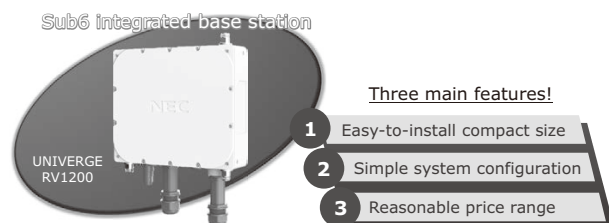


Fig. 1 NEC UNIVERGE RV1200: an all-in-one integrated compact base station for private 5G.

4. Managed Services for Private 5G

A private 5G network system utilizing the UNIVERGE RV1200 is expected that it will be introduced for various situations including use in company offices and demonstration experiments, because its simple network configuration enables greater flexibility in installation locations. Meanwhile, the introduction of private 5G still has many challenges as a result of factors such as the

■ Combined services: operation support (2 levels) and 5G core on the cloud

Standard package	Includes NEC handling 5G core and network operations <div> <div>5G core</div> <div>Operation management</div> </div> Monitoring of private 5G network operations Customer service, remote fault isolation, maintenance arrangements & recovery response, configuration management Operation monitoring for trouble detection and troubleshooting
Entry-level package	Includes support for network operations focusing on 5G core and customers <div> <div>5G core</div> <div>Recovery support</div> </div> Customer service, remote fault isolation, maintenance arrangements & recovery response Support for troubleshooting triggered by customer complaints
■ Device rental service for a monthly fee Device subscription service	
Includes rental of devices for private 5G base stations and maintenance as a set <div> <div>Device provision</div> <div>Device maintenance</div> </div> Includes rental of devices such as CU/DU ^{*1} , and RU ^{*2} for a monthly fee and maintenance in event of failure Device subscription term from 1 year, 3 years, or 5 years in accordance with customer needs <small>*1: Central Unit/Distributed Unit: 5G base station, aggregation/remote unit *2: Radio Unit: 5G base station and wireless unit</small>	

Fig. 2 Overview of managed services for private 5G.

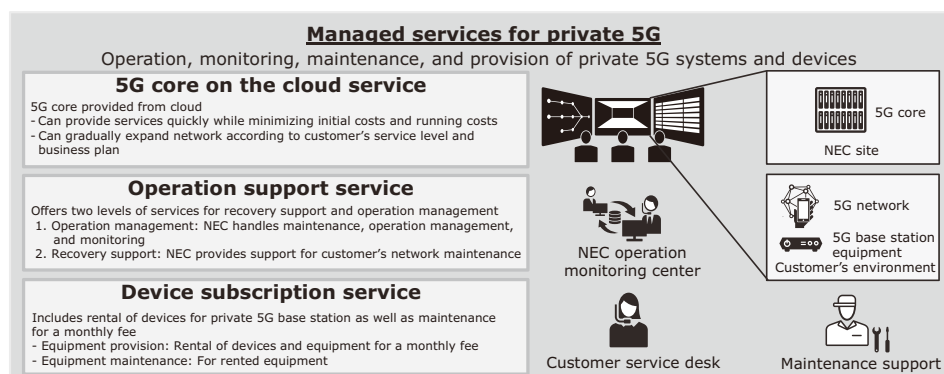


Fig. 3 Managed services for private 5G.

difficulty in securing 5G wireless technicians and the high cost of equipment. To address these challenges, we at NEC offer managed services that combine the operation of private 5G and the provision of equipment. These managed services help lower the barriers to introducing private 5G and provide support to companies trying to improve their business by using private 5G.

4.1 Overview of the managed services for private 5G

In the managed services for private 5G, NEC operates, monitors, and maintains 5G networks and provides 5G equipment on a monthly basis to thereby reduce the customers' operational burdens and initial costs. NEC offers three services: 5G core on the cloud, operation support, and device subscriptions. The services for 5G core on the cloud and operation support are packaged together and offered in two service packages: the standard package and the entry-level package, depending on the service level (Fig. 2).

4.2 Provided value of the managed services for private 5G

The two service packages both provide core functions for 5G communication as cloud services as well as operation support and maintenance for customers. The standard package supports stable 5G communications operations by setting up a service desk as the customer's contact point for inquiries, proactively detecting failures through operation monitoring, remote fault isolation, maintenance arrangements, and system restoration. The entry-level package simplifies services by doing troubleshooting only after reports of trouble are received from customers. With the device subscription service, customers can rent devices for a private 5G base station and network — including the UNIVERGE RV1200 — for a monthly fee. In this way, the initial costs as well as the

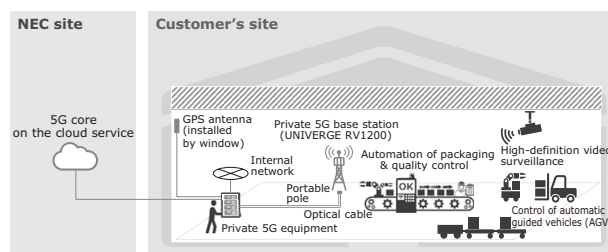


Fig. 4 Image of how the portable trial pack can be used.

overall costs are reduced, and the taxes and insurance premiums on fixed assets are also reduced (Fig. 3).

