

NEC's Approach to APN Realization – Field Trials

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Abstract

Efforts to provide the open architecture for optical networks and All Photonics Networks (APN) are entering the stage where new value is created. This paper introduces NEC's commitment to developing new value in the market such as the creation of an open ecosystem, integration to optimize the combination of open specification components, and case studies of field trials and other installations.

Keywords



IOWN Global Forum, Open APN (All Photonics Network), disaggregation, Openness ROADM, open architecture, Telecom Infra Project (TIP)

1. Introduction

The efforts in the implementation of the All Photonics Network (APN) have entered the stage of new value creation. Functional separation (disaggregation) as well as the openness of specifications and interfaces make it possible to accelerate innovation, to avoid vendor lock-in where system configuration flexibility is limited by a specific vendor, and to build optimal networks in accor-

dance with service requirements. Also, it helps create new value such as prompt provision of services, the achievement of high reliability, and hyper-realistic communication that transcends time and space.

In the meantime, there are challenges in transitioning from traditional all-in-one products that are vertically integrated. In order to address this issue, it is essential to manage disaggregated elements provided by multiple vendors, ensure connectivity through open interfaces, and assemble them into a solution — which requires ecosystems and integration providers (**Fig. 1**). NEC leads the building of open ecosystems and offers new value through integration services.

In this paper, we discuss the building of open ecosystems, the integration of systems, and some field trial examples as well as case studies.

2. Open Ecosystems

The advantage of disaggregation and openness is the freedom to combine components to create new value. It is important to build an ecosystem where participating vendors bring the results of their innovations and

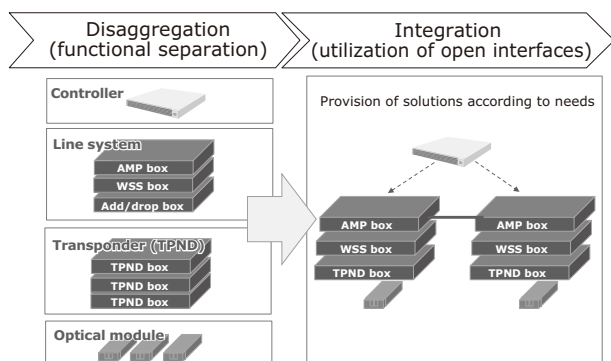


Fig. 1 Disaggregation and integration.

combine the superior features from them, rather than procuring all products and services from a single vendor. As part of our support for building open ecosystems for optical networks, we play the critical role of an integrator that combines individual elements to achieve optimal system integration.

3. Integration

Until now, conventional optical network systems have been provided in the form of vertically integrated, all-in-one products. Because such products were provided by a single vendor, implementation may look easy. However, the serious drawback is that customers have to rely solely on that single vendor in terms of post-implementation operations and maintenance, the lead time for adding new functions and procurement, and support for the latest technologies, no matter how much the vendor would be supportive and cost effective. In the world of open architecture, on the other hand, individual elements can be combined to build an optimal system. Integration of those elements, which conventionally is a task of vertically integrated vendors, is required in any case. Based on our knowledge and experiences accumulated through decades of product development for global tier-1 communication service providers (CSPs) and building of highly reliable networks, NEC offers the integration necessary to build carrier-grade optical networks by combining open-architecture and open-source components (**Fig. 2**).

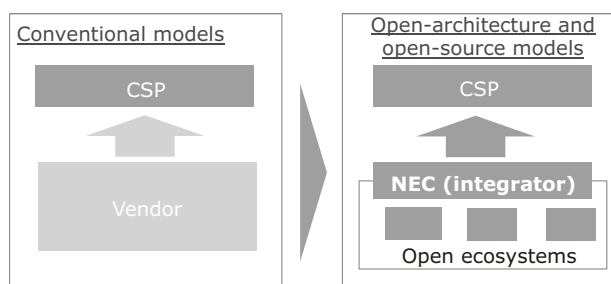


Fig. 2 System integration.

