

Open Up Bright Future

2024
Spring

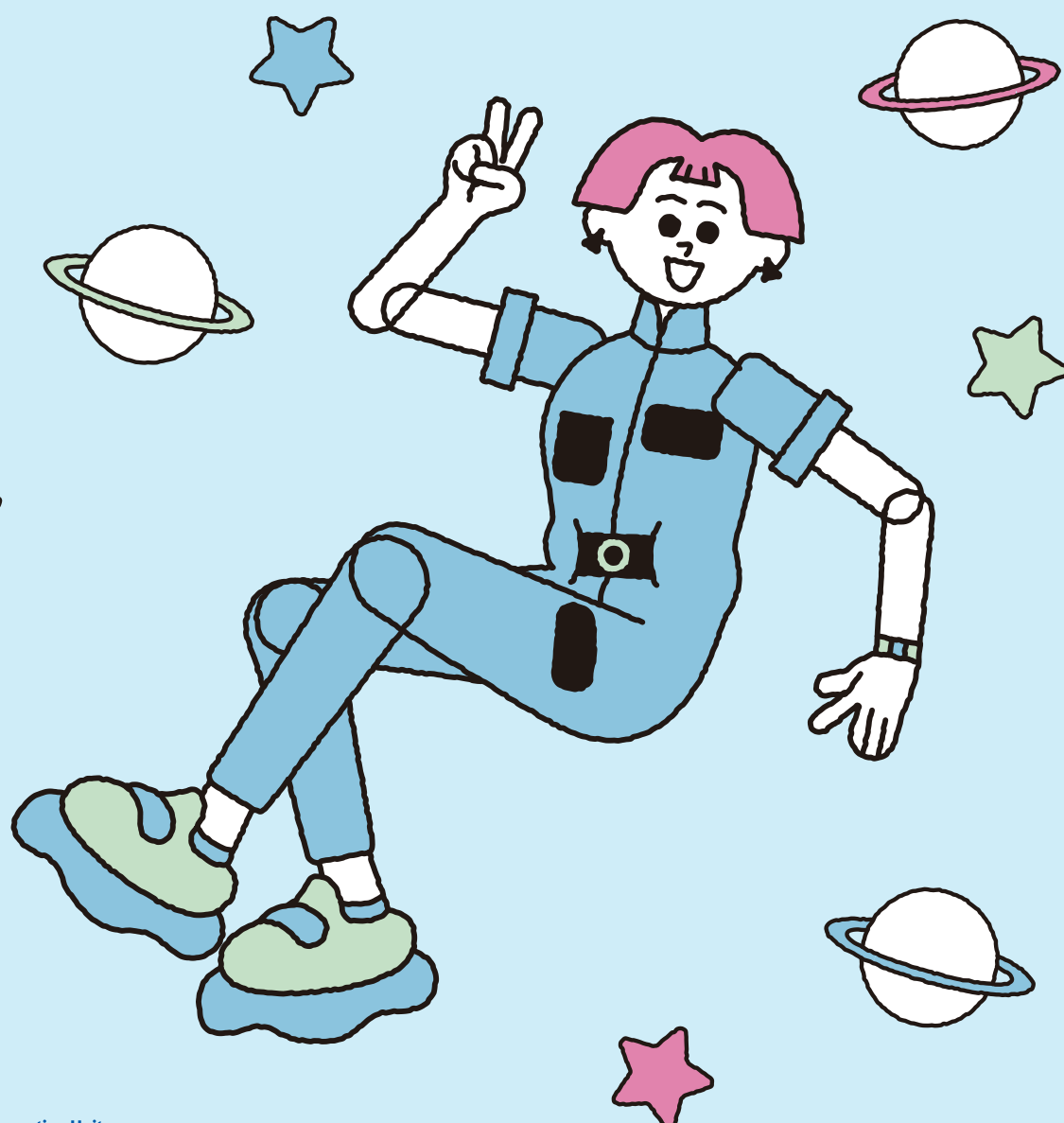
Xross B5G

English Edition

Beyond 5G R&D Promotion Unit
National Institute of Information and Communications Technology

