October 9, 2025

Japan Radio Co., Ltd.
SKY Perfect JSAT Corporation
Graduate School of Engineering, The University of Tokyo
National Institute of Information and Communications Technology

Proof-of-Concept Achieved for Satellite-5G Networks Utilizing Adaptive Routing and Quality Management

Connecting Society through Flexible Networks Bridging Space and Ground

Key Points

- Successfully demonstrated dynamic routing and Quality of Service (QoS) [*1] control in satellite-5G networks, across varied scenarios.

- Validated performance under simulated disaster response conditions.

- Improved reliability and flexibility of satellite-5G network communications.

Japan Radio Co., Ltd. (President: Ken Koarai, "JRC"), SKY Perfect JSAT Corporation (Representative Director, President & Chief Executive Officer: Eiichi Yonekura, "SKY Perfect JSAT"), the Graduate School of Engineering at The University of Tokyo (Dean: Yasuhiro Kato, Professor: Akihiro Nakao, "The University of Tokyo"), and the National Institute of Information and Communications Technology (President: Hideyuki Tokuda, "NICT") have successfully demonstrated dynamic switching of backhaul paths and QoS control in a 5G network environment that integrates a geostationary (GEO) satellite link, low earth orbit (LEO) satellite links, and terrestrial links. This achievement paves the way for the construction of highly reliable satellite-5G networks capable of flexibly responding to diverse services and network conditions.

This demonstration was conducted as part of the commissioned research "Research and Development of Satellite-Terrestrial Integration Technology in Beyond 5G" (No. 21901) by NICT, JAPAN.

Background

In the era of Beyond 5G, Non-Terrestrial Networks (NTN)—which connect space, air, and sea through multi-layered communication infrastructures such as satellites, high-altitude platform stations (HAPS), and drones—are attracting attention for their scalability and wide-area coverage. Each infrastructure component of NTN has unique communication characteristics in terms of latency and stability, making flexible communication paths essential for various applications. Standardization efforts for NTN connectivity in 5G are also progressing within the 3rd Generation Partnership Project (3GPP[*2]), and initiatives toward commercializing satellite-5G networks are accelerating both domestically and internationally.

NICT has signed a Letter of Intent (LoI) with the European Space Agency (ESA) to strengthen Japan-Europe collaboration in this field, promoting global technology development and realization of NTN infrastructure.

Building on this context, JRC, SKY Perfect JSAT, The University of Tokyo, and NICT have planned and carried out demonstration experiments aimed at developing networks capable of flexibly adapting to diverse communication demands and varying link conditions.

Demonstration of Satellite-Terrestrial Integrated Technology

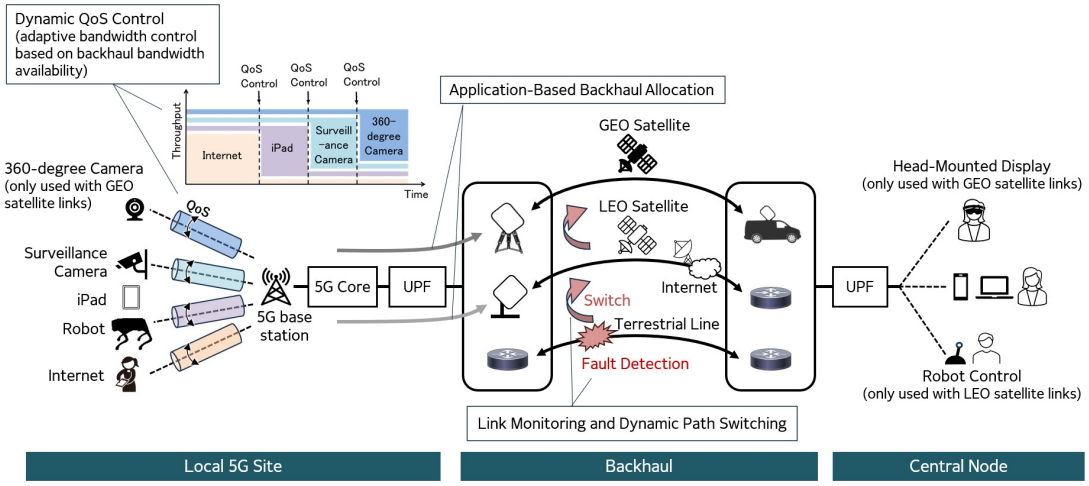

Figure 1: Network configuration integrating a GEO satellite, LEO satellites, and local 5G systems

The participating organizations jointly built and tested a network integrating a GEO satellite, LEO satellites, and local 5G systems. The demonstration validated next-generation communication technologies, including link monitoring, dynamic path switching, application-based backhaul[*3] allocation, and adaptive QoS control based on bandwidth availability. A simulated disaster scenario was also conducted to assess the feasibility of a flexible network infrastructure combining satellite and 5G technologies. All trials were successfully completed, confirming both the effectiveness of end-user communications and the potential to enhance the reliability of future social infrastructure through sustainable, adaptable networks that meet diverse communication needs.

