R&D Activity 2024

Open R&D Environment

Open R&D Environment | Forum/Symposium/Event

   The role that information communications should play in the advancement of the society and economy is of great importance. NTT has an objective to contribute to the development of information communications in Japan, and all around the world as well, by disseminating our research and development results. To achieve the objective, we are energetically developing the activities shown on the right.

Announcing research results, exchanging research with other organizations

Dissemination of R&D results through technology disclosures and other methods

Standardization activities

2023 Symposiums/Forums Schedule (arranged chronologically)

Event	Date	Location
Tsukuba Forum 2023	May 17-18, 2023	NTT Tsukuba R&D Center Tsukuba International Congress Center
NTT Communication Science Laboratories "Open House 2023"	June 1-2, 2023	NTT WEST QUINTBRIDGE
RIKOCHALLENGE SUMMUER OF 2023	August 10, 2023	NTT Atsugi R&D Center
NTT R&D FORUM 2023 — IOWN ACCELERATION	November 14-17, 2023	NTT Musashino R&D Center/Online

NTT R&D FORUM 2023 —IOWN ACCELERATION

NTT held "NTT R&D FORUM 2023 —IOWN ACCELERATION" at the NTT Musashino R&D Center over four days, from Tuesday, November 14th to Friday, November 17th, 2023. This was the first time in four years that the event was held in-person, as the previous three NTT R&D Forum were held mainly online in response to COVID-19. A total of about 12,000 guests from Japan and overseas, including NTT Group customers and business partners, attended R&D FORUM 2023.

NTT R&D FORUM 2023 featured NTT's Large Language Model "tsuzumi" as a pillar technology in the "IOWN Pick Up" exhibition, attracting the attention of many visitors. The event also showcased three timelines —"IOWN Now," "IOWN Evolution," and "IOWN Future"— according to the maturity of IOWN-related technologies. NTT's latest R&D results —97 exhibits (of which 20 were online only) in 18 themes— were also introduced in an easy-to-understand manner.

For the keynote speeches, NTT President and CEO Akira Shimada presented the potential of IOWN and "tsuzumi," NTT's own LLM, in solving social issues. Sachiko Oonishi, NTT Executive Vice President, Head of Research and Development Market Strategy, discussed NTT's R&D efforts from both "product-out" and "market-in" approaches. Shingo Kinoshita, NTT Senior Vice President, Head of Research and Development Planning, provided technical descriptions of IOWN and NTT's LLM, and synergies between these technologies. In addition, three special sessions and three MIRAI (Outlook) seminars were held. The contents of these lectures were also made available online and watched by approximately 15,000 viewers.

NTT R&D Forum 2023 allowed visitors to experience NTT R&D's various efforts and their steady progress. We could also receive valuable feedback. Going forward, we will work even harder to develop and deploy new technologies to meet the world's great expectations of NTT.

Keynote speech by Akira Shimada, NTT President and CEO
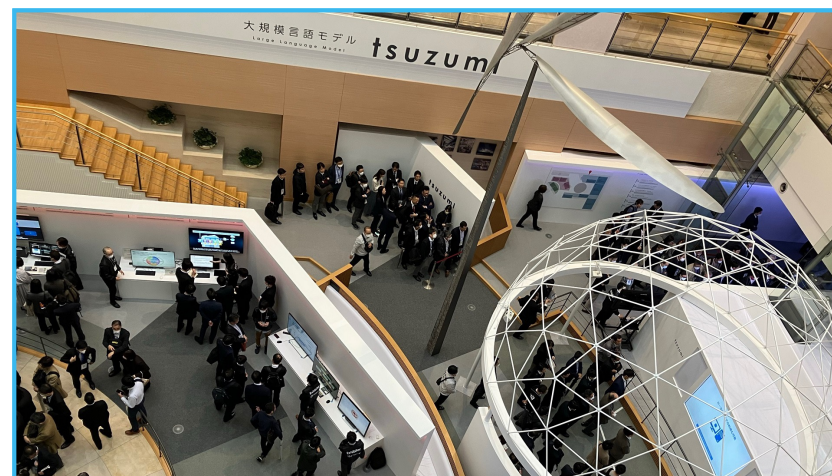
Exhibits of NTT's R&D achievements

Tsukuba Forum 2023

NTT Access Network Service Systems Laboratories held the Tsukuba Forum 2023 on Wednesday, May 17 and Thursday, May 18, 2023, at the NTT Tsukuba R&D Center. The theme of the forum was "Access networks that drive innovation -Staying connected from now onwards." This year's Forum featured proposals and presentations related to Access Network Service Systems Labs' latest R&D achievements, as well as numerous exhibits and technology demonstrations by a total of 97 organizations, including co-hosting associations and NTT Group companies. About 8,880 participants preregistered for this event, and 7,800 attended in person.

