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New Year Messages

From the Minister for Internal Affairs and Communications, Secretary-General of ITU, President of ITU-AJ

Special Feature

Local 5G Rollout

Co-creation Activities through "LOCAL 5G OPEN LAB"

Opening the Future of Private 5G through Collaboration

Fujitsu's Private 5G Initiatives

Mori Building 5G Plan

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About ITU-AJ

The ITU Association of Japan (ITU-AJ) was founded on September 1, 1971, to coordinate Japanese activities in the telecommunication and broadcasting sectors with international activities. Today, the principle activities of the ITU-AJ are to cooperate in various activities of international organizations such as the ITU and to disseminate information about them. The Association also aims to help developing countries by supporting technical assistance, as well as by taking part in general international cooperation, mainly through the Asia-Pacific Telecommunity (APT), so as to contribute to the advance of the telecommunications and broadcasting throughout the world.

Minister KANEKO's 2022 New Year's Greeting

KANEKO Yasushi
Minister of Internal Affairs and Communications

Happy New Year to all!

In October last year, I assumed the position of Minister of Internal Affairs and Communications.

The Ministry of Internal Affairs and Communications (MIC) handles wide ranging policy related to the daily lives of people in Japan, such as local economies, fire departments, information and communications, the postal system, and statistics. We are putting every effort into accelerating digital reform of all of society, building revitalized communities, and building national resiliency with disaster prevention and mitigation, while also working steadily to realize the "Digital Garden City National Concept," a priority initiative of Prime Minister Kishida.

At the end of last year, a supplementary budget was established, for economic measures based on four main themes. These include initiating a "new capitalism" and ensuring safety and security for all citizens. We will work hard, with a sense of urgency, to advance these initiatives.

Toward digital reform of all of society, we are putting every effort into realizing the "Digital Garden City National Concept," lead by the "MIC Digital Garden City National Concept Promotion Office."

Implementing a digital garden city nation will require the digital infrastructure to be consolidated in all regions, and digitalization of administration.

Initiatives we will work on include full integration of 5G networks (fifth-generation mobile communication systems) in regional and urban areas; promotion of "Local 5G," which will contribute to solving regional issues; consolidation of infrastructure such as optical fiber, which will help revitalize regional areas and reduce the disparity with urban areas; relocation of data centers, which are extremely centralized around Tokyo, in regional areas; and completion of the "Digital Garden City Super Highway," a network that will surround Japan with domestic submarine optical cables.

We will also continue to study information and communication policy, including directions for markets and technical development.

Regarding mobile telephone services, we will continue to build an environment with competition among operators, with initiatives to smooth the transition to lower-cost plans, among others.

To consolidate 5G and other digital infrastructure quickly, we will be studying ways for allocating new frequencies for mobile phone use, including examples from various other countries.

To ensure the efficacy of regulations regarding foreign investment in the information and communications field, MIC will quickly consolidate the necessary regulations, including the final proposals from the upcoming experts meeting, so that foreign-investment compliance conditions can be understood and verified, and so that operators and others can comply with the regulations reliably. At the same time, we will also study the future of broadcasting and broadcasting systems in the digital era, including the rapid changes in broadcasting environments, such as the spread of video viewing over the internet.

To secure a safe and reliable cyberspace, we are increasing efforts to build environments for analyzing cyber-security information and for training personnel, while also promoting security measures taken by telecommunications operators. We are also advancing comprehensive policies to deal with slander and defamation on the internet, promoting platform-operator efforts to delete it, preparing to enact revised regulations on provider responsibilities, and enhancing educational efforts and consultation systems.

We will invest even more into research and development of advanced technologies such as Beyond 5G, which will bring low-power digital infrastructure in the future and also quantum encrypted communication and AI, continuing to bring together public and private knowledge. We will also use the Beyond 5G New Business Strategy Center, comprising industry, government and academia, to obtain intellectual property rights and to promote international standardization.

With changes in the global environment, it is necessary to guarantee Japan's economic security, to strengthen our international competitiveness, and to forge deeper international cooperation.

To achieve these, we will engage in policy dialog to cultivate shared understanding on issues such as the use of AI and circulation of data, and will promote international development of MIC's superior technologies and services such as 5G, submarine optical cables, broadcast content, the postal system, fire-fighting, administrative consultation, and statistics.

Please accept my New Year's greeting, wishing everyone health and great happiness in the coming year!

New Year's Day, 2022

New Year Message from the ITU Secretary-General

—Bringing the Benefits of Digital Transformation to All—

Houlin Zhao
Secretary-General
International Telecommunication Union

Dear Friends of ITU in Japan,

This past year has been full of challenges, from coping with the ongoing COVID-19 pandemic to addressing the increasingly devastating impacts of climate change.

Information and communication technologies (ICTs) have emerged as a powerful source for good, with an unprecedented 4.9 billion people using the Internet in 2021. ICTs have changed our lives and societies forever, but we must never forget all those who remain offline and are still left behind.

The UN Secretary-General himself has challenged the world to achieve affordable, universal connectivity by 2030. It is a huge challenge – one that will require a new strategy for ICT development, especially when it comes to investments in digital infrastructure in underserved areas.

Investment in infrastructure sits at the center of my strategy for ICT development, based on four pillars: Infrastructure, Investment, Innovation and Inclusiveness. I have stressed the importance of these "4 I's" at major global venues with world leaders since the start of the crisis, and I count on all ITU partners in Japan to help carry this vision forward.

I commend the Government of Japan for supporting ITU in its efforts to expand access to affordable and reliable connectivity in some of the least well-connected countries in the response to and aftermath of the pandemic through initiatives such as Connect2Recover. The foundational work of this initiative on data, resilience and policy will help support other landmark initiatives like Giga, the joint ITU-UNICEF global initiative to connect every school to the Internet by 2030.

All these initiatives harness the power of ICTs and emerging technologies ranging from AI to 5G to accelerate progress on the UN Sustainable Development Goals (SDGs) and address humanity's most pressing challenges. As a long-established global source of ICT innovation and a leader in important areas of ITU's work, Japan has a prominent role to play in this endeavour.

I applaud Japan's mobile operators for accelerating their 5G roll out since the start of 2021. ITU plays a central part in the development of 5G mobile networks by both managing the radio spectrum and developing globally applicable standards for International Mobile Telecommunications (IMT), such as the detailed specifications of the terrestrial radio interfaces of IMT-2020 published by ITU in February 2021.

The year ahead will be a big year for ITU and the world of ICT, with the World Telecommunication Standardization Assembly, the World Telecommunication Development Conference and the ITU Plenipotentiary Conference 2022 all being held in the span of a single year. I am confident that Japan will take an active part in these conferences and in bringing the benefits of digital transformation to all.

I thank the Government of Japan for its role in the development of ICTs and its significant financial support to ITU, as well as the many Japanese companies that are Sector Members of ITU and our Japanese Academia Members for providing ITU with valuable technical expertise.

As 2021 marked the 50th anniversary of the ITU Association of Japan, we at ITU are grateful for the continued support we have received from ITU-AJ and look forward to what this partnership will bring for the next 50 years to come.

Wishing you all a healthy, peaceful, and happy New Year!

Welcoming in the New Year

Tetsuo Yamakawa
President
The ITU Association of Japan

Wishing Everyone a Very Happy New Year!

As we look back on 2021, we can see that the number of COVID-19 cases in Japan began to drop from early autumn, bringing some relief to society. From here on, we must keep a close watch on social trends, but we can assume that the "with-corona" lifestyle brought on by the widespread use of teleworking, online meetings, and webinars will continue thanks to the distinctive features of these formats. I expect 2022 to be an outstanding year filled with new trends and lively activities using information and communications technology (ICT).

Looking back at last year's International Telecommunication Union (ITU) and Asia-Pacific Telecommunity (APT) meetings and events that the ITU Association of Japan (ITU-AJ) was involved in, many were postponed or held online.

At ITU-AJ, we held the 50th Anniversary Ceremony of The ITU Association of Japan in an online format on September 1, 2021. This ceremony included the presentation of various awards. Mr. Yoshio Utsumi was presented with the MIC Minister's Award and ITU-AJ 50th Anniversary Honor Award, and Dr. Yasuhiko Ito, Dr. Akira Hashimoto, and Mr. Makoto Miura were presented with the MIC Minister's Award and ITU-AJ 50th Anniversary Special Award. In addition, 11 individuals were presented with the ITU- AJ 50th Anniversary Commemorative Award and 3 individuals were presented with the ITU-AJ Special Achievement Award. I extend my congratulations to all award winners! Then, in the second half of the ceremony, we held an online panel discussion with Mr. Houlin Zhao, Secretary-General of ITU, Mr. Masanori Kondo, Secretary General of Asia-Pacific Telecommunity, and Mr. Yasuo Tawara, Director-General of Global Strategy Bureau, MIC.

Continuing on, "Celebration of World Telecommunication and Information Society Day" postponed from May was held on November 30, 2021 at the Keio Plaza Hotel and distributed online. At this event, Mr. Yoichi Maeda (Telecommunication Technology Committee), who has long been involved in international standardization activities at ITU and APT, was presented with the MIC Minister's Award, and the Fight against COVID-19 using Fugaku: Droplet Simulation Project Team (representative researcher: Makoto Tsubokura, RIKEN) at RIKEN was presented with a Special Award. In addition, 9 individuals were presented with the Achievement Award and 16 individuals and 4 groups were presented with the Encouragement Award. Congratulations to one and all!

This year, we can expect commercial services of the fifth-generation mobile communications system (5G) to expand and evolve. Hopes are high that ICT technologies including 5G will help solve social problems and drive a quantum leap toward Society 5.0. At the same time, there is a need for awareness-raising activities about carbon neutrality as a global movement.

In relation to ITU, the World Telecommunication Standardization Assembly (WTSA) is scheduled to be held in March 2022 and the World Telecommunication Development Conference (WTDC) in June 2022. Then, in September and October, the ITU Plenipotentiary Conference will be held in Romania making 2022 a milestone year indeed. This is a truly important meeting since Japan will be backing Seizo Onoe, Chief Standardization Strategy Officer (CSSO) at NTT, as a candidate for director of the ITU Telecommunication Standardization Sector (ITU-T). Based on our experiences to date, ITU-AJ will continue to provide flexible support for ITU and APT meetings and events while collaborating with all concerned.

I would like to extend my appreciation for the support given by many to ITU-AJ over many years. Going forward, we will enhance our efforts in building a strong bridge between the ITU on one side and the Japanese government and our supporting members on the other.

In closing, I would like to pass on my sincere wishes to everyone for a healthy and prosperous New Year.