Make a New Connection

Japan-Germany Beyond 5G/6G Research Workshop
Beyond 5G Zero Gravity Event
Experiencing Virtual Reality: "A New Society Realized by Beyond 5G"
Mobile World Congress (MWC) Barcelona 2024 Exhibition Notes
Event Briefs



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Preface

As an expert in information and communications technology, NICT first published the results of discussions toward the realization of Beyond 5G in the "Beyond 5G/6G White Paper" in March 2021. Since then, we have continued the cycle of repeated discussions with many people through this white paper and updating the white paper with the results of the discussions. In the course of updating this white paper, we came to understand that there are aspects that cannot be fully expressed in the form of a white paper, such as the status of activities related to interaction with stakeholders and the timely disclosure of information on the latest R & D at NICT.

We have therefore decided to move away from the white paper format and take the form of a newsletter and start anew as "Xross B5G," a tool for communicating with you. About four times a year, we will provide you with information about various activities related to NICT's R & D for the realization of Beyond 5G, with a sense of liveliness, for example, the status of exchange activities such as "Ideation" with external experts aimed at providing feedback to NICT's R & D, trends in the latest Beyond 5G technologies developed at NICT that are not covered in the white paper, and the development process of a proof of concept system based on the Beyond 5G architecture with the cooperation of universities.

We hope that this booklet will create new connections with you and further expand the circle of discussion toward the realization of Beyond 5G.

Iwao Hosako

Executive Director of Beyond 5G Research and Development Promotion Unit

Report

Japan-Germany Beyond 5G/6G Research Workshop

– Toward Launching Specific Research and Development through Japan-Germany Collaboration –

The **Japan-Germany Beyond 5G/6G Research Workshop** was held as an opportunity for Japanese and German Beyond 5G/6G researchers to gather together, exchange views on the direction to be taken, introduce the latest research results, and explore the possibility of collaborative matching. It was hosted by NICT and 6G Platform Germany and has been held three times so far as shown in the table below.

Japanese participants included researchers from the NICT, researchers commissioned by the Beyond 5G R & D Promotion Project, and representatives from The Beyond 5G Promotion Consortium, as well as telecommunications carriers, electrical equipment manufacturers, and academic societies. German participants included universities and related companies, mainly from four research hubs (6G-Life, 6G-RIC, 6GEM, and Open6GHub) commissioned by the BMBF (German Federal Ministry of Education and Research).

The content of the program was planned not only to give lectures on initiatives, but also to emphasize interactive discussions such as panel lectures and poster sessions. In particular, in the third workshop, we planned a demonstration exhibition and were able to have equipment brought in from Germany. Through these initiatives, we have made friends who are familiar with us, and are building a network of people.

Joint research often begins with personal connections, and new research projects are actually emerging from the human relationships that have deepened here. We would like to draw your attention to future research on Beyond 5G/6G through collaboration between Japan and Germany.

The fourth workshop is scheduled to be held in conjunction with the Berlin 6G Conference on July 2-4, 2024. Details will be posted on the website of the Beyond 5G Research and Development Promotion Unit.

TABLE Status of Workshops

	Date	Participants	Location	Remarks
1 st	April 24-25, 2023	73 (51)	NICT Headquarters (Koganei, Tokyo)	
2 nd	June 28-29, 2023	Hundreds of people participated in the event (12)	Berlin Conference Center (Berlin, Germany)	Co-located with the Berlin 6G Conference
3 rd	February 5-6, 2024	85 (62)	NICT Innovation Center (Nihonbashi, Tokyo)	

The number of participants from Japan is shown in parentheses.