At the Tsukuba International Congress Center, Dr. Katsuhiko Kawazoe, Senior Executive Vice President and Representative Member of the Board of NTT, gave a keynote speech titled "NTT as a Creator of New Value and Accelerator of a Global Sustainable Society." He was followed by Mr. Takashi Inomata, Executive Vice Present, Senior Vice President, Network and Engineering Division, NTT WEST, with a keynote speech titled "Towards comprehensive engineering."

In addition to exhibits and technology introductions from a variety of companies, Tsukuba Forum 2023 included four workshops hosted by Senior Manager Osamu Sasaki of NTT EAST and Executive Research Engineers Takashi Ebine, Tomoaki Yoshida, and Takeshi Onizawa of NTT Access Network Service Systems Laboratories. It also featured two panel discussions under the themes "A world that expands human sensations and activities enabled by the evolution of wireless technology" and "Initiatives to create a "continuously connected access network"" with panelists from a trinity of organizations consisting of co-sponsoring organizations, NTT Group companies, and NTT Laboratories.

The number of in-person participants increased due to the downgrade of COVID-19 to a Class 5 infectious disease, making the Forum an effective venue for sharing practical information. Attendance grew not just in the number of exhibitors and guests but also in first-time participants. The Tsukuba Forum 2023 served as a place for creating new business and relationships, fulfilling its purpose.

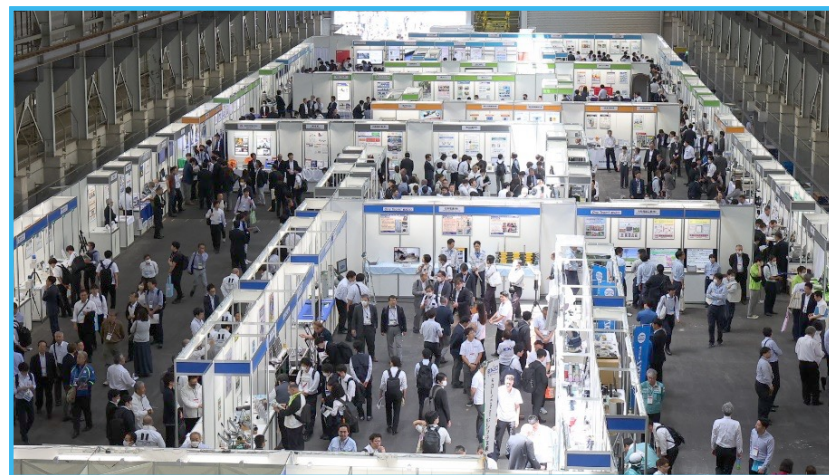* Positions and titles are current as of the dates of Tsukuba Forum 2023 .

Exhibit hall

Panel discussion

NTT Communication Science Laboratories "Open House 2023"

NTT Communication Science Laboratories (CS Labs) held "Open House 2023" to introduce its latest R&D achievements. It was the first time in four years that the event was held in-person. We presented NTT's research topics ranging from AI and media processing to the Science of Human and neuroscience in an easy-to-understand manner. As a new trial, the event was held at NTT West's innovation facility "QUINTBRIDGE" in Osaka City. To ensure that participants feel safe and secure, guests were asked to register beforehand.

For the invited talk, Akira Takagi, Director of hearing and speech- language center, Shizuoka General Hospital, gave a lecture on "Spoken language acquisition through electrical stimulation." He presented research that makes it possible for human beings whose organ of Corti in the inner ear does not function properly from birth to acquire language ability. To acquire language ability, children must be exposed to sufficient auditory stimuli by around the age of three. Dr. Takagi discussed how children with impaired hearing can develop language skills through the use of a cochlear implant, which provides electrical stimulation to the inner ear. Next, Futoshi Naya, Vice President, Head of NTT CS Labs, delivered a lecture titled "Deciphering the future of people, society, and the Earth, and designing a world where everyone can flourish: Communication science that connects the past, present, and future through diverse knowledge and technologies." This talk provided an overview of some of CS Labs's most recent research from the perspective of "deciphering people and society and the world." Examples include human science- and neuroscience-centered efforts, which seek to "deepen our understanding of human beings," as well as research in media processing and machine learning that aims to "surpass human abilities." In addition, CS Labs researchers gave talks on four research topics: "Machine learning that reproduces physical phenomena from data," "Dilemma between quantum speedup and computational reliability," "Decoding the human brain through machine brains," and "What is the lucid awareness in the mindfulness meditation?" Sixteen research presentations were delivered at the research exhibit, with demonstrations in four categories: "Science of Machine Learning," "Science of Communication and Computing," "Science of Media Information," and "Science of Human." The lectures and exhibit contents, including videos, were made available online for a certain period of time after the Open House ended so that the latest achievements of NTT CS Labs were accessible to a wide range of people.