Guests and Award Winners

Co-creation Activities through "LOCAL 5G OPEN LAB"

Norikazu Watanabe
New Business Development Headquarters
NTT East

1. Introduction

"Local 5G" refers to 5th Generation of Mobile Communication System (5G) that can be constructed and used in a flexible manner by a variety of entities according to regional and individual industrial needs[1]. It is anticipated that Local 5G will be used in regions in which 5G coverage by mobile operators cannot be provided anytime soon and be used in new ways by exploiting the 5G features of high-speed, large-capacity communications, wide-area coverage, etc. compared with Wi-Fi.

Given the expanding use of mobile devices such as smartphones, NTT East has been providing private network services including Wi-Fi to corporate customers since 2011. It has so far introduced more than 200,000 Wi-Fi access points as part of its "Giga-Raku WiFi" service. It is also promoting the construction of "Low Power Wide Area (LPWA)" networks such as LoRa and Enocean in fields that need wide-area coverage such as agriculture and river monitoring by local governments.

Local 5G is also expected to be used as a private network for corporate customers, and NTT East aims to provide a lineup of Local 5G end-point solutions for needs that have so far been difficult to satisfy by Wi-Fi or similar services.

This article introduces examples of co-creation activities between NTT East and various partners centered about "LOCAL 5G OPEN LAB," which has been working on various projects since the Japanese government began accepting applications for licenses to operate Local 5G.

2. LOCAL 5G OPEN LAB

2.1 Background to establishment

Local 5G is expected to meet the latent needs[2] of users and regional companies with no specialized knowledge of wireless or network technologies. On the other hand, barriers to its use are not necessarily low given the need to obtain an operating radio license at the time of implementation and to procure equipment that has yet to drop in price. Against this background, NTT East and The University of Tokyo (Nakao Research Laboratory) jointly established "LOCAL 5G OPEN LAB" in October 2019 as Japan's first industry-academia joint demonstration environment with the aim of demonstrating Local 5G use cases in which local governments and companies can openly participate[3]. Then, in February 2020, NTT East concluded a collaboration agreement with the Tokyo Metropolitan Government and The University

Figure 1: Overview of LOCAL 5G OPEN LAB

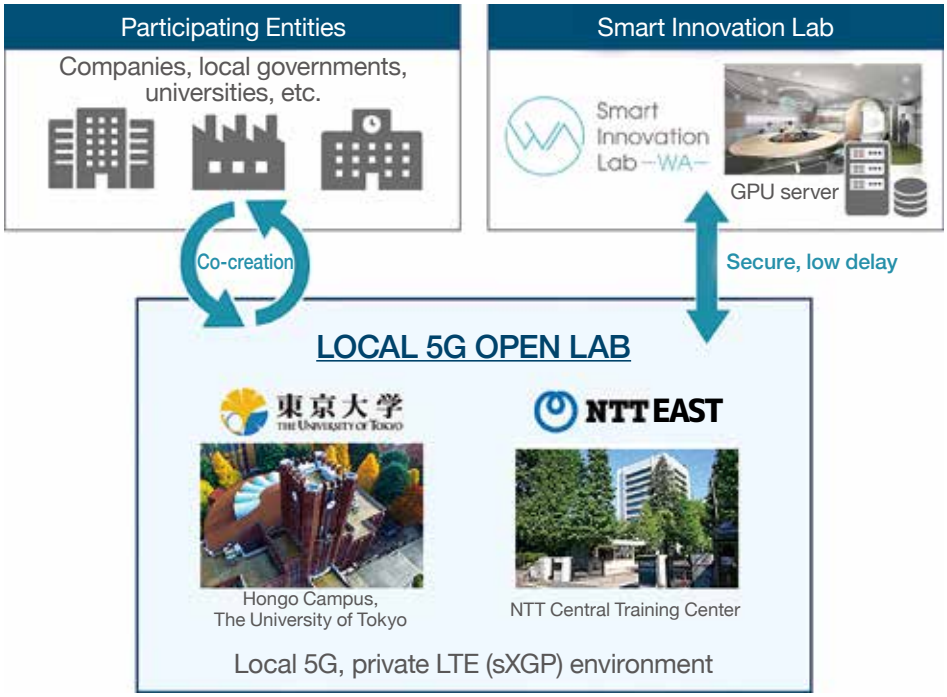
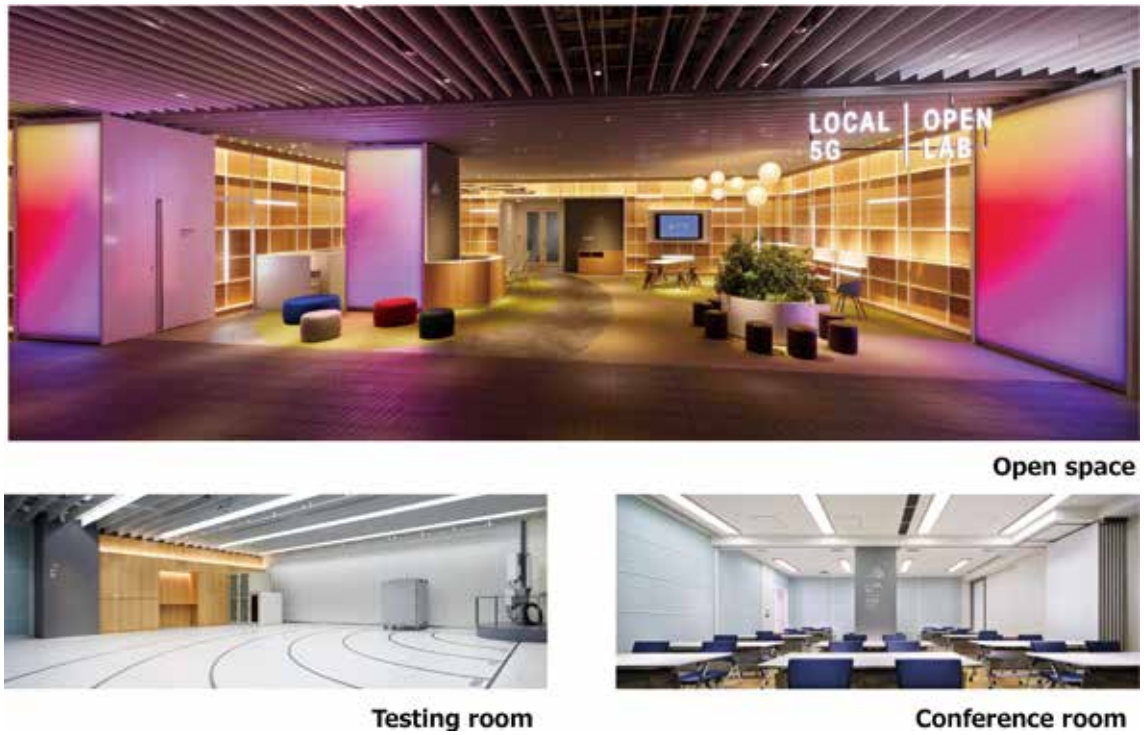


Figure 2: Interior of LOCAL 5G OPEN LAB



of Tokyo on deploying and using Local 5G environments[4]. This agreement marked the beginning of research and testing at LOCAL 5G OPEN LAB and elsewhere with the aim of revitalizing industry and fostering innovation.

By the end of 2020, LOCAL 5G OPEN LAB had held discussions (including tours of facilities) with over 100 local governments and companies on the holding of demonstrations. In this article, we provide an overview of the same facilities and take up to two examples of demonstrations centered about collaborations with the Tokyo Metropolitan Government.

2.2 Demonstration environment (as of December 2020)

At LOCAL 5G OPEN LAB, a demonstration environment has been set up for multivendor systems supporting a millimeter-wave frequency band (28.2 – 28.3 GHz), which was systematized in December 2019. Going forward, there are plans to support systems using the Sub6 (4.7 GHz) band launched in December 2020. Specifications for this demonstration environment as of December 2020 are given below.

○ Testing room
Provides a closed testing space about 100 square meters in size; equipment may be carried in.
- Local 5G non-standalone (NSA) (28.2 GHz – 28.3 GHz band)
- Local 5G-supporting terminals (customer premises equipment (CPE))
- Shield box (anechoic chamber)

○ Open space
Provides individual booths for concentrating on work as well as co-working space and solutions exhibition space

○ Conference room
Provides space for meetings after testing, for consultation purposes, etc.

○ Collaboration with Smart Innovation Lab
LOCAL 5G OPEN LAB works with Smart Innovation Lab, a joint demonstration environment having GPU resources, towards the social implementation of AI and IoT technologies.

3. Examples of Collaborative Projects with Partners

3.1 Collaboration with Tokyo Metropolitan Industrial Technology Research Institute

Tokyo Metropolitan Government, The University of Tokyo, and NTT East have entered into an agreement on the use of Local 5G. In June 2020, the Tokyo Metropolitan Government began to acquire licenses for Local 5G base stations for use by local governments, and in October 2020, set up a Local 5G environment in a millimeter-wave band at Tokyo Metropolitan Industrial Technology Research Institute (TIRI). TIRI supports the social implementation of cutting-edge technologies with a focus on small and medium-sized enterprises and promotes the digital transformation (DX) of society. As a public testing/research laboratory, it was the first in Japan to set up Local 5G base stations to provide comprehensive support for using Local 5G, robotic

Figure 3: Overview of "Collaboration Agreement on Deploying and Using Local 5G Environments"

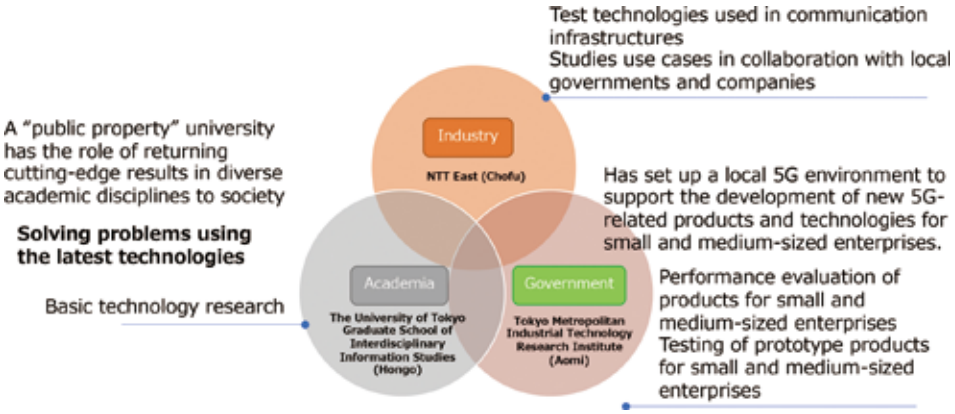


Figure 4: Demonstration environment at Tokyo Metropolitan Industrial Technology Research Institute

Figure 5: Test site at LOCAL 5G OPEN LAB

technologies, and IoT technologies[5].