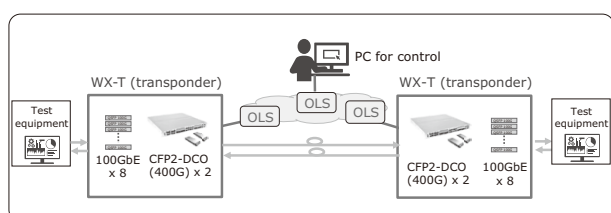


Fig. 3 Verification facility.

4. Case Studies and Field Evaluations

At NEC, we are proactively constructing verification labs as well as conducting field trials at customer sites to verify those values of open optical networks and APNs and to raise the market awareness.

In addition, the Telecom Infra Project (TIP)¹⁾ is making great efforts to bring innovation by applying open architecture and disaggregation to telecommunications infrastructure. As a result, we are collaborating with TIP to deploy TIP Phoenix-compliant 400G open transponders (SpectralWave WX-T) in the market.

4.1 Verification labs

We have established a verification environment in the TIP Community Lab in London, creating an environment where customers from around the world can verify interoperability (**Fig. 3**). This lab enables customers to perform many kinds of tests in a multi-vendor environment, such as verifying the connectivity with other vendors' open line systems (OLS) and controllers in addition to confirming the operation of open-source transponders.

4.2 Connection between data centers

As data centers become larger and more distributed, demand for data center interconnections via wavelength-division multiplexing (WDM) is surging (**Fig. 4**). The following example presents a case study on the deployment of an APN in South Africa²⁾.

We helped Teraco, Africa's largest data center operator, introduce the SpectralWave WX-T series of products compliant with TIP's Phoenix initiative as the solution to connect between high-capacity, low-latency data centers. According to Teraco, they were having trouble with connecting high-capacity, low-latency data centers. With speed as their top priority, they chose NEC's Phoenix-compliant products for their ability to be swiftly introduced. They say that they were able to introduce the solution promptly because our team provided the

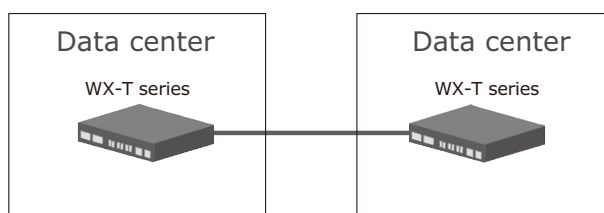


Fig. 4 Connection between data centers.



Fig. 5 Integration with existing WDM systems.

supporting system integration and training. As a result, they highly praised NEC's integration expertise and satisfactory support.

4.3 Integration with existing WDM systems

Among the functions of optical transmission equipment, the transponder portion is undergoing rapid technological innovation. Therefore, the latest transponder functions are highly demanded, especially among data center operators. Today, a solution is needed that uses the newest transponders in existing optical networks. In order to meet this demand, NEC has developed a solution that integrates existing WDM systems with the latest transponders (**Fig. 5**). Our solution easily upgrades existing optical networks by verifying and guaranteeing interoperability between existing WDM systems of other companies and SpectralWave WX-T transponders compliant with open specifications and this solution has a proven track record of deployment mainly in South America, Africa, Asia, and other regions.

4.4 Real-time remote concert

The major advantages of optical networks are their high capacity and low latency. As a use case to demonstrate these benefits, NTT Art Technology and Tokyo Bunkamura held a "remote concert" to prove the feasibility of musical performance where performers collaborate from multiple locations in real-time by connecting the NEC Abiko Plant and other multiple locations in Tokyo, Osaka, and Kanagawa via IOWN APN³⁾.

NEC provided SpectralWave WX-T and WX-D as components of IOWN's APN to support the realization of a high-capacity, low-latency APN. This contributed to the realization of remote concerts that made viewers feel as if the performers were right in front of them, demonstrating new possibilities for next-generation networks.

5. Conclusion

In this paper, we introduced NEC's efforts to develop the SpectralWave WX series, which helps to realize APNs. There is a growing interest in the market for open

architecture in general and for APNs in particular. At NEC, we will expand our open optical transport business by leveraging our experiences and expertise in delivering a variety of optical transmission products and solutions to create innovation and contribute to solving social issues.

* IOWN is a trademark or a registered trademark of NTT.

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

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Vol.17 No.1
September 2023

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