We welcome those interested to come to our next open house, get to know CS Labs, and share your feedback with us.

Research exhibits at NTT West QUINTBRIDGE

Open House 2023 Home Page

Open R&D Environment

Publishing of Technical Magazines

NTT publishes the following two technical magazines with the aim of disseminating research and development results.

(1) NTT Gijutsu Journal (monthly magazine in Japanese)

https://journal.ntt.co.jp/

Provides technical information on a wide range of subjects from the development of new technologies and services and the growth of various business lines in the NTT Group. It explains new technology trends in a straightforward manner for general readers.

(2023 Feature Articles)

Toward Quantum Technology Innovation, Launch of APN IOWN1.0 Service, Toward More Robust Networks, etc.

(2) NTT Technical Review (monthly magazine in English)

https://www.ntt-review.jp/

In line with the globalization of NTT Group businesses, the NTT Technical Review is issued as a monthly magazine in English and aims to communicate NTT's R&D results and activities worldwide.

(2023 Feature Articles)

Plasmon Control Technology, The Forefront of Cryptography Research with an Eye on the Quantum Era, Designing a Future Where Everyone Can Flourish by Sharing Diverse Knowledge and Technologies, etc.

Patents and Technology Disclosures

In addition to enthusiastically obtaining patents, technology resulting from research and development across a wide range of fields is provided at a reasonable cost so that it can be utilized in the industrial world when required.

■ Applications for R&D patents

Horizontal bar chart. X-axis: 0, 500, 1000, 1500, 2000, 2500, 3000 (Number). Fiscal years 2021, 2022, 2023. Legend: Overseas, Domestic.

■ Major technology disclosure

Year	Disclosure
2021	● High Quality Text-to-Speech Engine with Neural Speech Waveform Generation ● 50G-Class High-Output-Power EML and High-Sensitivity Photodiode ● Long Distance Bidirectional Power Transmission Technology for Supplying DC Power to the Outdoors
2022	● Global Solar Radiation Estimation and Forecast Correction Technology using Power Generation ● 1 Tbit/s Class Large-Capacity Digital Coherent Optical Device ● 1.2 Tbps Coherent Digital Signal Processor (DSP)
2023	● Evaluation Technology for Neutron Induced Soft Errors ● Delay-Adjustment Transmission System ● Data Selection for Multilingual ASR Model Training

Open R&D Environment

Scientific Papers and External Announcements

The results of research and development activities carried out at our research laboratories are frequently announced at domestic and international conferences and in specialized scientific journals.

These activities inspire more research and development into the field of information communications and contribute greatly to the development of science and technology.

(Number)

2021 **2022** **2023**

(Fiscal year)

2500
2000
1500
1000
500
0

Paper selected by Japanese academic societies and journals

Paper selected by overseas academic societies and journals

Presentation at meeting of domestic academic societies

Presentation at international conferences
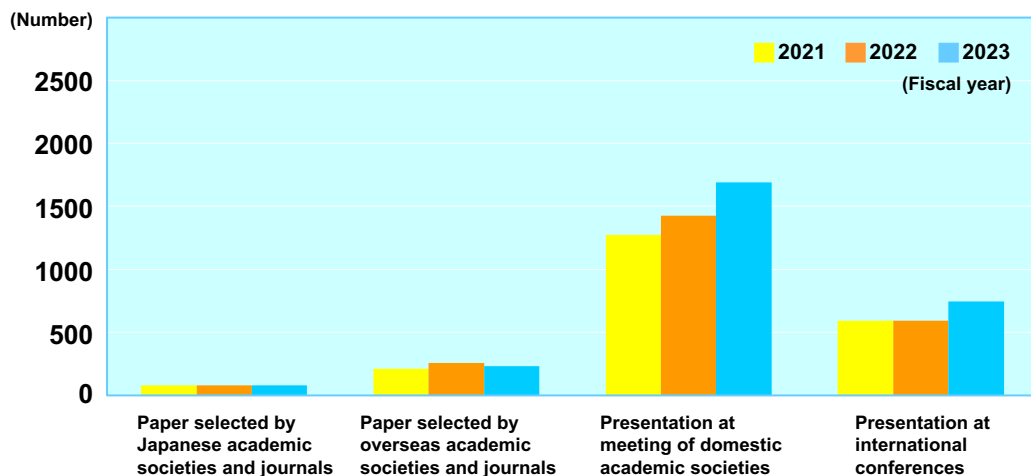
Standardization Activities