Going forward, the plan is to create use cases that give 5G functions to robots, IoT technologies, etc. and to support performance evaluations of developed products such as 5G-compliant devices.

3.2 Collaboration with Tokyo Development Foundation for Agriculture, Forestry, and Fisheries

In the area of primary industries, NTT East has entered into a three-party collaboration with the Tokyo Development Foundation for Agriculture, Forestry, and Fisheries, a public-

interest incorporated foundation and policy-linked body of the Tokyo Metropolitan Government, and NTT AgriTechnology Corporation, a company specializing in "agriculture × ICT," with the aim of implementing cutting-edge agriculture using Local 5G[6].

This collaborative project aims to achieve high-quality and efficient activities by using ultra-high-definition cameras, smart glasses, and autonomous driving robots to perform remote monitoring and support to enable remote farming in place of support activities that have traditionally been provided by agricultural instructors in the field. In the future, moreover, we can envision optimal support of farm operations based on data. This may take the form of diagnosing growing conditions as well as disease-and-pests conditions from collected video or displaying real-time information using smart glasses.

In December 2020, a test site connectable to the 5G system of LOCAL 5G OPEN LAB was constructed and demonstrations using millimeter waves began.

4. Conclusion

Local 5G is expected to meet regional needs and individual industrial needs, so there is a particular need for co-creation activities with partners that are facing such latent needs. Against this background, we presented examples of co-creation between NTT East and diverse corporate partners centered about LOCAL 5G OPEN LAB.

To further promote co-creation activities with even more partners at LOCAL 5G OPEN LAB as an open site for demonstrating Local 5G technologies, the plan is to expand support to Sub6 (4.7 GHz) band environments and multivendor, outdoor demonstration environments as the need arises.

Moreover, in addition to LOCAL 5G OPEN LAB, NTT East is managing co-creation facilities that have the potential of regional revitalization. These include "eXeField Akiba," an Esports facility of NTTe-Sports, NTT AgriTechnology's "own farm" in Yamanashi Prefecture in Japan, and a cultural facility of NTT ArtTechnology. We aim to link these facilities with LOCAL 5G OPEN LAB and establish a system that can provide a range of services from administration to Local 5G technologies in a one-stop manner. In this way, we hope to accelerate initiatives toward the implementation of Local 5G in society.

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Figure 6: Outlook for LOCAL 5G OPEN LAB

Opening the Future of Private 5G through Collaboration
Fujitsu's Private 5G Initiatives

Takashi Kanda
Executive Director
5G Vertical Service Office, Fujitsu

1. Introduction

Private 5G in Japan is currently in an introductory period, but with the institutionalization of private 5G in December 2020 together with increasing recognition and an increasing number of system launches, it looks to be entering a growth period. To this end and to broaden the type of use cases in which private 5G can be effective, many demonstrations using 5G have come to be performed such as "Development Demonstrations for Realizing Local 5G Services to Solve Local Issues"[1]. In the case of 5G, there are an extremely large variety of use cases and devices targeted for connection, and it is expected that 5G systems and services, in addition to being evolved forms of current systems and services, will break new ground and drive an increase in totally new communication scenarios. In particular, the construction of a system using private 5G will require a proposal for a comprehensive solution[2]. This will involve, for example, the construction and rollout of a high-reliability network with a level of performance optimal for the target use case and business scheme as well as the use of an advanced data center and cloud for using 5G functions to the fullest at the system level.

In this article, section 2 describes the institutionalization of private 5G in December 2020, section 3 explains the need for comprehensive solutions in the implementation of private 5G, and section 4 and later sections introduce a "partnership program" in which Fujitsu and partner companies integrate their respective know-how and products/services into systems with the aim of solving corporate and social issues.

2. Institutionalization Revision of Private 5G

Private 5G was first institutionalized with a partial frequency band (28.2 – 28.3 GHz) in December 2019[3]. Then, to support a variety of private 5G needs, an institutional revision was made including an expansion of private 5G frequency bands in December 2020[4].

Compared with the previously institutionalized millimeter-waveband, the added Sub6 band features a wide communication range robust to physical obstacles. The Sub6 enables early system construction using either a 4G-based non-standalone (NSA) system with Sub6 serving as an anchor for control signals or a standalone (SA) system using only 5G signals. This approach minimizes the number of devices needed to build a system and simplifies system construction, operation, and maintenance.

Main institutional revisions to private 5G including this Sub6 band addition are summarized below.

- Addition of Sub6 band (4.6 – 4.9 GHz)
- Expansion of millimeter-wave bandwidth (28.3 – 29.1 GHz)
- Use of another's ground (added to use of one's own grounds under certain conditions)
- Addition of anchor band (1.9 GHz)
- Simplification of modification procedures
- Addition of asynchronous/semi-synchronous operation

This new institutionalization of private 5G went into effect on December 18, 2020 and the acceptance of license applications for these expanded private 5G frequency bands commenced on the same day. Applicants included manufacturers, regional communication operators, universities, and regional public bodies[5]. Fujitsu also submitted license applications for its in-house developed Sub6 SA system and for millimeter-wave frequency-band expansion at multiple bases including Fujitsu manufacturing plants.

At the Fifth Generation Mobile Communication Promotion Forum (5GMF)[6], the Regional Utilization Promotion Committee where I serve as deputy chairman has created and released a manual that details the procedures involved in applying for private 5G licenses with a focus on participating companies[7]. The latest version of this manual reflects the institutionalization of private 5G in December 2020.

3. Need for Comprehensive Solutions

Fujitsu received Japan's first commercial private 5G license from the Kanto Bureau of Telecommunications, Ministry of Internal Affairs and Communications (MIC) in March 2020[8] and begin operating a private 5G network at its Shin-Kawasaki Technology Square office (location: Kawasaki City, Kanagawa Prefecture)[9]. With this network, Fujitsu will implement crime-prevention measures in the building by using private 5G to transmit high-definition video collected by multi-point cameras and analyzing various types of human behavior by AI thereby achieving a security system that can detect suspicious behavior early. System configuration is shown in Figure 1.

A surveillance system of this kind requires the construction of a system that can perform detection through video and data collected from on-site high-definition cameras and a variety of sensors, accurately determine on-site conditions by analyzing that video and data, and immediately feed back analysis results to that site. It is important here that the 5G features of high speed and large capacity, low latency, and massive connectivity be used to the maximum as needed in a flexible manner. However, a high-performance surveillance system cannot be achieved by providing 5G support for only base stations and terminals. In other words,

Figure 1: Configuration of security system using private 5G

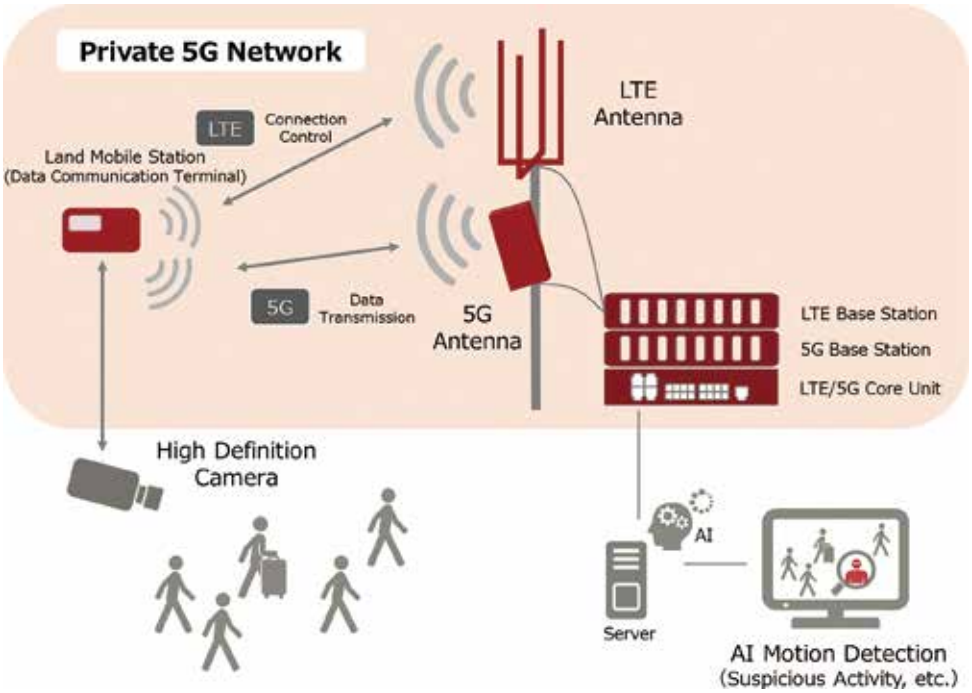

Figure 2: Fujitsu Collaboration Lab

a comprehensive combination of technologies is essential, such as digitalizing real-world information at "sensors," converting that information to value by "AI," and connecting that value by "5G" while ensuring "security." Linking technologies in this way has the potential of creating new work styles never before imagined and revolutionizing not only the means of doing business but business itself.

4. Private 5G Partnership Program

Putting technology to practical use while co-creating with diverse partners and fostering innovation is an important key to solving a variety of social issues. To this end, Fujitsu has established a "Private 5G Partnership Program"[10] to integrate solutions based on the knowledge and products/services of Fujitsu and its partner companies and "Fujitsu Collaboration Lab"[11] (Figure 2) (location: Kawasaki City, Kanagawa Prefecture) as a facility for verifying those solutions.

In this way, Fujitsu is providing private 5G network technology and a wide range of industry know-how at the program's site to create and realize private 5G use cases together with partner companies possessing advanced technologies. Support is also provided for implementing use cases at customers' sites. In addition to testing connections to a private 5G network, participants in the Private 5G Partnership Program can create

solutions that include devices and applications of partner companies and propose solutions to specific problems. The Private 5G Partnership Program consists of the following two subprograms:

(1) Connection verification program
(2) Solution co-creation program

4.1 Connection verification program

This program verifies interoperability between Fujitsu's network and products to be connected to a private 5G network. The testing consists of connection verification and performance tests, and determining the actual items to be tested according to the types and specifications of target devices (which may include a variety of sensors, cameras, unmanned vehicles, and IoT gateways) is included. Fujitsu is testing private 5G terminals in collaboration with Japanese and overseas partner companies with the support of communications chip manufacturers and is working on expanding the lineup of private 5G terminals that currently come in only a few types.