Beyond 5G Zero Gravity Event

– New Awareness from Expanding Discussions and Research Issues through Cross-Industry Exchange –

NICT has published the "Beyond 5G/6G White Paper" to present its vision for the realization of Beyond 5G to people inside and outside the organization. On the other hand, in order to realize Beyond 5G, it is necessary not only to advance R & D of elemental technologies individually, but also to deepen technologies in anticipation of new services to be created by Beyond 5G through collaboration and co-creation with various business sectors and industries. For this reason, the "**Beyond 5G Zero Gravity Event**"^{*1} has been held five times since February 2023, as shown in the table below. The purpose of this event is for NICT researchers to engage in in-depth discussions with people from different industries to discover new insights and ideas about research and to form a continuous community with people from cross-industries.

At each event, topics were provided by various industries and lightning talks were held by NICT researchers. Participants discussed services that combine multiple industries/data and information and communications research/technology. The fifth event was a two-day event that included a tour of the Fukuoka PayPay Dome facility and information exchange with information technology staff. There were heated discussions on how to revitalize the local community and new services beyond industry.

Many participants^{*2} from different industries, who do not usually have the opportunity to be involved, gathered at the event. It was a good opportunity for them to think deeply about problems to be solved to realize Beyond 5G from different viewpoints, to come up with ideas that lead to new businesses, and to notice new problems in promoting R & D related to Beyond 5G. In addition, it led to the recognition and appeal of NICT research to participants from different industries, and it also became a place for continuous community formation to collaborate and create with people from different industries. By changing the content of each lecture, the theme, and the group members, the discussion was activated so that each team can have heated discussions and ideas full of originality.

*1 The name of the event, "zero gravity," is used to indicate that the participants will have a frank discussion regardless of their organization, position, age, etc.

*2 There were also participants from the automobile, construction, insurance, sports, transportation, electricity, agriculture and travel industries, as well as universities and local governments.

TABLE List of previous events

	Date	Participants	Theme
1 st	February 3, 2023	45 (27)	Current status of each industry and expectations for Beyond 5G
2 nd	November 2, 2023	36 (25)	When the Cybernetic Avatar Society becomes a reality
3 rd	November 29, 2023	31 (15)	What services are offered in cities on the Moon?
4 th	January 22, 2024	29 (16)	What we want to achieve across time and space
5 th	March 15-16, 2024	33 (14)	Next Generation Stadium x Regional Revitalization

The number of participants from NICT is shown in parentheses.

Update

Experiencing Virtual Reality: "A New Society Realized by Beyond 5G"

– Use of technology to transcend industry boundaries –

In order to realize Beyond 5G, NICT is conducting R & D on leading-edge elemental technologies and Beyond 5G architecture as a mechanism for utilization across industrial boundaries. In April 2023, we developed a system that allows people to experience the future society, in which all industries will be connected and create new value through the realization of Beyond 5G around 2030, and our lives will become richer and more convenient. This system allows people to experience the future society through physical space and cyberspace.



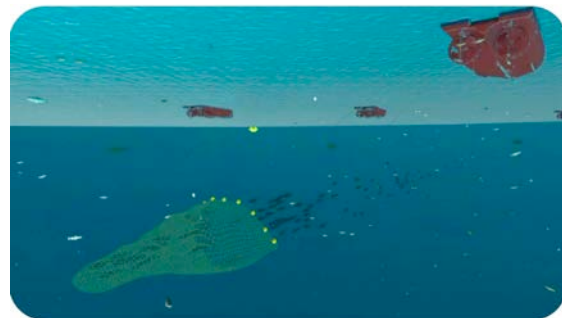
In this experience, the story highlights the seafood supply chain in order to see behind the scenes the development of human, energy and environment-friendly technologies and how they create new value. The story is divided into four scenes: "Catching," "Cooking," "Transporting," and "Eating." They describe the process from the time fish is caught in the ocean to the time it is served on people's tables. In

addition to improving the convenience of people's lives through the use of state-of-the-art elemental technologies for realizing Beyond 5G, new value-added functions called "orchestrators" that link different industries and people create new services and solve social issues such as reducing energy consumption. These activities can be experienced in VR through physical space and cyberspace.

