

xHaul Transformation Services

IMANAKA Kenichi , KHASANOV Jurabek

Abstract

In the network domain operated by communication service providers (CSPs), there is a noticeable trend towards increased openness and a shift to multi-vendor networks, similar to the developments observed in the field of IT computing. With the emergence of these trends, the technical requirements for CSPs to deploy network components like IP routers and optical transport network equipment in their own transport network are becoming more complex. In this paper, keeping in mind these technology trends, we introduce NEC's service portfolio, global organization, and case studies, by highlighting our expertise as a network system integrator in providing CSPs worldwide with best-of-breed solutions that are centered around consulting services and multi-vendor ecosystems.

Keywords



transport, software-enabled, openness, interoperability, migration, multi-vendor, ecosystem, service portfolio, CoE

1. Introduction

In preparation for the full-scale deployment of 5G services, demand is increasing among communication service providers (CSPs) for higher speeds, wider bandwidth, and lower latency of transport networks in addition to wireless networks. As a result, the range of network products and solutions used in building transport networks is expanding to include multi-vendor based open-architecture solutions, in addition to conventional vertically-integrated solutions based on specific networking equipment vendor products. In recent years, there has been a growing trend towards actively considering the deployment of networking equipment that complies with open technology standards as represented by the Telecom Infra Project (TIP), and CSPs are striving to optimize the total cost of ownership (TCO) with an awareness of the life-cycle management of such networking equipment. This means selecting best-of-breed products and solutions to avoid specific vendor lock-in, thereby highlighting the increasing importance of system integration capabilities that combine multiple vendors' products. In response to these needs, NEC offers xHaul transfor-

mation services, leveraging our global resources, deep knowledge, and extensive experience. This paper introduces NEC's service portfolio, the global organization for delivering services, and several use cases.

2. Challenges in Enhancing Transport Networks

Conventional transport networks have mainly been built using dedicated products that integrate hardware and software developed by specific vendors. However, current efforts to adopt open technologies in the field of transport networks are progressing in the same way that computers transitioned from mainframes with black-box specifications to general-purpose servers. Based on this trend, many emerging vendors, as well as established leading vendors of networking equipment, are launching solutions that support open technology. Numerous technical efforts, such as ensured multi-vendor interoperability and secure migration from existing networks must be addressed in order to deploy, integrate and operate these products. It is important to fully understand the designs and operational processes of the CSPs' existing networks before considering and implementing the most

optimal solutions for enhancing the transport network.

To address these challenges, NEC has launched the xHaul transformation services that include an extensive service portfolio built upon our long years of business experience in transport networks for the global market. The service covers the products of our ecosystem partners as well as NEC's own products. Additionally, we have established 5G transport network Centers of Excellence in the EMEA and LATAM regions as a global framework to deliver our services for CSPs across the globe.

2.1 xHaul transformation service

The xHaul transformation services includes a portfolio of offerings classified into five phases from planning the deployment of the equipment to operation with considerations of the life cycle of networking equipment (**Fig. 1**).

• Plan phase

An investigation and analysis of any technical and operational challenges for existing transport networks based on the service and network evolution plans drawn by CSPs are made in this phase to co-create a grand design. The purposes of this design are to maintain and improve network quality, implement a gradual transition, and automate operations.

• Design phase

Various design documents are created in this phase. These documents range from HLD (High-Level Design) to LLD (Low-Level Design) for the transport network architecture design, link design, deployment, migration, and operation.

• Implement phase

The activities performed in this phase include

pre-verification in the lab, system setup before shipping, delivery to the site and physical installation, configuration, and setup at the customer site as well as various tests for system validation before operations begin.

• Operate phase

Technical support for the operation and maintenance of transport networking equipment as well as life cycle management for equipment in operation, technical training to enhance the skills of operators, and maximization of the operational efficiency of the equipment are provided in this phase.

• Optimize phase

Proposals for the deployment of additional networking equipment and its preventive maintenance are made in this phase based on monitoring and analysis of communication traffic and operational status, aimed at enhancing operational efficiency. Also, we propose an accelerated time-to-market and improved cost efficiency by adopting automation solutions based on the analysis of operational processes.

These service portfolios comprise solutions that can only be provided by a network system integrator with comprehensive consulting capabilities and the expertise to effectively prioritize the challenges faced by CSPs and offer solutions that take into account the latest technological trends.