4.2 Solution co-creation program

This program drives business innovation and co-creates solutions to problems faced by companies and society using private 5G by integrating Fujitsu's network technologies and wide range of industry know-how with the products, services, and advanced technologies of partner companies. It features the following three components.

(1) Collaborative study of co-created solutions

Performs collaborative studies of solutions based on the devices, private 5G, applications, knowledge, etc. brought by each company participating in the Private 5G Partnership Program

(2) Tests and demonstrations of co-created solutions

Performs technical tests of collaboratively studied solutions within a private 5G network environment

(3) Collaborative demonstrations and proposals

Performs collaborative demonstrations and proposals with respect to studied solutions for companies and local governments that are contemplating the introduction of private 5G.

5. Fujitsu Collaboration Lab

This section introduces Fujitsu Collaboration Lab as a facility for co-creating solutions using private 5G and verifying connection with a variety of devices.

The private 5G network presently being used at this facility is configured with a NSA system consisting of millimeter-wave 5G and 2.5-GHz-band 4G and a Sub6 SA system as well. In addition to private 5G network equipment, Fujitsu Collaboration Lab provides a variety of measuring instruments and monitors as well as the equipment and materials needed for reproducing a pseudo environment for radio-wave propagation. These provisions enable the construction of a test environment corresponding to the target usage scenario. The facility is also equipped with 4K cameras and other devices that enable testing using the "transmission of high-definition video" based on the private 5G feature of stable, large-capacity communications (Figure 3). There is also a space for conducting tests with partner companies and a working area for development work and meetings, all of which facilitate connection verification and solution co-creation.

6. Example of Solution Co-creation

This section presents an actual example of solution co-creation. In this example, Fujitsu collaborated with Microsoft Japan Ltd. to verify the effectiveness of a system that uses private 5G to visualize data within a manufacturing site in real time with a view to the digital transformation (DX) of manufacturing sites[12].

Using Fujitsu's private 5G network at the Fujitsu Collaboration Lab, this system analyzes high-definition video of people, unmanned vehicles, etc. moving within the facility and operating data obtained from cameras, mobile terminals, servers, and other devices on an edge-computing platform. It also performs unified visualization of human behavior, the control of unmanned vehicles, and equipment operating conditions on industry applications. Integrating private 5G with edge computing and a cloud system in this way achieves a system optimized for network and application processing loads.

Figure 3: Connection verification environment

6.1 Purpose of test

The purpose of this test was to verify the usefulness of a private 5G use case envisioned for manufacturing sites and the effectiveness of a system that integrates edge computing using private 5G and a cloud system.

- Verify the effectiveness of integrating a private 5G network with an edge-computing platform and cloud system
- Achieve video analysis and real-time processing through edge computing
- Achieve uniform management of site equipment and information on the cloud

6.2 System overview

System overview is shown in Figure 4. In this test configuration, the system uses edge computing to perform AI analysis of large-capacity video data with the aim of achieving "real-time sensing by high-definition video analysis" using private 5G. It also implements a cloud-linking function for visualizing the analyzed real-time data, performing a statistical analysis on that data, and linking analyzed data between sites. The system includes a distribution function for edge servers to support version upgrades of AI functions.

(1) Transmit high-definition video capturing the movements of people and unmanned vehicles and operating data obtained from mobile terminals, servers, and other devices to edge computing via private 5G

(2) Perform video analysis by AI of the movements of people and unmanned vehicles on the edge-computing platform and use the results of analysis to perform remote control (Figures 5 and 6)

(3) Transfer analyzed data to the cloud system

Figure 4: Test configuration of system integrating private 5G, edge computing, and cloud

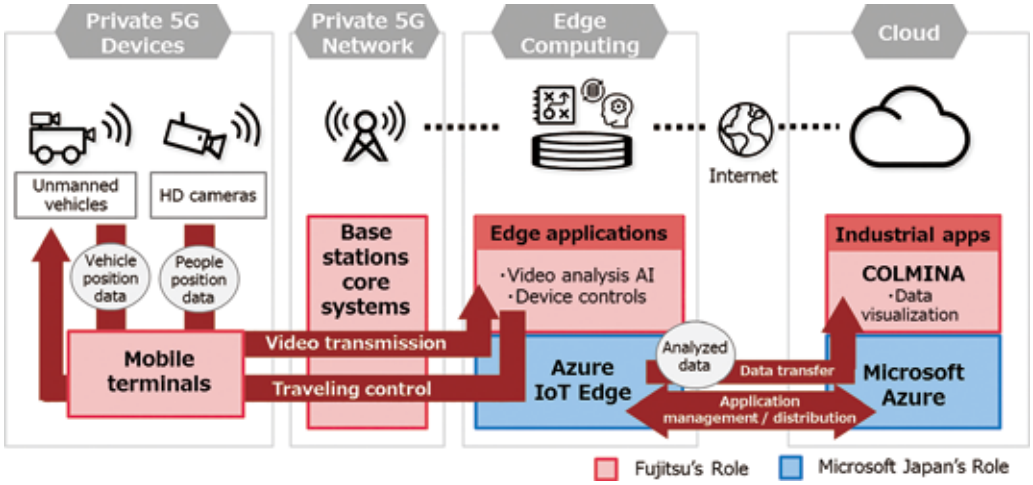

Figure 5: Joint testing of high-definition video analysis using edge computing

Video analysis (edge computing) Testing work

Figure 6: Joint testing of unmanned vehicles using edge computing

Video analysis, position detection (edge computing)

Prototype of unmanned vehicle equipped with a camera and 5G communication module

Figure 7: Dashboard display screen (cloud)

(4) Coordinate business applications on the cloud system and visualize the accumulated analyzed data (density of people, positions of unmanned vehicles, paths of movement, operating conditions of high-definition cameras, mobile terminals, servers, and other devices within the site) on a dashboard (Figure 7).

(5) Manage the versions of edge applications such as AI-based video analysis on the cloud system and distribute applications to edge computing.

6.3 Test results

We achieved a system optimized for network and application processing loads by integrating private 5G, edge computing, and a cloud system. This confirms that the system is effective for operating unmanned vehicles and performing remote monitoring/control using high-definition video as envisioned for manufacturing sites.

At Fujitsu's Oyama plant (location: Oyama City, Tochigi Prefecture), a manufacturing base for Fujitsu network equipment, Fujitsu is working with Fujitsu Telecom Networks Limited, which is involved in the manufacturing of this equipment, to test the utility of products and systems tested in the Private 5G Partnership Program. Here, the plan is to test support for work procedures and the running of unmanned vehicles using high-definition video and AI.

7. Conclusion

This article explained the need for comprehensive solutions toward the use of private 5G and described a partnership program now in progress.

Looking to the future, we can expect private 5G to undergo a wide rollout to solve a variety of issues and to be widely used in projects to provide support for solving both corporate and regional issues. Through its partnership program, Fujitsu seeks to contribute to the solving of diverse social issues by engaging in co-creation activities with a wide range of partners and combining Fujitsu and partner technologies in an integrated manner.

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Cover Art

Kyotomeishonouchi Gionsha Secchiyuu (Gion Shrine in Snow)

Utagawa Hiroshige (1797~1858)

Collection of the Art Research Center (ARC)
Ritsumeikan University
Object number: arcBK06-0013_012

Mori Building 5G Plan

Soichi Watanabe
Director
eHills Corporation

1. Communication as urban infrastructure

Cities are formed according to the major types of infrastructure of the era. The major infrastructure contributing to the structure of modern cities is roadways. This is so obvious that modern people are scarcely aware of the fact that all homes face a roadway and people and goods move on these roadways, which support people's lives and activities in cities. In the outskirts of cities throughout Japan, all kinds of shops can be seen along main roadways.

Another infrastructure supporting cities is railways. Rail lines stretch across major cities like a mesh and help to move people, even in medium-sized cities. Railways were the main type of urban infrastructure in Japan before automobiles became widespread in the late 1960s and early 1970s. There were railway stations in the center of cities where people would gather, with department stores and shopping areas nearby. When automobiles become widespread, the weight of urban infrastructure shifted from railways to roads, and shopping centers and other commercial facilities in inner cities began to suffer while shopping centers began to flourish in suburban areas.

For a long time before railways appeared, a main infrastructure supporting cities was not railways or roads, but waterways. Evidence that waterways were a primary type of infrastructure for towns can be seen throughout Japan. Let's look at two examples.

Figure 1 shows an Edo period riverside fish market near what is now Muromachi1-chome in Nihonbashi, Tokyo. Shops lined the sides of the waterway, and many boats came and went carrying goods. Such scenes continued until World War II. In Edo towns, waterways were heavily relied upon for the distribution of goods, so they were lined with many stores. Tokyo's waterways have since fallen into the background, but they were firmly at the forefront during the Edo period.

Figure 1: Late Edo period riverside fish market (near current Muromachi 1-chome, Nihonbashi Tokyo). From "Famous Places in the Eastern Capital: *True View of Nihonbashi Bridge, Together with a Complete View of the Fish Market (Nihonbashi shinkei, narabi ni uoichi zenzu), from the series Famous Places in the Eastern Capital (Tôto meisho)*

The other example that waterways played an important role as infrastructure is Itsukushima Shrine (Figure 2), which is a UNESCO World Heritage Site.

Figure 2: Itsukushima Shrine

Itsukushima Shrine, said to have been built during the era of Empress Suiko in around 600 AD, is famous for its "floating" torii gate. The torii gate is on the approach to the front of a shrine, and its location in the sea meant that the waterway was the formal entrance to the shrine and therefore the formal approach for worshipping was done by boat. The reason for worshippingby boat can be understood by looking at the local shipping routes at the time (Figure 3).

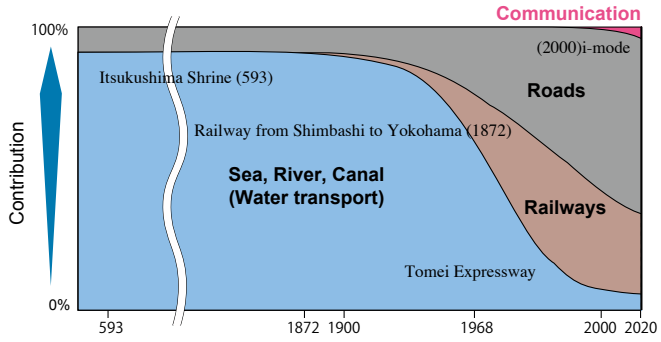
Figure 3: ajor shipping routes of Inland Sea during Tenpyo Era (around 750 AD). Based on "Ancient states and transportation on Seto Inland Sea," Hironobu Matsubara, 2004.

