Release of NTT Technology Report for Smart World 2021

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Abstract

NTT Research and Development Planning Department annually releases the NTT Technology Report for Smart World, which summarizes its vision for the Innovative Optical and Wireless Network (IOWN) launched in 2019 and technologies intended to make the world a better place for everyone. It has now published the 2021 edition. This article provides an overview and main updates of the new edition.

Keywords: technology, social trend, smart world

1. Innovations and technologies that overcome limitations in transforming society

Our world is undergoing dramatic changes (the COVID-19 pandemic, environmental destruction, and climate change). It has become evident that, if humanity does not change course, even sustainable development will no longer be possible. As artificial intelligence (AI) processes big data and use of virtual currency expands, the volume of data requiring information processing has exploded, consuming ever-growing amounts of electricity. In the face of these new changes, the technologies we are researching and developing are intended to form the foundation for a world in which people can live bountiful lives. This article describes integrated technologies essential for transcending current limitations and building a better world and explains how these technologies are related to each other while focusing on the Innovative Optical and Wireless Network (IOWN) vision, which is at the center of our activities.

2. Three pillars, three platforms, and five kinds of value for the IOWN vision

IOWN consists of three pillars: the All-Photonics Network (APN), which uses photonics-based technology in everything from networks to terminals; Cognitive Foundation, which connects and controls everything; and Digital Twin Computing, which combines the real and digital worlds to predict the future.

The IOWN vision originated with the announcement in April 2019 of the invention of optical transistors. Alongside the development of these devices based on photonic technology, three common platforms are part of the IOWN vision: photonic direct communication, extreme network as a service (NaaS), and data-centric computing infrastructure. From these platforms, five kinds of value that aim at solving social issues and making the world a better place can be generated: fourth-dimensional (4D) digital platform™, the Remote World, well-being, zero environmental impact, and a value chain that will build new trust. These three common platforms and five kinds of value are described below.

3. Three common platforms

3.1 Data-centric computing infrastructure

It is imperative to create a data-centric society capable of creating new value from a wide variety of data. On the data-centric computing infrastructure, a platform to be built through IOWN, new value will be created for data owners and middle service providers, helping to create a sustainable society. This platform will be built atop three core functions: data hub service, AI service platform, and photonic disaggregated computing.

3.2 Extreme NaaS

As the reach of the fifth-generation mobile communication system (5G) services expands and the deployment of 6G technology comes into sight, even faster networks are needed. In addition to high capacity, it is vital to have networks that can reliably maintain connectivity. We believe that implementing extreme NaaS requires innovation in three areas: network service provision, the concept of control information, and access networks.

3.3 Photonic direct communication

We believe that if we are to fully utilize the APN of IOWN, we need multi-point connection technology that can promptly handle a wide range of bandwidths coupled with a stress-free user experience, along with ultra-reality communication technology. Thus, one of our objectives is to provide a photonic direct communication service. Two technologies are important for this: network information acquisition and provision and provision of multi-point connectivity. When this service becomes available, people in different locations will be able to communicate with each other as if they were in the same place, and new ways of engaging in sports and entertainment may be found.

4. Five kinds of value

4.1 4D digital platform™

The 4D digital platform™ provided through IOWN is a digital platform that integrates 4D information (accurate 3D location information plus time information) into high-precision geospatial information. It provides four kinds of value: efficient management of road traffic, utilizing urban assets, cooperative maintenance of social infrastructure, and understanding the Earth's environment and natural disasters. It can conduct cross-industry analysis of the prevailing situation and make predictions regarding the future for a range of social activities and feed the resulting data into various industrial infrastructures, thereby making it possible to balance people's comfort with overall optimization in traffic and smart city management, reduce the cost of operating and maintaining social infrastructure, and contribute to achieving harmony between society and the natural environment.

4.2 Remote World

In the wake of the COVID-19 pandemic, many industries have clearly shifted towards remote activities. Consequently, there is a need for mechanisms, such as remote work and online education that can provide value similar to the real world without having to be physically present. Through IOWN, we aim to achieve the Remote World by integration and unification of environmental conditions between remote sites, conveying people's thoughts and intentions and synthesizing abilities, transcending barriers of culture and values, and integration with activities carried out in close proximity.

4.3 Well-being

The concept of well-being that has recently garnered attention encompasses not only physical but also mental and social well-being and has spurred initiatives that seek to understand human well-being from medical, pleasure-seeking, sustainable, and other perspectives. In line with this, we will build the foundations that allow each individual to achieve a state of well-being. Key points in this effort will be visualization of well-being factors, presentation of options tailored to each individual, promoting autonomous behavioral change and choice, and complementary ecosystems that transcend industries.

4.4 Zero environmental impact

It is urgent to create a society that can cope with global environmental changes, such as climate change, major disasters, and pandemics. The key points in providing zero environmental impact will be achieving a society that accepts environmental change, next-generation energy distribution networks, optimal operation of nuclear fusion reactors, and ultra-high accuracy weather prediction. A new communications platform such as IOWN will be essential to utilizing next-generation energy technology and optimal energy distribution.

4.5 Value chain to build new trust

The digitalization of society has made it possible for people to enjoy more convenient services, but at the same time, the risk of cybercrime is increasing. As information processing becomes an integral part of human society, damage in the cyber world has a direct impact on people. That is why we want to create a platform that can support a safe and secure society. Key points in creating such a platform will be establishing more robust and simple security, practicing glocalism by working with trustworthy organizations, connecting value chains that span industries, and accelerating data-driven value creation.

5.   Conclusion

NTT Research and Development Planning Department will continue to release a summary of technology trends and the activities of NTT R&D. You can download NTT Technology Report for Smart World 2021 from NTT R&D's website [1].

Reference

[1]   NTT Technology Report for Smart World 2021, https://www.rd.ntt/e/techreport/

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