

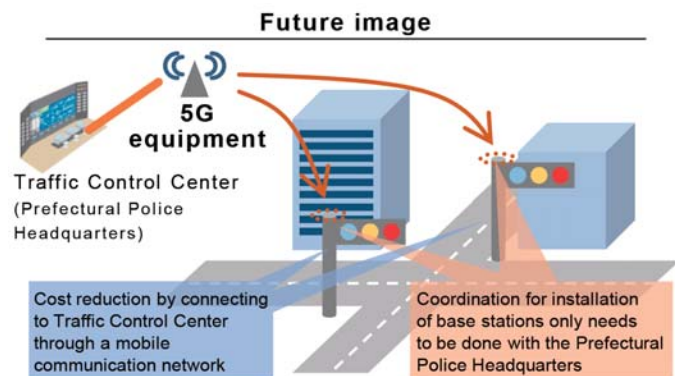
Program Director **MURAI Jun** Professor, Keio University

Original measure: R&D on 5G base station sharing technology (Ministry of Internal Affairs and Communications)

Issues and Goal

For nationwide deployment of 5G, it is necessary to ensure efficient and stable communication even after deployment of a large number of base stations. On the other hand, since only about 30% of traffic signals are centrally controlled (networked), and most of them use high-cost telephone lines, it is necessary to reduce the cost and upgrade them.

Considering these conditions, we will create a reference architecture that enables low-cost and flexible deployment of the 5G area and secure digitization and networking of traffic signals, as well as methodologies to maximize the value of installation with the aim of expanding the 5G area by installing 5G base stations on traffic signals and of promoting centralized control of traffic signals.



Overview

Original measure: R&D on 5G base station sharing technology (Ministry of Internal Affairs and Communications)

The original measure is to conduct R&D of broadband wireless communication system configuration technology, and network connection management and control technology required for shared use of base stations by multiple mobile network operators. By linking with the original scheme, shared base stations that suit the actual environment will be developed to enable installation in more traffic signals, so that it is expected to induce investment by private companies and accelerate the efforts of the National Police Agency and the Ministry of Internal Affairs and Communications to reduce the cost of networking of traffic signals and to secure 5G base station installation locations.

Overall view of the measure

Original scheme: R&D on base station sharing technology for 5G deployment
R&D related to base station sharing technology (antenna sharing technology, etc.) to realize sharing of multiple frequencies and carriers

Accelerate installation of 5G base stations on traffic signals by researching and developing technologies that enable sharing of base stations among multiple carriers.

PRISM "Building a 5G network using traffic signals"

By researching and developing methods of provision of signal information to automated vehicles, traffic signals using network will be promoted, and installation of 5G base stations in traffic signals will be accelerated.

Related scheme: "R&D related to provision of signal information for automated driving" (SIP measure)

◎ R&D related to provision of Signal Phase and Timing (SPaT) information using cloud and other technologies

Accelerate infrastructure development (installation of 5G base stations on traffic signals) necessary for realizing signal control utilizing AI

- Utilize a 5G network for signal control utilizing AI
- Incorporation of sensor information, etc., collected by a 5G network into AI

NEDO

"R&D on advanced traffic signal control utilizing AI"

Development of various technologies that contribute to advancement of traffic control systems by artificial intelligence utilizing big data such as roadside sensor information, probe information, and image sensor information, etc.
* Considering autonomous distributed signal control

Achievements to date and expected positive ripple effects

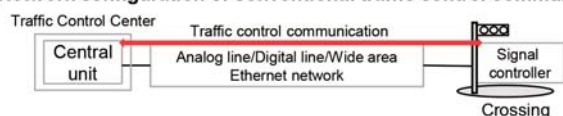
Achievements by FY2020

Derivation of optimal placement of 5G network equipment in traffic signals through small-scale demonstration experiments; implementation of networking of traffic signals utilizing 5G networks; and formulation of maintenance and operation rules for 5G base stations.

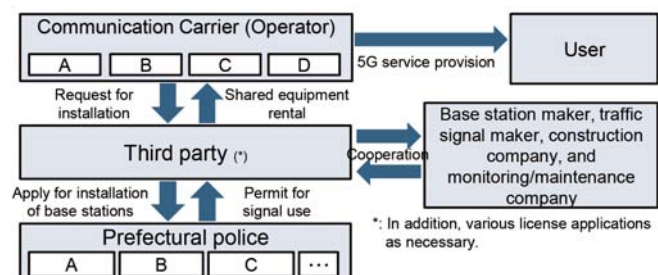
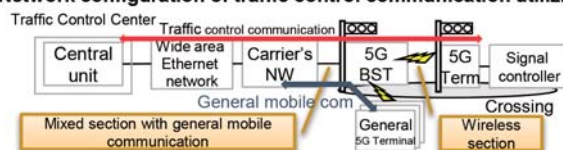
Configuration of communication and security verification in small-scale demonstration experiments

Consideration of operational measures

[Network configuration of conventional traffic control communication]



[Network configuration of traffic control communication utilizing 5G]



Exit strategy

The 5G trusted network utilizing traffic signals will be constructed. This network is expected to serve as the hub for smart cities in both normal and disaster settings, triggering investment by private companies including telecommunications operators. Furthermore, the network to be developed and constructed will be packaged as an infrastructure, with the aim of deploying it overseas.