At the time, the inland sea was a major artery for the movement of people and goods, connecting ancient Nara, the Chugoku, Shikoku and Kyushu regions, and even the Korean peninsula.

In current terms, it was equivalent to an expressway. Ships traveled this "expressway," so the location of Itsukushima Shrine on this important route was like a service center on a modern expressway, which is why passing ships would stop to visit the shrine.

As such, waterways constituted the main infrastructure for cities from the Asuka era through Edo and into the Meiji era, but this role gradually shifted to rail during Meiji and then began shifting to roads in the Showa era. This is illustrated in Figure 4.

Figure 4: Rates of contribution to urban infrastructure



Telecommunications appeared as infrastructure in the 1990s, and we can now see now how communication infrastructure has impacted cities. From the time when telecom carrier DOCOMO launched its i-mode mobile internet service in Japan in the late 1990s, the purchase of goods through the internet has increased continuously. According to Japan's Ministry of Economy, Trade and Industry, sales of goods through the internet in 2018 reached one billion yen, or over half the sales volume of department stores and supermarkets (1.94 billion yen).

Before sales became possible through the internet, people made purchases at physical stores, which made such stores absolutely necessary. This is not necessarily the case now, and as a result, physical stores, including commercial areas around train stations and in suburbs, have begun to decline. This is resulting in changes in the structure of cities, including the further decline of commercial facilities around train stations and the thinning-out of suburban shopping areas.

2. Infrastructure's impact on city formation

So far, we have examined changes in urban infrastructure, including waterways, rail, roads and telecommunications, but the impact of telecommunication on cities is very different from that of waterways, roads and rail, so it is expected to greatly change the direction of city formation.

Waterways, rail and roads are infrastructure for transporting physical things, including people and goods. Of course, information is also transported by people, but this is a secondary effect.

Telecommunication is very different because it moves information entirely independently of a physical process, and this has exactly the opposite effect on cities. Moving physical things efficiently requires reduction of distances and time, which results in the formation of more centralized and highly concentrated cities. Centralizing everything as much as possible increases efficiency. Conversely, rather than concentrating information in one place, efficient transmission of information is achieved through sharing. Information is more efficient when people share the same information, and having information in only one place is not efficient. The effect on city formation is decentralization, which is opposite to the effect of waterways, rail and roads (Figure 5).

Figure 5: Effects of urban infrastructure

Urban Infrastructure	Transport Items	Measure of Efficiency	City formation
Roads	People	Efficiency = Concentration Reduction of travel Distance Reduction of travel Time	Centralization
Rail	Goods		
Waterways	Information		
Telecom	Information	Efficiency ≠ Concentration ≒ Sharing	Decentralization

Until now, this effect has not been particularly striking or noticeable to people, but the COVID-19 pandemic instantly brought it to the forefront. Before COVID-19, people were aware of the ideas of telework and web meetings, but few had any opportunity to actually participate in such activities, nor did they think that such methods were truly practical. Now, telework and web meetings have permeated society in one fell swoop, prompted by COVID-19. The immediate switch to telework is evidence that telecommunications as infrastructure has permeated society, but telework itself has also changed the way people think about where to live. It has created the possibility of being decentralized in suburbs or other regions rather than being centralized in cities, unlike in the recent past. With fewer commutes into the city and more time spent at home, employees are beginning to focus more on the quality of their home environments and less on their commute times. As a result, people are considering moving to the suburbs or regional communities where they can live in better environments with roomier homes. In fact, according to the Report on Internal Migration in Japan from the Ministry of Internal Affairs and Communications' Statistics Bureau, people began moving out of the 23 wards of Tokyo around May 2020 and since that August, almost 5,000 people per month have been exiting cities. The most popular destination has been Kanagawa Prefecture, south of Tokyo, followed by Saitama Prefecture, north of Tokyo.

Similar trends have been observed overseas, such as reports of homes with gardens outside of London becoming more popular.

However, it does not mean that this trend will persist and people will continue to move out of large cities, making cities decline further. Humans exist in the physical world, so urban infrastructure, including roads and railways, will remain essential and focused on centralization. In the future, therefore, the forces of centralization and decentralization can be expected to compete and over time they likely will reach some form of equilibrium.

3. What is required of communication?

Telecommunications now occupies an important position as urban infrastructure, but it has come upon the scene relatively recently and its functionality has not necessarily reached its full potential yet. In fact, the current functionality and capabilities of telecommunication are said to be inadequate.

Urban infrastructure, including waterways, rail and roads, share the essential role of distributing goods. Waterways transport large volumes of goods over long distances, rail transports large numbers of people at high speed, and roadways transport smaller numbers of people and goods but with the flexibility to reach locations that waterways and rail cannot. As such, the combination of these three types of infrastructure meets various types of demand. With telecommunications, however, relatively few types of service are available to users and the services themselves do not differ among mobile carriers. If a user wants to utilize telecommunication in an uncommon way, the options are very limited.

As an example, many people have experienced the problem of unstable communication when engaged in telework or a web meeting. During COVID-19, people have been taking part in web meetings increasingly more often, and anyone who has done so will have surely experienced someone in a meeting losing their connection or their image freezing. Of course, a large part of this is the communication bandwidth of the service being used, but basically it is a problem of speed. Generally, communication is provided with speeds on the uplink (transmitting/uploading) and downlink (receiving/downloading) in a ratio of roughly 1:2, with priority given to the downlink. This is because when people use the internet, they generally look at websites or video, so priority is given to the downlink. This is how communication environments are configured at present. For a web meeting, users are also transmitting video of themselves, so a speed ratio of 1:1 would be desirable, but carriers do not offer such a choice and users are left with only 1:2 services.

Next, let's consider the growing use of sensors and other IoT devices in production sites. In facilities such as plants and factories, IoT devices for measurement and control are being installed to increase production efficiency, but wireless communication systems are not optimized for this task. Installing optical or other cables would be the most reliable method, but most factories are large and various locations must be tested before deciding where to install IoT devices, so costs and time make cables impractical. With Wi-Fi, however, latency cannot be guaranteed and communication can be interrupted when there is congestion. Also, on-site IT specialists are needed to maintain security at all times, but this is not practical for most companies. There are carriers that provide guaranteed latency and high-security communication, but these are expensive. In the end, there is no practical choice.

Meanwhile, telecommunications services currently provided to homes and industrial buildings such as factories do not offer the necessary range or types of functions essential for serving as basic infrastructure.

Services that can overcome such limitations include local LTE (4G) and local 5G. In particular, local 5G provides the capabilities required by industry, including ultra-high speed, low latency and massive simultaneous connections. It also offers strong security through the use of changeable SIM cards. Further, users can flexibly realize desirable communication environment with the use of advanced technologies such as slicing.

Telecom carriers now fulfill the role of seamlessly connecting the entire country, similar to waterways, rail and highways. If local 5G could handle the last mile from main lines to homes, enabling users to freely configure various services, telecommunications will be able to guarantee the functionality and freedom required to be considered a genuine urban infrastructure.

4. Local 5G and Mori Building

As shown, local 5G is a technology capable of supporting and even transforming activity in cities, as urban infrastructure. Mori Building is now considering deploying local 5G to create communities where people living and working in cities will be able to enjoy tremendous convenience in their lives and work.

Communication nodes linking telework and satellite offices

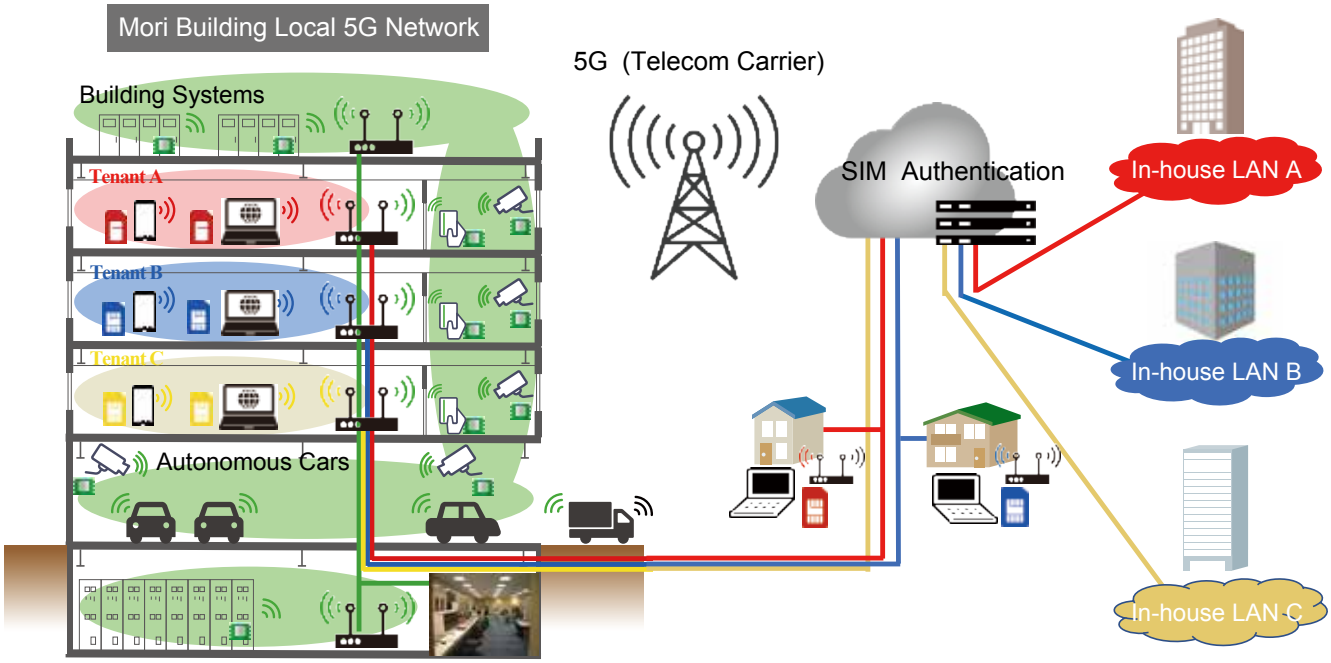
Whereas the COVID-19 pandemic is expected to wind down eventually, we have seen that telework is possible in a practical sense, so it is expected to continue to be used. That said, this does not mean that offices in city centers will disappear. But how this new form of telework will be integrated with existing ways of working in offices will need to be considered carefully.

Part of the challenge will be to provide opportunities for "five-sense" communication, something that has been diminished by telework. With telework, it is difficult to feel beyond words, with all five senses, as we can when communicating with someone in person face to face. Subtle nuances, such as atmosphere, gestures and even handshakes, can be lost in digital communication. It is said that in enterprises, new business ideas often arise in lively discussions among people in a room or during idle talk among colleagues. In the future, there will be a need for the kind of five-sense communication that is possible when people gather in a downtown office but not during telework. Mechanisms and environments to make this happen will be needed.

