

NTT Research, Inc. Launched to Strengthen and Globalize R&D

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Abstract

A plan to establish a new company, NTT Research, Inc., was announced in November 2018 as part of NTT Group's Your Value Partner 2025 medium-term management strategy. NTT Research will conduct basic research to lay the groundwork for new technologies with the aim of creating new business in five to ten years. The first three fields of basic research to be tackled—quantum physics, mathematical information theory, and medical informatics—form the basis of NTT's IOWN (Innovative Optical and Wireless Network) initiative announced in May 2019. NTT Research aims to *Upgrade Reality*—we intend to bring an even greater transformation (Upgrade) of the real world (Reality).

Keywords: basic research, IOWN, Upgrade Reality

1. NTT's global businesses

NTT is strengthening its global business competitiveness—one of the pillars of growth in the NTT Group's Your Value Partner 2025 medium-term management strategy (**Fig. 1**). As one source of competitiveness, it is fostering innovation through the establishment of three new companies.

The first new company, NTT Disruption, aims to commercialize new technologies in a short timeframe of roughly one to three years through proof of concept and other development activities. The second new company, NTT Venture Capital, will invest in startups with the aim of bringing new technologies to market in about three to five years. The third new company is our company, NTT Research, Inc. Our mission is to conduct basic research to lay the groundwork for new technologies with the aim of creating new business in five to ten years.

The goal is to deploy new technologies globally by integrating these three companies with NTT Group's existing companies and research laboratories. The three companies are headquartered in the region in northern California known as Silicon Valley, an area of technical innovation. Establishing the companies there, a crucial nexus of people, money, and information, will help speed up the deployment of new technologies with our customers and partners. Another important reason for headquartering in Silicon Valley

is that it offers a stimulating environment that attracts the best researchers engaging in basic research, precisely because of its nexus status.

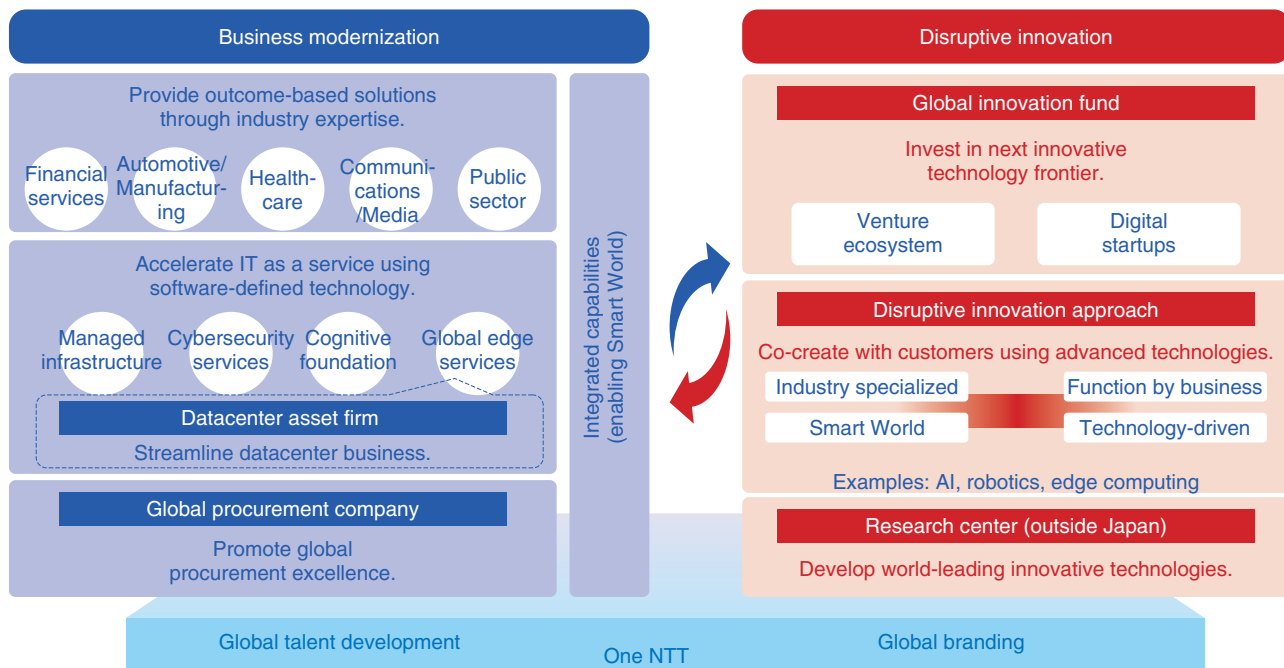
2. Areas of research at NTT Research, Inc.

Our research areas at NTT Research were established through close collaboration with the NTT laboratories in Japan. By consistently supporting long-term research processes from fundamentals to applications across a wide range of research fields related to information and communication technologies, from optical communication devices to human psychology, NTT laboratories have produced a number of important results, some of which have been chosen as IEEE milestones.