This system was later modified so that it could be projected onto a dome theater. Together with the VR system, it was used at a total of 23 exhibitions in fiscal 2023, including various exhibition events, academic conferences, and events and lectures at high schools, technical colleges, and universities, and was experienced by more than 1,700 people.

Catching

Fish can be captured easily from fish school data obtained from HAPS, smart buoys, and underwater drones, and future catch volumes can be predicted in cyberspace from current catch volume trends. In addition, you can experience how the "orchestrator" accurately grasps the necessary catch amount according to the needs of consumers and catches based on it, leading to the stabilization of income of fishery workers and the conservation of fishery resources.



■ Cooking

At fish processing factories, the cooking process is handled by avatar robots controlled by cooks, which improves hygiene and quality control and the working environment. In addition, "Orchestrator" aims to connect people who work across time and space, so you can gather cooks from around the country according to customer's cooking needs and operate the avatar robot from a remote location to cook quickly without losing freshness. You can experience how new types of catering services are provided, such as delivery cooking by first class chefs.



■ Transporting

Progress in autonomous driving technology and the spread of flying cars can significantly reduce traffic accidents and traffic jams. In addition, you can also experience the overall reduction of energy consumption for transportation by combining delivery packages according to the destination, reducing the frequency of truck transportation, and transferring package transportation to a taxi on the way, through the use of "orchestrator" for collaboration among vendors.



■ Eating

You can shop from home using your supermarket avatar. In addition, through the matching conducted by the "orchestrator", a new service was created in which consumers can purchase fish directly from fishermen, allowing consumers to obtain rare fish. You can also experience how food loss can be reduced by having fishermen sell unused fish, which had previously been discarded, directly to consumers on board.



In fiscal 2024, a new story was added in which the main Beyond 5G character "Sakura-chan" and a flying car take a stroll through the future society of the 2030s and beyond. You can experience Beyond 5G technologies, orchestrator functions, and use cases in an easy-to-understand manner. We hope you will experience it firsthand at exhibitions and other events.

*If you have any requests for classes or exhibits, please contact us at the address below.
B5G-inquiry@ml.nict.go.jp

Report

Mobile World Congress (MWC) Barcelona 2024 Exhibition Notes

– Beyond 5G projected on the dome theater Bonds with the World Woven by Future Society –

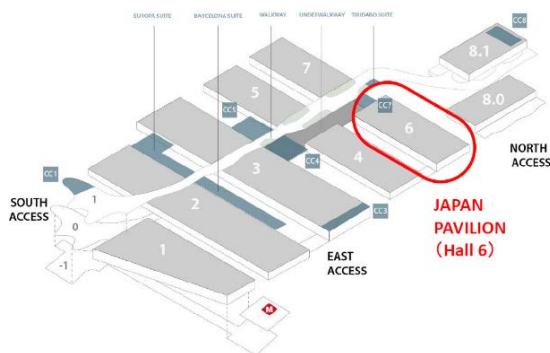


Mobile World Congress (MWC) is one of the world's largest mobile technology trade shows, organized by the GSM Association and held annually at the **Fira de Barcelona** in Barcelona, Spain.

It is also known as an event that attracts a great deal of attention from a wide range of industries, including

the ICT industry, with a large number of exhibitors from a wide range of parties, including telecommunications carriers, vendors, and service providers. It is attended by more than 100,000 people from more than 200 countries. It is a huge global event where you can experience world-class technology trends.

At the end of last year, it was decided for the first time this year that NICT would exhibit at such a worldwide international exhibition. It was decided that some of the R & D results related to Beyond 5G would be exhibited, and preparations began at a rapid pace. The NICT booth is in the corner on the front left side of the Beyond 5G Promotion Consortium frame of "Japan Pavilion" where Ministry of Internal Affairs and Communications and 15 Japanese companies will exhibit.



