

# Remarks for Special Issue on Open Network Technologies

---

Since the onset of the novel coronavirus infection (COVID-19) pandemic in 2020, we have witnessed substantial and far-reaching changes in every sphere of Life. Remote work, online education, and e-commerce were initially alternatives to going to physical locations, but they have since proven effective in terms of time management and activity efficiency. Even as we begin to return to our pre-pandemic ways of life, these elements have become essential parts of our daily routines. An important factor that supports these changes is our information and communication networks.

At the same time, the social environment and technological trends surrounding information and communication networks are also undergoing rapid changes. With the emergence of cloud and edge services utilizing artificial intelligence (AI) and machine learning (ML), we can easily access all kinds of information around the world through our smartphones. Digital transformations (DX) across various industries continue to drive significant improvements in efficiency and foster the creation of new value. This is achieved through the collection and analysis of large volumes and diverse types of digital information, enabling the delivery of optimized solutions. To realize diversification of these services, it is expected that not only will information and communication networks be accelerated, but network devices and software modules will be



## KIUCHI Michio

Corporate Executive Vice President (EVP) and  
President of Telecom Services Business Unit

combined in an open environment, enabling flexible adaptation to meet individual service requirements and to seamlessly connect people, things, and events in the service. One of the initiatives in this endeavor is open architecture.

Since the early 2010s, NEC has been at the forefront of promoting open architecture in information and communication networks. Our leadership in the Open Networking Foundation (ONF) has been instrumental in driving the advancement of network function virtualization (NFV) within the European Telecommunications Standards Institute (ETSI), resulting in the realization of software-defined and virtualized core networks. This has significantly simplified the process of configuring networks tailored to specific service requirements. Over the past few years, NEC has also placed a strong emphasis on fostering openness in the radio interface through its involvement in the O-RAN ALLIANCE. Furthermore, NEC has taken strides in developing open and all-photonics network, which will serve as the infrastructure for ultra-high-speed communications in the 2030s. These core, wireless, and optical technology assets based on open architecture will be interconnected, resulting in a substantial enhancement in the value of services offered by information and communication networks.

In 2022, NEC consolidated its initiatives into a suite of solutions called NEC Open Networks as

part of our commitment. In this special issue, we will introduce this suite of solutions and delve into the research and development of Beyond 5G/6G technology.

To effectively achieve the Sustainable Development Goals (SDGs), particularly in terms of attaining carbon neutrality, it is imperative to transform information and communication networks. In the era of 5G open networks where every person, thing, and event is connected to the network, it is crucial to mitigate the energy consumption associated with rapidly increasing data communications and the processing power required for AI and ML applications. Telecommunications carriers have already taken significant steps to contribute to the realization of a carbon neutral society by communicating their commitment to international organizations such as the Global System for Mobile Communications Association (GSMA) and the Next Generation Mobile Networks Alliance (NGMN). NEC shares this commitment and aims to achieve these goals by developing highly efficient wireless and optical devices and also by improving the efficiency of open network operation and management.

\* The names O-RAN ALLIANCE, O-RAN and their logo are trademarks or registered marks of O-RAN ALLIANCE e.V.

\* All other company names and product names that appear in this paper are trademarks or registered trademarks of their respective companies.

# Information about the NEC Technical Journal

Thank you for reading the paper.

If you are interested in the NEC Technical Journal, you can also read other papers on our website.

Link to NEC Technical Journal website

Japanese

English

## Vol.17 No.1 Special Issue on Open Network Technologies

– Network Technologies and Advanced Solutions at the Heart of an Open and Green Society

Remarks for Special Issue on Open Network Technologies  
NEC's Technological Developments and Solutions for Open Networks

### Papers for Special Issue

#### Open RAN and Supporting Virtualization Technologies

Innovations Brought by Open RAN  
Reducing Energy Consumption in Mobile Networks  
Self-configuring Smart Surfaces  
Nuberu: Reliable RAN Virtualization in Shared Platforms  
vrAIn: Deep Learning based Orchestration for Computing and Radio Resources in vRANs

#### Wireless Technologies for 5G/Beyond 5G

NEC's Energy Efficient Technologies Development for 5G and Beyond Base Stations toward Green Society  
Millimeter-wave Beamforming IC and Antenna Modules with Bi-directional Transceiver Architecture  
Radio-over-Fiber Systems with 1-bit Outphasing Modulation for 5G/6G Indoor Wireless Communication  
28 GHz Multi-User Massive Distributed-MIMO with Spatial Division Multiplexing  
28 GHz Over-the-Air Measurements Using an OTFS Multi-User Distributed MIMO System  
Comprehensive Digital Predistortion for improving Nonlinear Affection and Transceivers Calibration to Maximize Spatial Multiplexing Performance in Massive MIMO with Sub6 GHz Band Active Antenna System  
Black-Box Doherty Amplifier Design Method Without using Transistor Models  
39 GHz 256 Element Hybrid Beam-forming Massive MIMO for 8 Multi-users Multiplexing

#### Initiatives in Open APN (Open Optical/All Optical)

NEC's Approach to APN Realization — Towards the Creation of Open Optical Networks  
NEC's Approach to APN Realization — Features of APN Devices (WX Series)  
NEC's Approach to APN Realization — Field Trials  
Wavelength Conversion Technology Using Laser Sources with Silicon Photonics for All Photonics Network  
Optical Device Technology Supporting NEC Open Networks — Optical Transmission Technology for 800G and Beyond

#### Initiatives in Core & Value Networks

Technologies Supporting Data Plane Control for a Carbon-Neutral Society  
NEC's Network Slicing Supports People's Lives in the 5G Era  
Application-Aware ICT Control Technology to Support DX Promotion with Active Use of Beyond 5G, IoT, and AI  
Using Public Cloud for 5G Core Networks for Telecom Operators

#### Enhancing Network Services through Initiatives in Network Automation and Security

NEC's Approach to Full Automation of Network Operations in OSS  
Autonomous Network Operation Based on User Requirements and Security Response Initiatives  
Enhancing Information and Communications Networks Safety through Security Transparency Assurance Technology  
Enhancing Supply Chain Management for Network Equipment and Its Operation

#### Network Utilization Solutions and Supporting Technologies

Positioning Solutions for Communication Service Providers  
The Key to Unlocking the Full Potential of 5G with the Traffic Management Solution (TMS)  
Introducing the UNIVERGE RV1200, All-in-one Integrated Compact Base Station, and Managed Services for Private 5G  
Vertical Services Leveraging Private 5G to Support Industrial DX  
Integrated Solution Combining Private 5G and LAN/RAN

#### Global 5G xHaul Transport Solutions

xHaul Solution Suite for Advanced Transport Networks  
xHaul Transformation Services  
xHaul Transport Automation Solutions  
Fixed Wireless Transport Technologies in the 5G and Beyond 5G Eras  
SDN/Automation for Beyond 5G  
OAM Mode-Multiplexing Transmission System for High-Efficiency and High-Capacity Wireless Transmission

#### Toward Beyond 5G/6G

NEC's Vision and Initiatives towards the Beyond 5G Era

### NEC Information

2022 C&C Prize Ceremony



Vol.17 No.1  
September 2023

Special Issue TOP