Based on its comprehensive range of research and development on information communications, NTT has been active in fora and consortia, which are recently playing leading roles, as well as in standardization organizations such as ITU-T and ISO.

These activities also contribute to the orderly development of worldwide information communications.

■ Participation in de jure standardization organizations, such as ITU (FY2023)

Participants to domestic/ international SDO*	Members of domestic committees
total 150	total 338

■ Degree of participation in de jure international standardization meetings (FY 2023)

977 person-days

(excluding preparatory studies)

* SDO: Standard Development Organization

■ Percentage of contributions submitted to ITU-T (2017-2020 study period)

NTT 1.8%

Japan (Excluding NTT) 3.8%

Other countries 94.4%
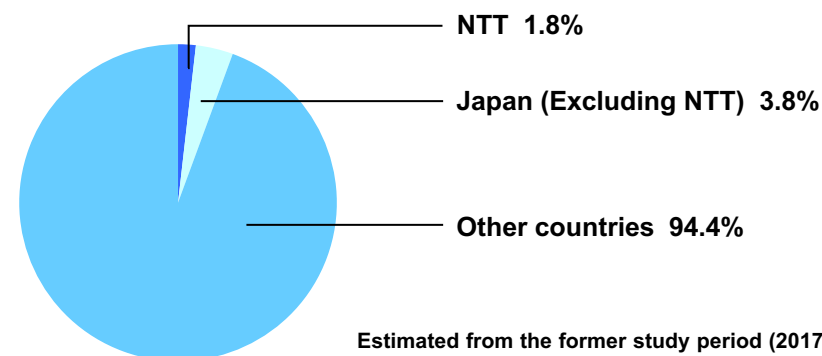
Estimated from the former study period (2017-2020) data of ITU-T and of the Ministry of Public Management, Home Affairs, Posts and Telecommunications, Japan.

Open R&D Environment

Statistical Data

Main Commendations and Prizes Awarded in FY2023

Organization and Award	Items and Recipient
The Young Scientists' Award The Commendation for Science and Technology by the Minister of Education, Culture, Sports, Science and Technology	Research on modeling multimodal communication and facilitating human and human-computer interactions (Ryo Ishii)
Maejima Hisoka Award Tsushinbunka Association	Research and development of a mobile application technology for high-speed terminals using 60GHz band millimeter-wave, high-capacity wireless transmission (Daisei Uchida, Tatsuhiko Iwakuni, Masaaki Koiwa, and Yukihiko Okumura)
Maejima Hisoka Encouragement Award Tsushinbunka Association	Research on long-haul optical repeatered transmission systems using mode division multiplexing (Kouki Shibahara)
IEEE Photonics Society 2023 William Streifer Scientific Achievement Award IEEE Photonics Society	For contributions to ultra-high speed, low power consumption membrane lasers and their heterogeneous integration (Shinji Matsuo)
JSAP Fellow The Japan Society of Applied Physics (JSAP)	Exploration of novel properties of photonic crystals and application to integrated nanophotonics (Masaya Notomi)
2024 Fellow Optica (formerly OSA)	For achievements and leadership in advancing optical access architecture and technologies (Jun-ichi Kani)
Fellow The Institute of Electronics, Information and Communication Engineers (IEICE)	Research and practical application of the advanced open source cloud (Yoji Yamato)
IPSJ Contribution Award Information Processing Society of Japan (IPSJ)	Contribution to the technology and legal system of data security and privacy (Katsumi Takahashi)

Number of R&D researchers

* The total number of employees of the NTT Holding Company Laboratories is posted.

R&D Expenditure

* Research and development expenses of the NTT Holding Company on a non-consolidated basis are posted.