One prerequisite for this will be communication nodes with the functionality to enable work and communication to proceed smoothly and securely between offices, satellite offices and telework locations (Figure 6).

Advanced security is necessary when handling important corporate information at homes, satellite offices and other external locations. Network management departments in every enterprise

Figure 6: Mori Building local 5G overview



make use of various technologies to maintain security, but when employees use these systems off-premises, as with telework and satellite offices, it can be practically impossible to manage all cases. It is also difficult for employees working externally to perfectly perform the many and often complex security procedures required. As such, it is becoming necessary to incorporate local 5G into business, enabling companies to control their own communication and provide advanced security by only using SIM cards. With this solution, as long as local 5G is deployed in the main, satellite offices and other locations such as resorts or "workation" spots, every company can ensure highly secure communication among internal locations, work can be done safely and the company intranet can be accessed securely from any of these locations.

The same measures will be deployable for telework by combining local 5G with a carrier's roaming mechanism. One day it likely will be a standard practice to install local 5G base stations in downtown offices.

Self-driving valet services for building parking

The appearance of self-driving vehicles in cities will have a huge impact. Less-mobile people suddenly will be able to go anywhere they want, whenever they want, and with fewer traffic accidents than at present. An example of this phenomenon will be self-driving in building parking lots. With this technology, drivers will be able to leave their vehicles at building entrances and the vehicle will proceed to a parking space on its own. If a time to return is set, the vehicle could be ready and waiting at the appointed time, similar to a hotel valet service, at any building.

Shopping facilities lose sales opportunities due to customers waiting to enter parking areas during holidays and other busy times. If this same time could be spent inside, sales would likely increase. If self-driving technology were available in office buildings and apartment buildings, parking areas would no longer need to be within a building itself, since available spaces nearby also could be used for parking.

Establishing this technology will require the introduction of local 5G. Inside a building, where GPS is not available, it is difficult for a self-driving vehicles to determine its location. Local 5G would enable a building to communicate with self-driving vehicles to provide information on building access, the parking-lot entrance, lanes within the parking lot and available spaces for parking, allowing vehicles to operate indoors without a need for AI. Local 5G, with its advanced security and low latency, will enable this to become a reality.

The deployment of local 5G is also being considered for handling sensitive information in residential facilities, for supporting healthcare management through the use of sensors, and for providing added-value conveniences to building residents.

5. Conclusion

Local 5G technology will provide customized communication services beyond those provided by carriers at the present time, and in user-friendly formats. It will require communication carriers, vendors and users to collaborate to make this technology even better. If this can be done, the promise of safer and more convenient cities would appear to be possible.

Overview of the 2021 White Paper on Information and Communications

Economics Research Office, ICT Strategy Policy Division
Information and Communications Bureau
Ministry of Internal Affairs and Communications

In this white paper, the special theme of Part 1 is "Livelihood and Economy Supported by Digital Technologies," reflecting on Japan's efforts toward digitalization, as well as the present situation and challenges of digital utilization in daily life, in corporate activities, and in the public sector. It also examines the changes caused by digitalization accelerated by the COVID-19 pandemic. The white paper reports that it is necessary to improve the digital utilization capabilities of the people and to promote digital transformation in the private and the public sectors strategically and seamlessly in order to realize a resilient society that is capable of dealing with infectious diseases and natural disasters. The white paper states that these initiatives entail the establishment of common platforms for the digital society. In addition, Part 2 provides the latest data on the current state of information and communications in Japan, as well as the policy trends centered on the efforts of the Ministry of Internal Affairs and Communications (MIC). This article provides an overview of Part 1.

1. History of digitalization in Japan

(1) History of Japan's digitalization policies

Since the enactment of the Basic Act on the Formation of an Advanced Information and Telecommunications Network Society in 2000, Japan has been promoting digitalization by laying down various national strategies including the e-Japan Strategy in 2001. The white paper highlights the goals and key initiatives of the national strategies, dividing them into four phases; namely, the first phase of development of ICT infrastructure, the second phase of promotion of ICT utilization, the third phase of promotion of digital data utilization, and the fourth phase of aiming to build a digital society.

(2) Progress of digitalization of Japanese society

The state of the uptake of ICT infrastructures in terms of fixed-line communications shows that the number of FTTH subscribers has increased rapidly since the late 2000s, and the ratio of households with access to ultra-high-speed broadband has reached 99.98 percent in 2015. The shift to broadband in mobile communications has also continued, with more mobile devices connecting to the Internet than PCs in 2010, and the ratio of households with smartphones reaching more than 80% in 2019. According to the OECD, the ratio of optical fiber for fixed-line broadband in Japan ranked second in 2020, and mobile broadband penetration ranked first in 2019.

Japan's use of ICT infrastructure is progressing to a certain degree, as shown by the scale of the e-commerce (BtoC) market for daily life reaching approximately 19.4 trillion yen in 2019. Meanwhile, in corporate activities, ICT investments have been sluggish, reaching only around 15.8 trillion yen in 2018. This contrasts with the continually increasing ICT investments in the U.S. There is also a shortage in ICT personnel of about 220,000 as of 2018, and it is estimated that there will be further shortages in the future.

(3) Digitalization of Japan as measured by international indicators

As to Japan's global position in digitalization, for example, in the digital competitiveness ranking by the International Institute for Management Development (IMD), Japan ranked 27th among 63 countries in 2020. In particular, Japan scored low in "international experience" and "digital/technological skills" for "talent," and in "opportunities and threats," " agility of companies," and "use of big data and analytics" for "business agility."

2. Current situation and challenges of digitalization

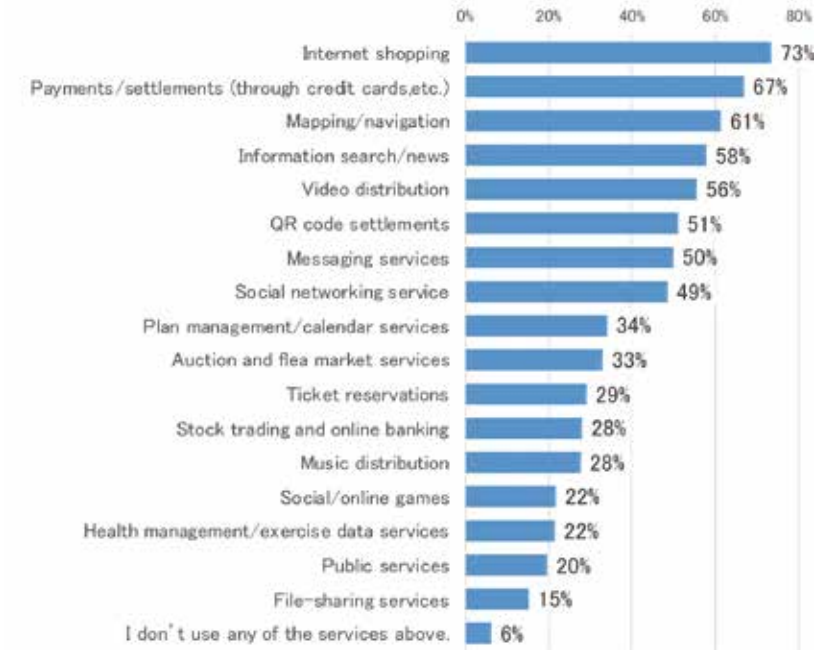
(1) Current state and challenges of digital utilization in daily life

In a survey conducted by MIC among the general public, when asked about the Internet services they normally use, many respondents replied that they particularly use "Internet shopping" and "payment and settlement (through credit cards, etc.)" (Figure 1). In addition, when asked about the reason for the slow progress of digitalization in society, most of the respondents pointed out "anxiety about information security and privacy breaches" (52%) and "lack of literacy among users" (44%).

Moreover, according to the Cabinet Office (2020) "Public Opinion Survey on Utilization of Information and Communication Devices," smartphone and tablet usage is particularly low among people in their seventies or older ("not using" is 50%). The top reasons cited were "not necessary for living life" (52%), "not knowing how to use" (42%), and "relying instead on family members" (40%). There is a need for initiatives to support the use of digital technology so that older people are not left behind by the digital society.

Figure 1: Internet services for daily use

(n=1000)



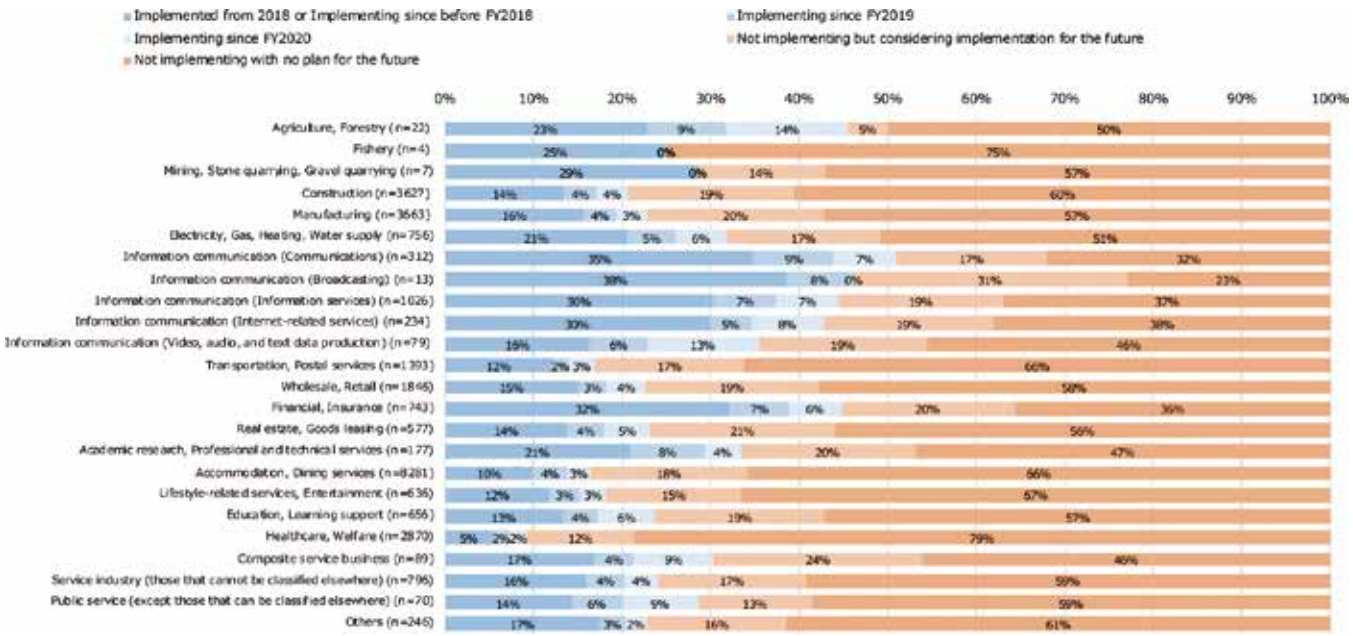
(2) Current state and challenges of digital transformation of corporate activities

In Japan, ICT has contributed to improving productivity amid the decline of the productive-age population. However, the impact of ICT's contribution to improving productivity is not sufficient due to the low amount of ICT investments and their being mostly aimed at improving operational efficiency. Compared with the U.S., Japan's labor productivity remained at about 60% as of 2019.