By utilizing these managed services, we at NEC offer the value of stable operation of private 5G networks while helping to optimize customers' resources and equalizing equipment costs.

4.3 New initiative to make it easy for customers to try private 5G

NEC offers a portable trial package as an initiative to enable customers to experience the value of private 5G by utilizing the compact UNIVERGE RV1200 with its simple configuration. This package includes everything required for the use of private 5G with NEC handling the licensing, providing the equipment and lines, as well as offering support for construction, operations, and maintenance. With the all-in-one trial package, NEC reduces the burden on customers and introduces private 5G in a short period of time. The base station is portable, so customers can move the base station to anywhere in the designated area to conduct various verification tests (Fig. 4).

5. Examples of UNIVERGE RV1200 Usage Scenarios

Three scenarios of using the UNIVERGE RV1200 are introduced in this section. The first scenario is in an office environment (**Fig. 5**). When someone tries to book a meeting room at their company, they sometimes have to give up booking the room because no room is available at the desired time and date. On the actual day, however, it often turns out that the room is not being used in that time slot. This may be a waste of office space and energy that cannot be ignored if you consider the efficiency of office use as well as the time and effort required by the person in charge of coordinating the meeting. When private 5G is used to address this issue, a variety of data — such as entry/exit information from sensors installed in the meeting rooms and usage information obtained from web conferencing services — is re-collected to comprehensively assess the status of the rooms. For example, this makes it possible to automatically cancel room reservations if there is no sign of a meeting starting even after 5 minutes have passed since the reservation's starting time. Private 5G is also suitable for controlling multiple working robots at the same time because it offers stable connectivity even with simultaneous multiple connections. Until now, it has been common to limit the number of robots working at the same time as well as the working envelope of each robot to prevent collisions between robots. With private 5G,



Fig. 5 Next-generation office with IoT x private 5G.

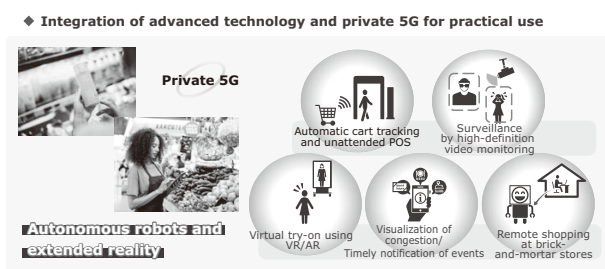


Fig. 6 New wireless platform for shopping.

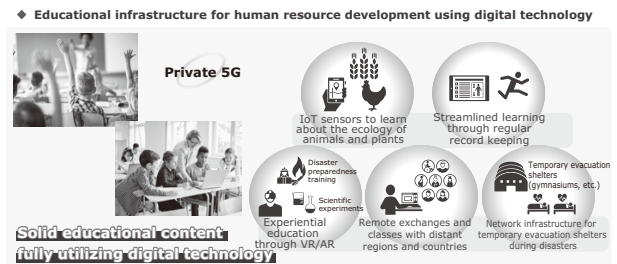


Fig. 7 Digital transformation in education for the digital native generation.

such considerations are no longer necessary. Robots can handle a variety of tasks, such as cleaning rooms and delivering documents in an office. This makes it possible for companies to prepare for labor shortages resulting from declining birthrates and aging populations.

Another scenario is in the retail sector (**Fig. 6**). Retail is one of the areas that has quickly incorporated digital transformation (DX), but this can be further accelerated by using private 5G. For example, unattended POSs (point of sale systems) have become popular, but barcodes still have to be manually scanned. When private 5G is used, however, the checkout items can be recognized by a device attached to the shopping cart and many payment processes can be automated. It is also considered possible to make the carts follow customers as they navigate the store so they can enjoy a hands-free shopping experience. Furthermore, in fashion retail, virtual try-on using virtual reality (VR) and augmented reality (AR) can provide customers with a new experience.

The third area to be focused on in our usage scenarios is education (**Fig. 7**). A significant advancement has been made in educational settings thanks to the Global and Innovation Gateway for All (GIGA) School Program. However, private 5G is considered capable of providing value beyond simply replacing textbooks and notebooks with tablets. For instance, combining private 5G with technology that reproduces the sense of touch when interacting with something makes it possible to offer experiences that were unimaginable before, such as walking on the surface of the moon or touching the skin of a whale while in the classroom. In terms of administration, enhanced security is possible by separating the network into Wi-Fi for students and private 5G for teachers. When efficiency is improved in various areas of schools through digitalization, issues such as teachers' long working hours are also expected to be addressed.

6. Conclusion

In this paper, we introduce the NEC UNIVERGE RV1200 — an all-in-one integrated compact base station for private 5G — and discuss the features of its managed services and usage scenarios. In addition to social issues such as labor shortages due to declining birthrates and aging populations as well as problems in transferring skills along with issues regarding energy and carbon neutrality, the industrial structure is undergoing significant changes, making DX indispensable. Through our initiatives for the implementation of private 5G, we at NEC continue to be committed to providing a comfortable, efficient, and secure work-life environment for everyone, contributing to digital transformation (DX), and endeavoring to create new social value.

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* All other company names and product names that appear in this paper are trademarks or registered trademarks of their respective companies.

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