2.2 CoE's value to accumulate technical know-how and deliver advanced services

In 2021, we established CoEs in the LATAM and EMEA regions as hubs to centralize resources and expertise to

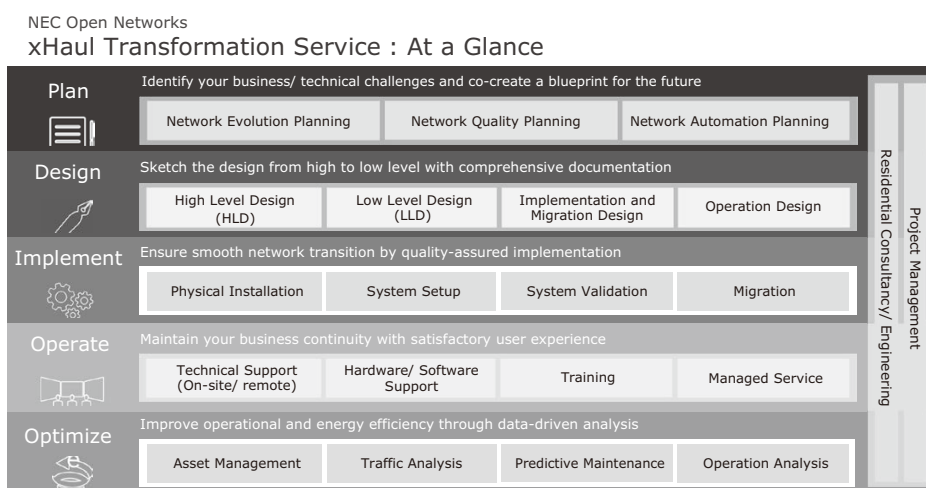


Fig. 1 Overview of NEC xHaul transformation service portfolio.

Transport Network Center of Excellence (CoE)



- Global Leading Professionals for the Success of Your xHaul Transformation Journey

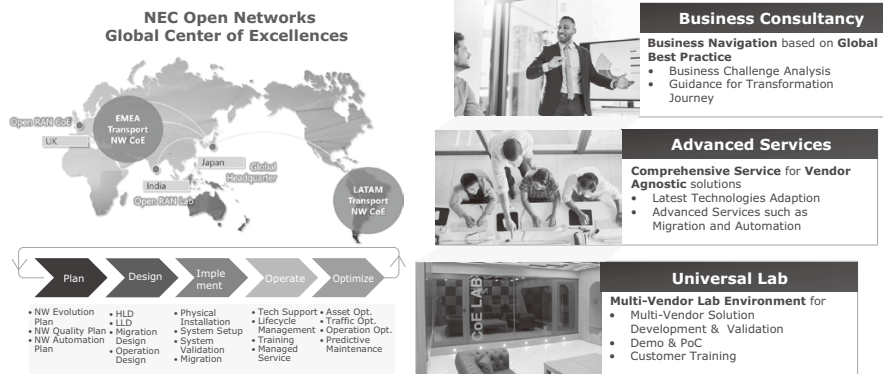


Fig. 2 CoE launched in two regions: LATAM and EMEA.

deliver more advanced services (**Fig. 2**). The reason is that as the technologies used in transport networks are continuously evolving and incorporating elements such as high speed, openness, and virtualization, we need to proactively capture the latest technological trends and contribute to building highly competitive networks by leveraging cutting-edge technologies.

Each CoE has experienced consultants and engineers who, through direct communications with customers, propose optimal solutions based on our globally accumulated best practices and expertise to help solve various challenges faced by CSPs. Also, our universal lab facility serves as the foundation to support these efforts, allowing us to validate products in a quality-conscious multi-vendor lab environment and accumulate the know-how gained from such validation. Furthermore, we have established an organizational structure and environment to provide borderless services across countries while making the services available in the local languages of each region.

• LATAM CoE

The structure of the LATAM CoE is centered around technologies such as IP networks, optical networks, data centers, wireless networks, and security. More than 230 members (as of April 2023), including those who are certified by leading networking vendors, work at the LATAM CoE. In addition to global partners, we collaborate with local partners who are highly valued in the LATAM region and whose participation in NEC's open ecosystem enables the delivery of tailor-made solutions that align with the unique needs of customers in the region.

• EMEA CoE

The structure of the EMEA CoE is centered around technologies such as IP networks, optical net-

works, and security. More than 100 members (as of April 2023), including those who are certified by leading networking vendors, work at the EMEA CoE. We also collaborate with esteemed local vendors to provide tailor-made solutions that align with the unique needs of customers in the region as in the LATAM region.

In addition to fostering collaboration among these CoEs to enhance NEC's global competence, NEC's headquarters in Tokyo have established alliances with various partners on a global level. This collaboration with the headquarters of partner companies enables us to deliver comprehensive services globally and ensures the provision of even higher quality and more competitive services.

3. Use Case of Service Offerings

The following are three use cases of our service offerings to various CSPs with the aim of strengthening their transport networks.