The COVID-19 pandemic has prompted the acceleration of digitalization on a global scale, leading to changes in consumption behavior, digital disruptions that force existing companies to exit the market as digital companies enter, and acceleration of the globalization of the digital market. For companies to survive, they must use digital technologies to develop new products, services, and business models, and to transform their organizations, corporate culture, and workstyles. In other words, they need to carry out "digital transformation (DX)" to create new added values.

In a survey conducted by MIC among company workers on the status of DX efforts in Japan, about 60% of companies responded that they have "not implemented, and no future plans" for DX. Detailed results show that DX initiatives are progressing in some industries (Figure 2). In addition, while many of the responses of companies in Japan cited "operational efficiency and

Figure 2: Efforts for digital transformation (Japan)



cost reduction" (45%) as the purpose for implementing DX, many of the responses in the U.S. and Germany pointed to "creation of new products and services" and "improvement of customer satisfaction," which are the primary objectives of DX. Regarding DX issues, Japan had a significantly higher number of responses pointing to "shortage of human resources" (53%) compared with the U.S. and Germany. In addition to the lack in quantity and quality of ICT human resources, another problem in Japan is that ICT human resources are skewed towards ICT companies rather than user companies.

(3) Current state and challenges of digitalization in the public sector

Since the formulation of the e-Japan Strategy, Japan has taken steps to bring administrative procedures online, to reform government information systems, and to strengthen IT governance. It has achieved a certain degree of success in improving the efficiency of internal government organizations and in establishing systems and infrastructures. This is exemplified by efforts to reduce the operating costs of information systems through the implementation of the individual Number system and the establishment of systems to accelerate the distribution and utilization of administrative data. Even during the COVID-19 pandemic, the government has also made good use of the "Mynaportal" for processing applications for special cash payments. On the other hand, the complexity of the procedures for the administrative services that are provided to the public and business operators remains an issue that needs to be addressed. There is also a need for further dissemination of the use of the individual number card. Residents are, therefore, not fully enjoying the benefits of the use of digital technology.

As shown by the advanced digital government initiatives overseas, many countries now have systems that enable carrying out various procedures on government portal sites. Denmark has implemented thoroughly designed user-centric services, while the U.K. has been working to improve services through agile development on the basis of feedback from the citizens. South Korea has required the use of a common standard framework for government services and plans to deploy the framework overseas, while the U.S. is actively promoting the introduction of cloud among government agencies. Further, establishment of base registries is being promoted in the EU and other countries.

In March 2020, Japan compiled a "Grand Design for Realizing Digital Government," presenting the directions of efforts to be taken towards the realization of administrative services in 2030 along four pillars (Figure 3).

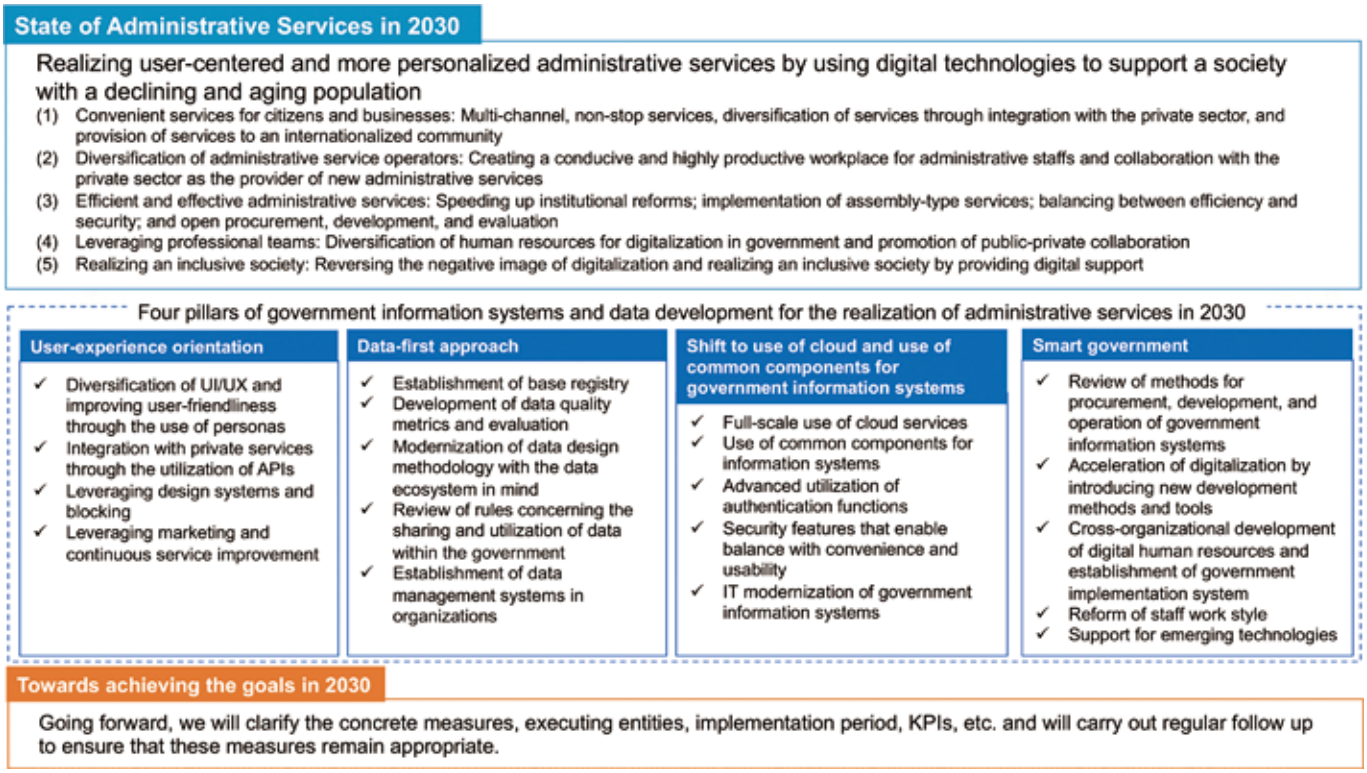
3. Acceleration of digitalization brought about by the COVID-19 pandemic

(1) Expansion of digital utilization during the COVID-19 pandemic

During the COVID-19 pandemic, "nesting consumption" has grown, and households using Internet shopping have been increasing rapidly since March 2020. Also, the usage rate of paid video streaming services has increased more than the previous years in 2020.

In addition to the expansion of online consumption, Internet traffic is also dramatically increasing due to telework and remote

Figure 3: The four pillars shown in the Grand Design



Source: Materials of the Liaison Committee of the CIO of each Ministry and Office on March 31, 2020
*This is a tentative translation by our office.

classes. On average, Internet traffic has been increasing by around 20% annually, but it increased by more than 50% in 2020.

(2) Digital utilization in the public sector during the COVID-19 pandemic

In Japan, the national and local governments have implemented various efforts using digital technologies to provide prompt economic assistance to citizens and to monitor the status of infections and risks in the regions. These efforts have largely been considered as the result of the development of digital infrastructures for national and local governments and have been hailed as landmark use cases in the introduction of new development methods. However, they have also led to the manifestation of problems related to the restrictions imposed by systems, rules, and customs, as well as issues related to procurement and project management.

Governments overseas have also resorted to the use of digital technologies during the COVID-19 pandemic. In Denmark, systems have been put in place to enable completing the processing of cash benefits online and for real-time monitoring of patient numbers. In Korea, the government implemented prompt payment of benefits through partnerships with credit card companies and shared the status of infections in real-time. Taiwan established a name-based mask-rationing system and made the stock status of medicines in pharmacies available as open data.

(3) Changes in corporate activities during the COVID-19 pandemic

While Japan's corporate activities declined significantly in the second quarter (April-June period) of 2020, the degree of the decline and the status of recovery vary by industry. In the manufacturing sector, industries are recovering due to the recovery in exports to the U.S. and China. In the non-manufacturing sector, retail and telecommunications have exhibited strong performance due to the rise in Internet shopping and the digitalization of companies; but face-to-face industries have been sluggish. Among the listed companies, GAFA and other "tech companies" in the U.S. are seeing increased overall performance, and ICT-related industries in both Japan and the U.S. are exhibiting significant gains in their market capitalization.