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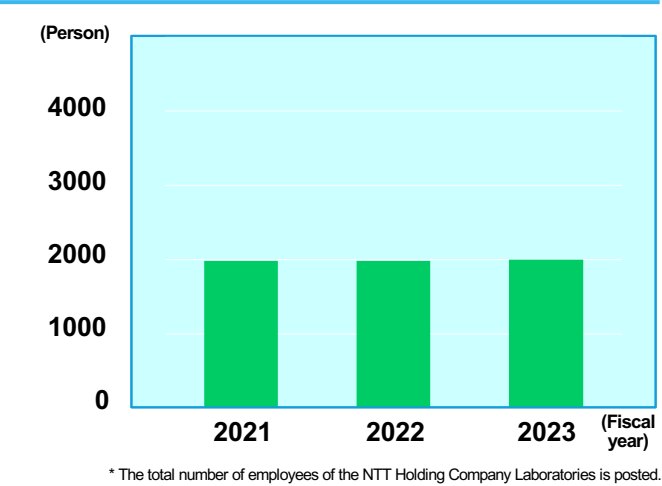
Organization Chart of NTT
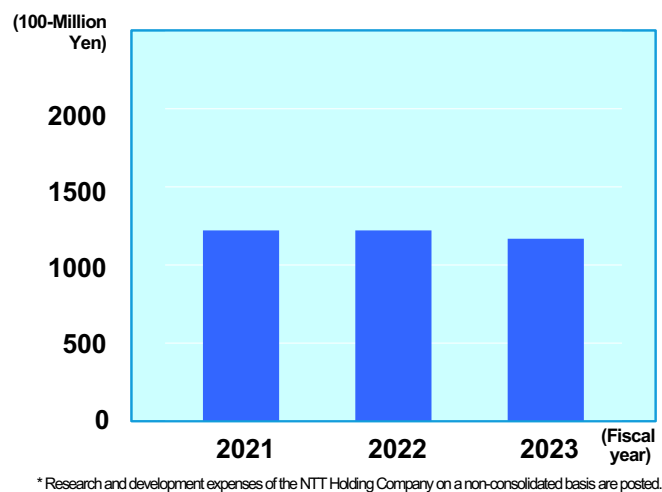
Organization Chart of Nippon Telegraph and Telephone Corporation and Mission of Laboratories