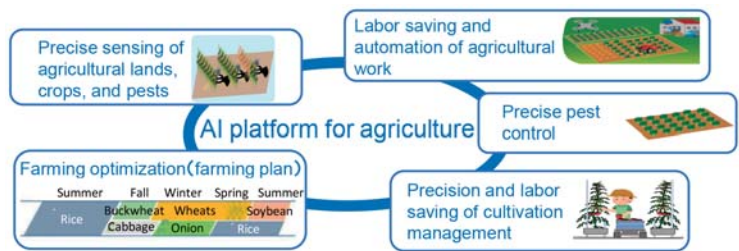
Program Director **TERASHIMA Kazuo** Senior fellow, National Agriculture and Food Research Organization

Original measure: MAFF Commissioned project study/Innovative Materials Development and Capability Enhancement Programs (M3)

Issues and Goal

Realization of data-driven agriculture centering on the agricultural AI platform

To solve difficult problems surrounding agriculture, such as depopulation and aging, and frequent occurrence of abnormal weather due to global warming, we will promote digitalization of agricultural production activities, which conventionally have relied on long years of experience and intuition of farmers. By integrating the big data and AI systems into the "AI platform for agriculture" (The National Agriculture and Food Research Organization: NARO), we will promote utilization of data by the private sector and accelerate transition to data-driven agriculture.



Overview

Accelerate development of individual technologies that form the basis of data-driven agriculture

For the following three issues, which are being implemented under the budget of the ministries and agencies, we will accelerate development of technologies to create an environment where private companies can easily use them by providing them as contents of the AI platform for agriculture or related technologies.

① Development of image diagnosis AI for pests

We will expand the image diagnosis technology of 45 pests affecting four crops implemented in the original measure to 115 pests affecting 14 crops in PRISM and develop AI to diagnose pests from images. Furthermore, PRISM will make it possible for private companies to offer diagnostic imaging services by disclosing the developed diagnostic AI through the AI platform for agriculture. In March 2021, the diagnosis AI for diseases of four crops was released.



Pest image diagnosis app using image diagnosis AI of pests

② Development of next-generation cultivation system that accelerates smart breeding technology

We develop an agro-environment emulator that fully controls the agro-environment and evaluates the environmental response of crops, and accelerate acquisition of a large amount of data (breeding big data) necessary for improving the accuracy of breeding selection utilizing the AI developed in the original measure, through the PRISM program. Furthermore, we will build a "breeding virtual lab" that can utilize breeding big data in collaboration with other agricultural information data.



Agro-cultivation environment emulator that enables non-destructive sensing of crops by reproducing the cultivation agro-environments around the world

③ Development of odor sensors for agriculture and livestock

We develop a high-performance odor sensor that enables simple and rapid quality inspection and management at production sites under difficult conditions in which odors are difficult to detect with conventional methods, such as enclosed spaces. By making full use of the world's most advanced odor sensor-related technologies in both hardware and software researched and developed under the original measure, PRISM will build a high-precision odor identification system that utilizes AI to evaluate the quality of cattle feed and milk, especially for the field of agriculture and livestock, thereby contributing to improvement of productivity and profitability of agricultural and livestock products.



Prototype of an odor sensor that enables quality inspection of agricultural and livestock products using odors at production sites in the agricultural and livestock industries

Achievements to date and expected positive ripple effects

Positive ripple effects of achievements

- The image diagnosis AI for pests can be used in development of an image diagnosis service for pests that provides diagnostic results to producers along with information on agricultural chemicals as well as farming services that package other AI and pest control measures, thus contributing to reduction of agricultural chemical use and improvement of pest control efficiency.
- Smart breeding technology can be used in the future to develop new varieties that are optimal for the region or meet diverse needs, using high-precision artificial weather facilities in collaboration with seed companies, IT vendors, etc.
- The odor sensor for agriculture and livestock will be introduced to feed companies and farmers through sensor system manufacturers to realize simplified quality inspection of agricultural and livestock products including feed and milk and contribute to reduction of losses due to silage or metabolic diseases.

Deployment of farming services by BtoBtoC model via WAGRI

To provide data to a wide range of farmers in an easy-to-use format, we will offer data and technologies to a variety of private sectors (middle B) including IT vendors, manufacturers, and seed companies, through the Agricultural Data Collaboration Infrastructure (known as WAGRI; approximately 50 companies participated as members as of the end of June 2021), and then each business will deploy services that match the needs of farmers.