3.1 Integration of fixed, mobile, and enterprise networks through multi-vendor solution

A major CSP in South America faced significant challenges to reduce implementation and operational costs to maintain and operate separate networks for fixed, mobile, and enterprise services respectively. This use case is about the integration of three separate transport networks to reduce operating costs and improve agility and flexibility in providing services to end-users. After assessing the existing network traffic condition and future plan for the line capacity, NEC proposed and deployed different partner products for the core/metro

network and access network respectively to achieve the optimal network configuration. The key success point is that when deploying the products and solutions, we identified potential technical issues that might arise in a multi-vendor environment when deploying the products and conducted pre-validation testing based on our quality standards. Thanks to this pre-validation testing, we have achieved smooth implementation and migration of the multi-vendor solutions. Currently, discussions are underway to adopt open technologies, such as the introduction of white-box solutions (the separation of networking devices and network operating systems), to further strengthen transport networks.

3.2 Integration of fixed broadband service infrastructure

As part of the policy to enhance a broadband network in a country in Asia, we received a request to transfer the network infrastructure for fixed broadband services provided by a mobile network operator (MNO) to a fixed network operator (FNO) to realize fixed-mobile convergence (FMC).

Because the MNO and FNO had IP routers from different networking vendors installed, we first installed an autonomous system border router (ASBR) at the boundary of each network as a temporary bridge between the two networks. Then we deployed core routers compatible with advanced broadband network gateway (BNG) functions and used Inter-AS Option-C as a method to connect different ASs to minimize implementation and operational risks (**Fig. 3**). Finally, we managed to realize the FMC, which was the initial request from the customer, by following the pre-validated procedures for smooth migration.

In the provider edge (PE) router domain, the introduction of multi-vendor products is being considered in the future and we are expected to achieve greater cost savings and operational efficiency.

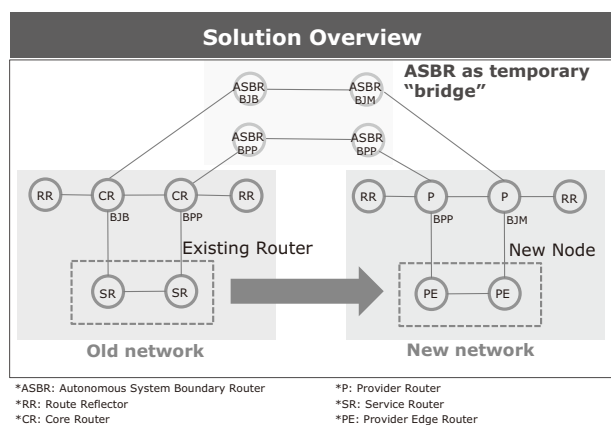


Fig. 3 Migration procedures.

3.3 Technical training

A major CSP in the Middle East asked us to provide technical training for their network maintenance and operation personnel when introducing the latest IP routers. They needed more practical training based on actual network configurations in addition to general technical training provided by networking vendors. They also faced the challenge of lacking a training facility within their company to effectively conduct the training with a fully equipped network environment.

In response to these requirements, the EMEA CoE created and provided optimal training programs tailored to actual network configurations of the customer using a state-of-the-art transport network lab composed of multiple networking vendor products. The experienced engineers at the EMEA CoE, all of whom hold advanced certification from leading networking vendors, made a proposal from a customer-oriented perspective as a network integrator. Through interactive dialogue with trainees, the engineers had deep-dive into customer challenges and needs, offered advice for achieving stable operations and proposed new solutions to optimize operational efficiency. As a result, we received a request for additional training from the customer allowing us to expand our services further. This included conducting the validation of network equipment connectivity using the multi-vendor lab, which contributed to enhancing operational efficiency.

This training program has been well received by many CSPs, resulting in their ongoing utilization of our services (**Photo**).

4. Conclusion

NEC is committed to delivering an open ecosystem of best-of-breed solutions that effectively tackle the busi-



Photo Technical training at the EMEA CoE lab.

ness challenges confronted by CSPs and building networks that support safe and secure social infrastructure on a global scale. This objective is accomplished through our provision of xHaul transformation services, which encompass comprehensive service portfolios provided by CoEs that consolidate global competencies.

Authors' Profiles

IMANAKA Kenichi

Professional
Service Provider Solutions Department

KHASANOV Jurabek

Assistant Manager
Service Provider Solutions Department

The details about this paper can be seen at the following.

Related URL:

NEC Open Networks xHaul Transport

<https://www.nec.com/en/global/solutions/5g/5G-Transport-Network.html>

NEC launches 5G xHaul transformation services with the establishment of 5G transport network CoEs

https://www.nec.com/en/press/202106/global_20210621_03.html

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