Audit & Supervisory Board

Audit & Supervisory Board Members

Office of Audit & Supervisory Board Members

Board of Directors

Chairman

President

Corporate Strategy Planning Department

Technology Planning Department

Research and Development Market Strategy Division

Market Planning and Analysis Department

Research and Development Planning Department

Alliance Department

Global Business Department

Finance and Accounting Department

Public Relations Department

General Affairs Department

Intellectual Property Center

Internal Audit Department

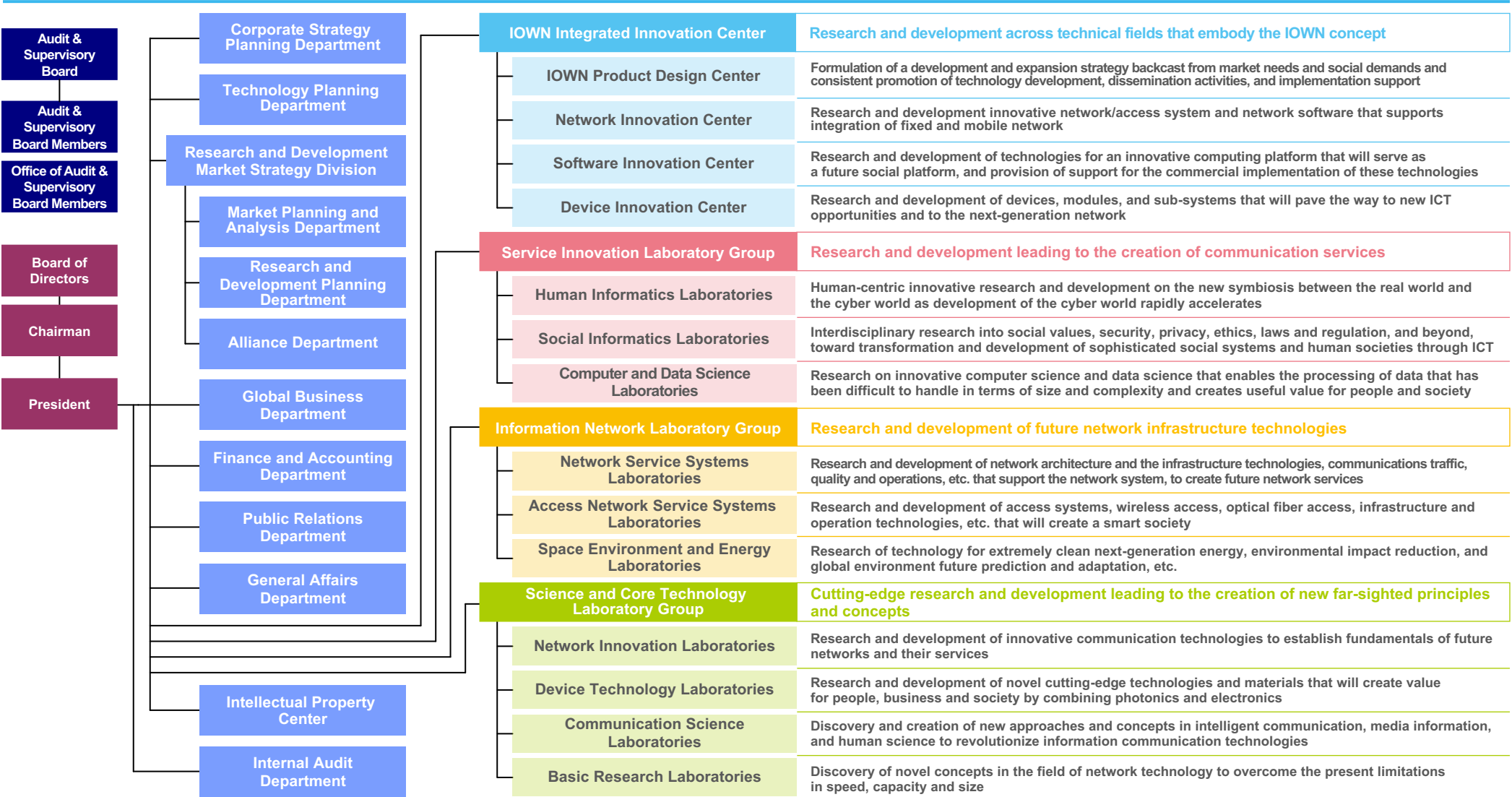| Organization	Mission
IOWN Integrated Innovation Center	**Research and development across technical fields that embody the IOWN concept**
IOWN Product Design Center	Formulation of a development and expansion strategy backcast from market needs and social demands and consistent promotion of technology development, dissemination activities, and implementation support
Network Innovation Center	Research and development innovative network/access system and network software that supports integration of fixed and mobile network
Software Innovation Center	Research and development of technologies for an innovative computing platform that will serve as a future social platform, and provision of support for the commercial implementation of these technologies
Device Innovation Center	Research and development of devices, modules, and sub-systems that will pave the way to new ICT opportunities and to the next-generation network
Service Innovation Laboratory Group	**Research and development leading to the creation of communication services**
Human Informatics Laboratories	Human-centric innovative research and development on the new symbiosis between the real world and the cyber world as development of the cyber world rapidly accelerates
Social Informatics Laboratories	Interdisciplinary research into social values, security, privacy, ethics, laws and regulation, and beyond, toward transformation and development of sophisticated social systems and human societies through ICT
Computer and Data Science Laboratories	Research on innovative computer science and data science that enables the processing of data that has been difficult to handle in terms of size and complexity and creates useful value for people and society
Information Network Laboratory Group	**Research and development of future network infrastructure technologies**
Network Service Systems Laboratories	Research and development of network architecture and the infrastructure technologies, communications traffic, quality and operations, etc. that support the network system, to create future network services
Access Network Service Systems Laboratories	Research and development of access systems, wireless access, optical fiber access, infrastructure and operation technologies, etc. that will create a smart society
Space Environment and Energy Laboratories	Research of technology for extremely clean next-generation energy, environmental impact reduction, and global environment future prediction and adaptation, etc.
Science and Core Technology Laboratory Group	**Cutting-edge research and development leading to the creation of new far-sighted principles and concepts**
Network Innovation Laboratories	Research and development of innovative communication technologies to establish fundamentals of future networks and their services
Device Technology Laboratories	Research and development of novel cutting-edge technologies and materials that will create value for people, business and society by combining photonics and electronics
Communication Science Laboratories	Discovery and creation of new approaches and concepts in intelligent communication, media information, and human science to revolutionize information communication technologies
Basic Research Laboratories	Discovery of novel concepts in the field of network technology to overcome the present limitations in speed, capacity and size

(As of June 3, 2024)