Roles and Achievements of Each Organization

Organization	Roles and Achievements
JRC	-Planned and promoted demonstration experiments using disaster scenarios. -Demonstrated advanced video transmission and remote robot operation via satellite-local 5G integration. -Prepared, constructed, and operated earth stations for satellite links.
SKY Perfect JSAT	-Provided Ku-band satellite connectivity via the GEO satellite Superbird-B3 (162°E); -Supported the construction of an environment integrating QoS and path control -Validated dynamic traffic control under varying link conditions.
The University of Tokyo	-Built local 5G software base stations. -Constructed a Japan-Europe joint testbed for collaborative experimentation. -Established and validated dynamic QoS control methods for network slicing[*4].
NICT	-Established a Japan-Europe collaboration framework with ESA to promote international R&D. -Supported the construction of the demonstration environment, including 5G base stations and 5G core[*5] software. -Provided technical support based on NICT's expertise in satellite and 5G network integration and contributed to the experiment's success by improving system reliability and stability.

Future Outlook

JRC, SKY Perfect JSAT, and The University of Tokyo will continue to promote the utilization of these R&D results for disaster prevention agencies and further develop technical demonstration environments for 5G NTN deployment and future use cases. The local 5G systems supporting flexible satellite-terrestrial integration will be promoted for commercial deployment through industry-academia collaboration. The organizations will continue research and field demonstrations of the core technologies developed in this project, aiming to realize a society where seamless connectivity is available anytime, anywhere, through flexible networks bridging space and ground.

NICT will further deepen collaboration with domestic and international partners and promote R&D and implementation of satellite-terrestrial integration and NTN technologies from a global perspective, aiming to realize a three-dimensional network connecting land, sea, air, and space.

Glossary

[*1] QoS (Quality of Service) Control: Mechanisms for adjusting communication priorities and bandwidth.

[*2] 3GPP (3rd Generation Partnership Project): A project among standardization bodies for mobile network specifications.

[*3] Backhaul: Communication path connecting wireless base stations to the network core.

[*4] Slicing: Technology for dividing a single network into multiple virtual networks optimized for different services or needs.

[*5] 5G Core: The part of the 5G network responsible for connection and routing.

About the Organizations

JRC
President: Ken Koarai
Established: December 1915
Capital: 14,704 million yen
Headquarters: Nakano Central Park East, 4-10-1 Nakano, Nakano-ku, Tokyo
Business Overview: JRC is an information and communications equipment manufacturer providing products and services that contribute to the safety and security of people and society, leveraging its expertise and experience across various fields.
Website: https://www.jrc.co.jp

SKY Perfect JSAT
Representative Director, President & Chief Executive Officer: Eiichi Yonekura
Established: November 10, 1994
Capital: 50,083 million yen
Headquarters: 1-8-1 Akasaka, Minato-ku, Tokyo
Business Overview: Recognized as “Space Business Pioneers”, SKY Perfect JSAT operates two core businesses: Space and Media.
In Space Business, we provide satellite communication services using geostationary satellites and are actively developing our space intelligence business, which leverages satellite data. We have also decided to own low Earth orbit (LEO) Earth observation satellites, expanding our services into diverse fields including national security.
In our Media Business, we deliver broadcasting and distribution services through “SKY PerfecTV!”, along with B2B media solutions, and fiber-optic retransmission services. We are also expanding into the global IP content market to further diversify our business portfolio.
Website: https://www.skyperfectjsat.space/?lang=en

The University of Tokyo
Dean: Yasuhiro Kato
Location: 7-3-1 Hongo, Bunkyo-ku, Tokyo
Research: The Nakao Laboratory (Professor: Akihiro Nakao) conducts research in communication networks, operating systems, network security, and distributed applications, aiming to contribute to society through innovative technologies.
Website: https://www.t.u-tokyo.ac.jp/soe

NICT
President: Hideyuki Tokuda
Location: 4-2-1 Nukui-Kitamachi, Koganei, Tokyo
As Japan's only national research and development agency specializing in the field of information and

communications technology (ICT), the National Institute of Information and Communications Technology (NICT) promotes ICT R&D from an integrated perspective, from the basic to the applied, while collaborating with universities, industry, local governments, and domestic and overseas research institutions and aiming to generate innovation by giving back to society with the results of our R&D.
Website: https://www.nict.go.jp/en/index.html

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