The exhibition floor is about three times the size of Tokyo Big Sight, and the Fira Barcelona Gran Via exhibition hall is huge, and it takes a few minutes to walk from the hall entrance to the Japan Pavilion. It is large enough to look at, and it is not possible to go around in one day.

The NICT exhibits are as follows.

For Cross-industry / Non-Professional

- Dome Theater Projects the Beyond 5G Future Life of the 2030s Drawn by NICT [Beyond 5G Design Initiative]
- NICT overall Poster [Public Relations Department]



For professionals

- Uncompressed Wireless Transmission Demonstration of 4K Video Using 300 GHz Band Radio Wave [Terahertz Laboratory]
- Video Transmission Demonstration Using 60 GHz-Band High-Capacity Instantaneous Wireless Link [Social-ICT System Laboratory]

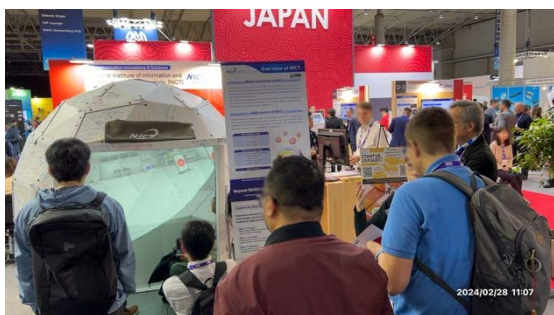


The Beyond 5G Research and Development Promotion Unit has explained the future vision (concept) of Beyond 5G and the technologies that support it (elemental technologies), as well as the Beyond 5G architecture based on the white paper published by NICT, to the general public and companies at Japanese exhibitions. This is the first large-scale exhibition at an overseas event such as MWC. The biggest challenges this time were the procedures involved in the export of experimental equipment to be exhibited as research results, the local assembly of those equipment, and the assembly and adjustment of the Dome Theater. A total of 12 staff members headed for Barcelona, Spain, two days before the event to prepare for the venue, while coordinating a tight schedule from exhibition planning to preparation and delivery of the exhibits.



Monday, February 26, the First Day:

Around 20 minutes after the start, visitors came in. The Japan Pavilion is located in Hall6 at the far end of the entrance, and it will take some time to get here. After confirming the first visitors, a wave of people formed one after another, and in no time the Japan Pavilion was full of people and the NICT booth was crowded with many people. The "Dome Theater" we exhibited had a unique size and shape, and there was no end to the number of people who wanted to look inside and experience "What is this?" and "What can I see?"

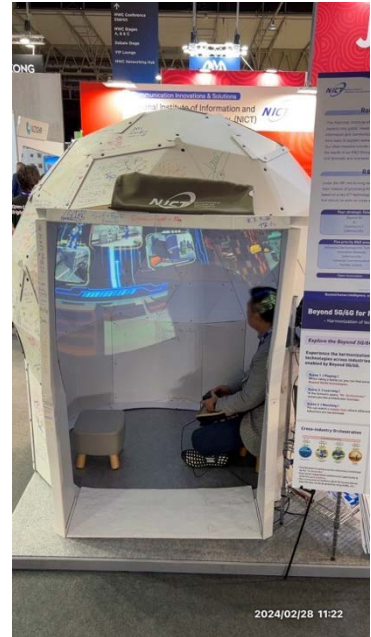


The content of the "Dome Theater" experiences this time was a new three-part version of Chapter1,2,3, a story in which you walk around the future society after the 2030s with the Beyond 5G main character "Sakura-chan" and a flying car. If you haven't experienced it yet, please try it at an exhibition.

Chapter1. Look for a Beyond 5G Technology

Chapter2. Orchestrator Function

Chapter3. Optimized Supply Chain Use Cases



We introduced NICT to students (local students were exempted from the high admission fee), telecom operators, vendors, event organizers, service providers, and government officials, and gave them a chance to experience the Beyond 5G future society. "Great!" "That's cool!" "Wow! after 2030?" Everyone comes out of the theater dome looking happy. After the experience, I signed (illustrated) the paper dome in commemoration. When I realized it, the area around the dome theater was filled with signs and illustrations, and it was hard to find the blank space. (Some people just signed as they passed by.) Each letter was filled with a feeling, and sometimes some people would lay on the ground and draw Japanese animation characters well.