Moreover, although Japan has manifested a certain level of entrenchment of telework, which is the typical example of the changes in corporate activities during the COVID-19 pandemic, its implementation rate differs depending on the industry, region, and size of the company. Also, the rate of telework implementation rose during the state of emergency but declined after it was lifted. A recent survey by MIC aimed at the general public pointed to the ease of taking time for self and family as a particular benefit of telework (Figure 4). As to the challenges and barriers for telework, many respondents particularly pointed out the unsuitability of the nature of their job and company systems to telework (Figure 5). It

Figure 4: Advantages of telework

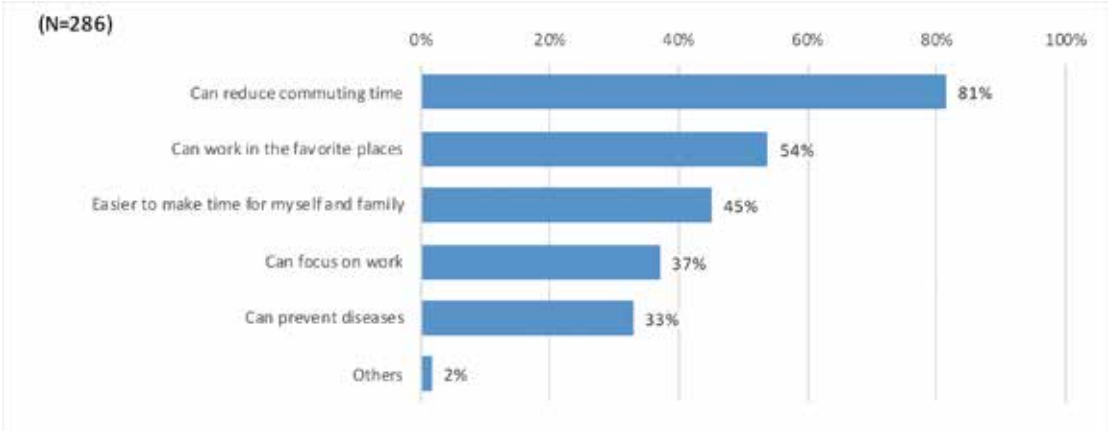
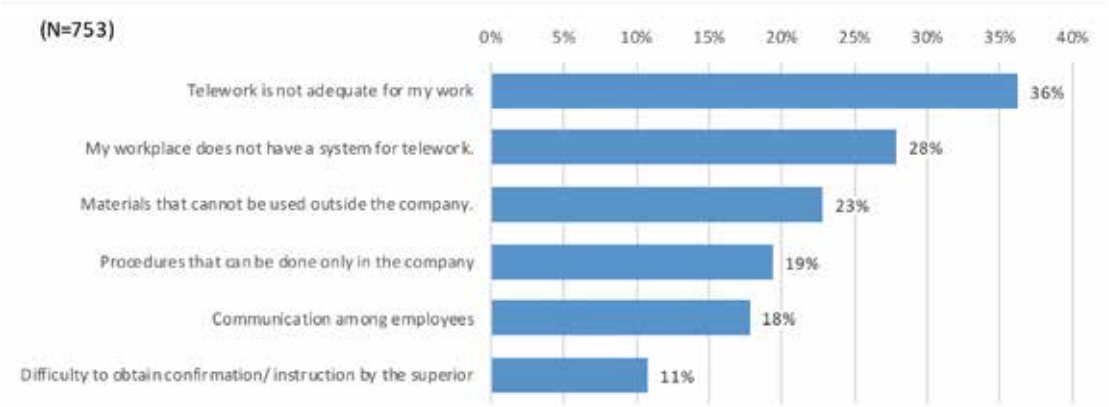


Figure 5: Challenges and barriers for telework (upper ranking choices)



is important to view telework as a means to realize the vision being aimed at, rather than making the implementation of telework itself as the ends.

(4) Issues that emerged from the use of digital technologies during the COVID-19 pandemic

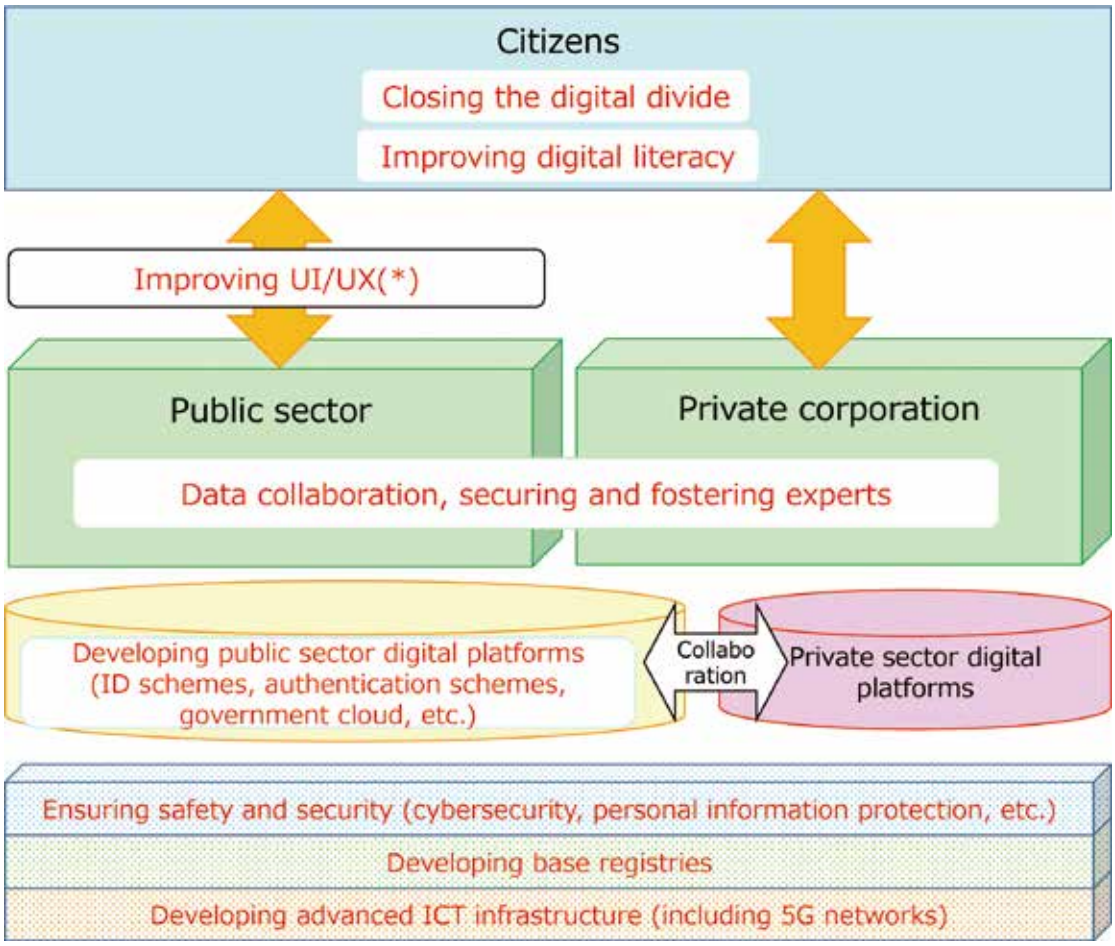
With the rapid digitalization of the entire society during the COVID-19 pandemic, various challenges toward the realization of a digital society have emerged. Regarding security risks, according to the Information-technology Promotion Agency (IPA) "Top 10 Threats to Information Security 2021," attacks targeting telework and other activities ranked new for organizations, and threats to online payments and other transactions ranked as the top threats for individuals. Improving the literacy of users is also important in dealing with these security risks.

4. Toward the realization of digital transformation that "leaves no one behind"

Going forward, Japan needs to build a society with a strong resilience to deal with infectious diseases and natural disasters. It needs to build a sustainable society that addresses issues—such as the shrinkage of the working population and the domestic market due to the declining and aging population and the reduction in digital competitiveness due to the changes in the industrial structure brought about by global digitalization—by increasing productivity and creating new added values. Also, it needs to build a society that can offer a diverse, rather than a one-size-fits-all, form of happiness, leaving no one behind.

To this end, initiatives to encourage users (the public) to use digital technology (eliminating the digital divide, improving digital literacy, and improving UI/UX), digital transformation (data distribution and collaboration, securing and developing digital human resources, shift to open and cloud-based systems, and work-style reform) of suppliers (private companies and the public sector), and construction of common platforms (establishment of advanced information and communications infrastructures, establishment of base registry, and ensuring safety and security) must be promoted strategically and in a seamless manner.(Figure 6).

Figure 6: Digital transformation that "leaves no one behind" should be tackled strategically and in a seamless manner



*UI stands for "user interface" and UX for "user experience."
*Words written in red are future policy challenges.

53rd Celebration of World Telecommunication and Information Society Day

30 November 2021 at the KEIO PLAZA HOTEL

The ITU Association of Japan

Ceremony at the Keio Plaza Hotel, Tokyo

Award winners and Honorable guests

MIC Minister's Award winner
Mr. MAEDA Yoichi

ITU-AJ Special Achievement Award winner
Researcher representative Prof. TSUBOKURA Makoto
Prof. KAGI Naoki Prof. IIDA Akiyoshi

Honorable Guest : Mr. SASAKI Yuji
Vice-Minister for Policy Coordination, MIC

Honorable Guest : Mr. HARA Keiichi
Deputy Assistant Minister, MOFA

Anniversary Keynote Presentation:
Part I / Prof. MATSUOKA Satoshi
Director, RIKEN Center for Computational Science

Anniversary Keynote Presentation:
Part II / Prof. TSUBOKURA Makoto
Team Leader, Complex Phenomena Unified Simulation Research Team, RIKEN Center for Computational Science

The List of the Award Winners on 30 November 2021
(Affiliation is at time of nomination)

MIC Minister's Award

Mr. MAEDA Yoichi (TTC)

ITU-AJ Special Achievement Award

Fight against COVID-19 using Fugaku : Droplet Simulation Project Team /Researcher representative : Prof. TSUBOKURA Makoto, RIKEN

ITU-AJ Accomplishment Awards

Dr. KANI Jun-ichi (NTT)
Mr. KITAJIMA Koji (KAI Solution)
Mr. TAKAGI Satoru (KDDI)
Mr. TANIKAWA Kazunori (NEC)
Mr. TAMURA Motoshi (NTT DOCOMO)
Mr. CHONO Keiichi (NEC)
Mr. HOYA Hideo (BHN)
Mr. YAGO Ryoichi (Former employee of NTT EAST)
Dr. YAMAMOTO Hideki (OKI)

ITU-AJ Encouragement Awards

Mr. AOYAGI Kenichiro (NTT DOCOMO)
Mr. OHSEKI Takeo (KDDI Research)
Mr. KAMEI Masashi (NHK)
Dr. KUBOTA Fumito (TELEC)
Dr. KURITA Daisuke (NTT DOCOMO)
Dr. SAKAMOTO Taiji (NTT)
Mr. SAKAMOTO Nobuki (NTT DOCOMO)
Mr. SHITOMI Takuya (NHK)
Mr. SEKINE Norio (NTT EAST-South KANTO)
Mr. TESHIMA Kunihiko (NTT DOCOMO)
Dr. TOUMURA Kunihiko (HITACHI)
Mr. TOKUSHIMA Yutaka (Instalimb)
Dr. NAGAO Jiro (NTT)
Mr. FUJITA Kazunori (KDDI Foundation)
Ms. MINEMURA Takae (NTT EAST)
Dr. YOSHIKANE Noboru (KDDI Research)
Mr. FUKUMOTO Shiro, Mr. KOMATSU Hiroshi,
Mr. HUANG Jingyi, Mr. SAKATA Kentaro (SoftBank)
Croix Co.,Ltd.
Task Force for Next-generation Digital Terrestrial Television (ARIB)
Japan Battery Regeneration, Inc.

通巻百三十三号
定価 一冊 一、六五〇円（本体価格 一、五〇〇円、消費税 一五〇円） 年間購読料 六、六〇〇円（本体価格 六、〇〇〇円、消費税 六〇〇円）