NTT announced the IOWN (Innovative Optical and Wireless Network) initiative in May 2019 [1] to promote the development of technologies that further enhance humans beyond the boundaries of conventional communication services. To start with, NTT Research has established three laboratories focused on key research areas: quantum physics (the novelty of the IOWN initiative), mathematical information theory (which enables the secure use of various types of data, including personal information), and medical informatics (which deals with the basic biological data of humans). The respective labs are named as follows:

“One NTT” Global Growth Strategy

Strengthen competitiveness by creating innovative solutions and supporting customers' business modernization.



AI: artificial intelligence
IT: information technology

Fig. 1. Strengthening the competitiveness of NTT's global business.

- (1) Physics & Informatics Laboratories (NTT PHI Labs)
- (2) Cryptography & Information Security Laboratories (NTT CIS Labs)
- (3) Medical & Health Informatics Laboratories (NTT MEI Labs)

These are the basic technological fields that NTT laboratories have cultivated in Japan for many years. However, our goal is to take these technologies in new directions by adding into the mix the best research outside Japan.

NTT PHI Labs will explore the interdisciplinary area between physics and informatics, focusing on basic physics research, particularly quantum-classical crossover physics and critical phenomena in neural networks. It will also pursue basic research to build new theories, which will include those that can be applied to information processing technologies. Its director is Yoshihisa Yamamoto, a professor emeritus of Japan's National Institute of Informatics and Stanford University. He is also program manager of Japan's ImpACT (Impulsing Paradigm Change through Disruptive Technologies) Program.

NTT CIS Labs will conduct basic research on cryptography and information security with the goal of building a safe and secure future. It will focus on theoretical topics such as cryptography in support of advanced functionality and security in decentralized environments that use technologies such as blockchain. The director is Tatsuaki Okamoto, an NTT fellow and one of the world's leading cryptography researchers.

NTT MEI Labs will work on the information processing technology that drives precision medicine, particularly focusing on data-driven medical technology for handling large multidimensional data sets of biological information, such as medical records and genomic information, as well as the electrical phenomena of the human body. The director is Hitonobu Tomoike, adviser to the Sakakibara Heart Institute, who has a track record of fruitful exchanges with world-class institutions.

NTT Research is taking advantage of the research networks and personal connections of these laboratory directors as we recruit new research teams to collaborate with NTT's Japanese researchers. We are

hiring the best external researchers from Japan and other countries in the areas that underlie the proprietary technologies developed by NTT laboratories. We want to introduce our customers and partners to the unique vision of the future that will inspire basic research at NTT Research. This showcases our value as a long-term business partner and highlights NTT Group's unique corporate assets, including our long-term vision and unparalleled depth of human resources. We hope that NTT Research along with these activities will contribute to the global development of the NTT Group businesses.

3. Future development

In the Feature Articles in this issue, the research lab directors explain the aims of their respective laboratories [2–4]. In addition, Brent Waters, a distinguished scientist in the area of basic cryptography theory, shares his thoughts on creating a new research lab [5].

NTT laboratories have a wide range of achievements, but globally, laboratories such as IBM and Samsung have achieved more results in terms of numbers of patents and papers. In addition, GAFAs (Google, Amazon, Facebook, Apple) and other technology giants have invested in university laboratories to strengthen their research activities. In cooperation

with NTT laboratories in Japan, NTT intends to further expand the advanced research network it has cultivated to universities and other organizations around the world. We will use our site in Silicon Valley as a base to build out a global research ecosystem starting from the basic research stage. Based on the digital society created by Xerox PARC and other pioneering research labs in Silicon Valley, we intend to bring an even greater transformation (Upgrade) of the real world (Reality). In short, NTT Research aims to *Upgrade Reality*.

References

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Kazuhiro Gomi

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He joined NTT in 1985. Before taking up his current post in April 2019, he served as vice president (VP) of the Global Business Department of NTT Communications from 2001–2004, after which he served as VP of the Global IP Network Business Unit of NTT America (2004–2009), chief operating officer of NTT America (2009–2010), and president and chief executive officer of NTT America (2010–2019).



Kei Karasawa

Vice President of Strategy, NTT Research, Inc.
Kei Karasawa has been leading research and development (R&D) at NTT for more than 20 years. He is currently the vice president of strategy at NTT Research, Inc. From 2015–2019, he worked with the R&D planning department at NTT and built cooperative relationships with NTT operating companies around the world to deploy NTT R&D technology to global markets. He led applied R&D at NTT EAST from 2011–2015 and put the technology into practice in developing network services. Prior to that, he researched network software technologies, implemented patented software, such as security and distributed systems, and developed commercial services for the Next Generation Network. In 2005, he conducted basic research on cryptography and information processing as a visiting scholar, with Prof. Dan Boneh, in the Security Laboratory at Stanford University. He holds a doctorate of engineering in data-driven parallel computer technology. He has extensive knowledge and experience in information processing-related technologies from basic technology to applications.