Thursday, February 29, the Final Day:

On the final day, which was a big success, 1000 sets of "N-kun" Congress Bags containing Japanese pamphlets and novelty goods ("Tenugui" hand towels with the NICT logo were quite popular) were completely gone in the morning, and nearly 500 people experienced it at the "Dome Theater" exhibited by the Beyond



5G Research and Development Promotion Unit. For the four days that lasted from 9 am to 7 pm (the last day was closed at 4 pm), my legs and hips were in tatters, and the Spanish air was so dry that my throat was dry and I was honestly very tired, but I still remember the happy smiles of all those who were connected with many people across countries and talked with excitement about the upcoming Beyond 5G society.



I am now looking forward to the future of Beyond 5G in the 2030s and beyond, and to the world where R & D on Beyond 5G technology, which will be the foundation not only for communications but also for society as a whole, will further advance and take shape.

※Mobile World Congress(MWC) Barcelona 2024 <https://www.mwcbarcelona.com>

Event Briefs

— A summary of lectures and other events held at various locations —

Thursday, January 25, 2024

Dr. Ishizu, Director of the Beyond 5G Design Initiative, NICT, gave a lecture at the ICT Research & Development Support Seminar.

The "ICT Research & Development Support Seminar" was held at the Kumamoto Castle Hall, co-sponsored by the Kyushu Bureau of Telecommunications, the Kyushu Island Alliance of ICT, and the NICT.

From NICT, Kentaro Ishizu, Director of the Beyond 5G Design Initiative, gave a lecture entitled "Industrial Activities in Ten Years' Time, Changed by Beyond 5G" on important concepts such as the fusion of cyberspace and physical space (CPS) and Beyond 5G architecture that creates new services across industrial fields through system collaboration.

At the exhibition corner in the venue, we exhibited VR contents that allowed participants to experience the mechanism of Beyond 5G through the "Shape of Industry After the 2030s Changed by Beyond 5G (Supply Chain of the Fisheries Industry)," which was experienced by an extremely large number of participants.

*ICT Research & Development Support Seminar (Kyushu Bureau of Telecommunications, Ministry of Internal Affairs and Communications)
<https://www.nict.go.jp/publicity/event/2024/01/25-1.html>

February 1 (Thu) - 2 (Fri), 2024

Three speakers from NICT gave lectures at the Beyond 5G International Conference.

The Beyond 5G International Conference (co-hosted by Ministry of Internal Affairs and Communications and Beyond 5G Promotion Consortium) was held at Hotel New Otani Tokyo (Chiyoda Ward, Tokyo Prefecture).

The purpose of this conference was to "grasp international trends in the elements of R & D, etc. necessary for the promotion of Beyond 5G, and to consider international collaboration (R & D and social implementation) among industry, government, and academia for the promotion of Beyond 5G through sharing efforts for the promotion of Beyond 5G from the perspectives of industry, government, and academia in Japan and overseas." Lectures were given on the following three main themes.

- (1) International Trends surrounding Beyond 5G
- (2) Japan's Efforts to Promote Beyond 5G
- (3) International Collaboration for the Promotion of Beyond 5G

Three people from the NICT gave lectures.

■ Special speech

Hideyuki Tokuda, President of NICT (Vice Chairman of Beyond 5G Promotion Consortium)

■ Activity report

Morio Toyoshima, Director General of Wireless Networks Research Center, Network Research Institute, NICT

Iwao Hosako, Executive Director of Beyond 5G Research and Development Promotion Unit, NICT

*Beyond 5G International Conference <https://beyond5g-conference.jp/>

This text has been translated using "Min'na no Jidou Hon'yaku@TexTra(R)".

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TECHNOLOGY
PARK

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