

NTT Corporation

NTT Advanced Technology Corporation

ACCESS Co., Ltd.

IP Infusion Inc.

Broadcom Inc.

Edgecore Networks Corporation

UfiSpace Co., Ltd.

Fujitsu Optical Components Ltd.

NEC Corporation

**Launch of IOWN Network Solution for 400Gbps High-Speed Inter-Data Center  
Connections that Reduces Construction and Operation Costs by 50%, and power  
consumption by 40%**

~ Integration of technology of NTT's IOWN and IP Infusion, a leading software company in the  
United States ~

The IOWN Network Solution (400G) (hereinafter, The Solution) combines the IOWN-related technologies of NTT Corporation (NTT) and those of IP Infusion Inc. (IP Infusion) (\*1), a leading software company in the United States, to realize high-speed, high-capacity, and low-power consumption communication.

NTT and ACCESS Co., Ltd. (ACCESS) (\*2) have been strengthening the collaboration of the R&D and productization of network OS as well as sales and support in the global market through a capital and business alliance (\*3) to develop the IOWN.

Today, nine companies, NTT, NTT Advanced Technology Corporation (NTT-AT), ACCESS, IP Infusion, Broadcom Inc. (Broadcom), Edgecore Networks Corporation (Edgecore), UfiSpace Co., Ltd. (UfiSpace), Fujitsu Optical Components Ltd. (FOC), and NEC Corporation (NEC), are announcing that they are ready to provide the solution to realize 400Gbps high-speed data center connectivity by their close collaboration, with their technologies and products. This solution will be sold by NTT-AT and IP Infusion.

With this solution, customers such as data center operators and telecommunication carriers can construct simple and lower cost inter-data center networks based on 400G ZR/ZR+ for high-speed and long-distance transmission. This will contribute to a 50% reduction in the construction and operation costs of the network equipment (\*4), 40% reduction in power consumption (\*4), and rack space.

## 1. Background

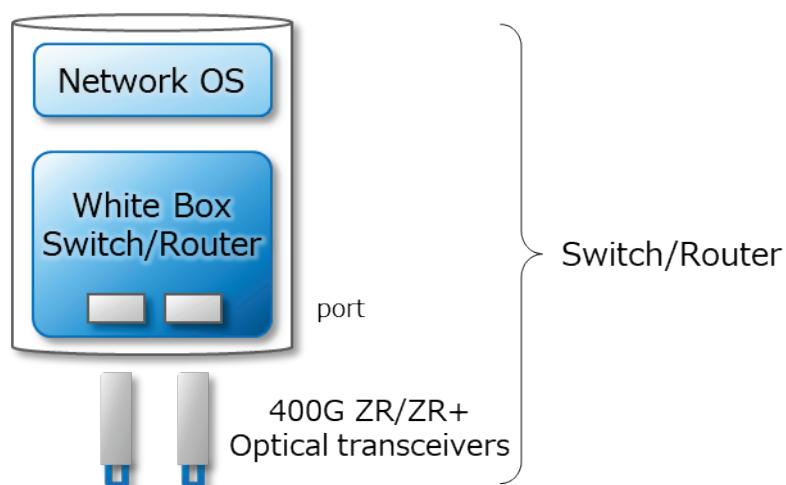
The rapid increase in power consumption has become a social issue as the data amount in data centers increases due to the development and spread usage of generative AI and machine learning. As the data amount is expected to further increase in the future, there are growing expectations for low-cost construction of high-speed connections between data centers to distribute expanding data calculation processing and low-power consumption.

In constructing high-speed data center connections, software-hardware integrated network devices with a limited number of optical transceivers options are usually used in the current network, which poses a problem in terms of investment efficiency. In response, there is a need to improve investment efficiency through the software and hardware disaggregation and the flexible selection of optical transceivers.

## 2. IOWN Network Solution (400G) Overview

This solution provides a switch/router capable of long-distance transmission at 400Gbps. Its software and hardware are disaggregated, it's consisted of a network OS (software), a white box switches/routers (hardware), and a 400G ZR/ZR+ optical transceivers (optical transceiver). Depending on the needs, customers can combine optical transceivers that comply with the open standard and is fully validated.

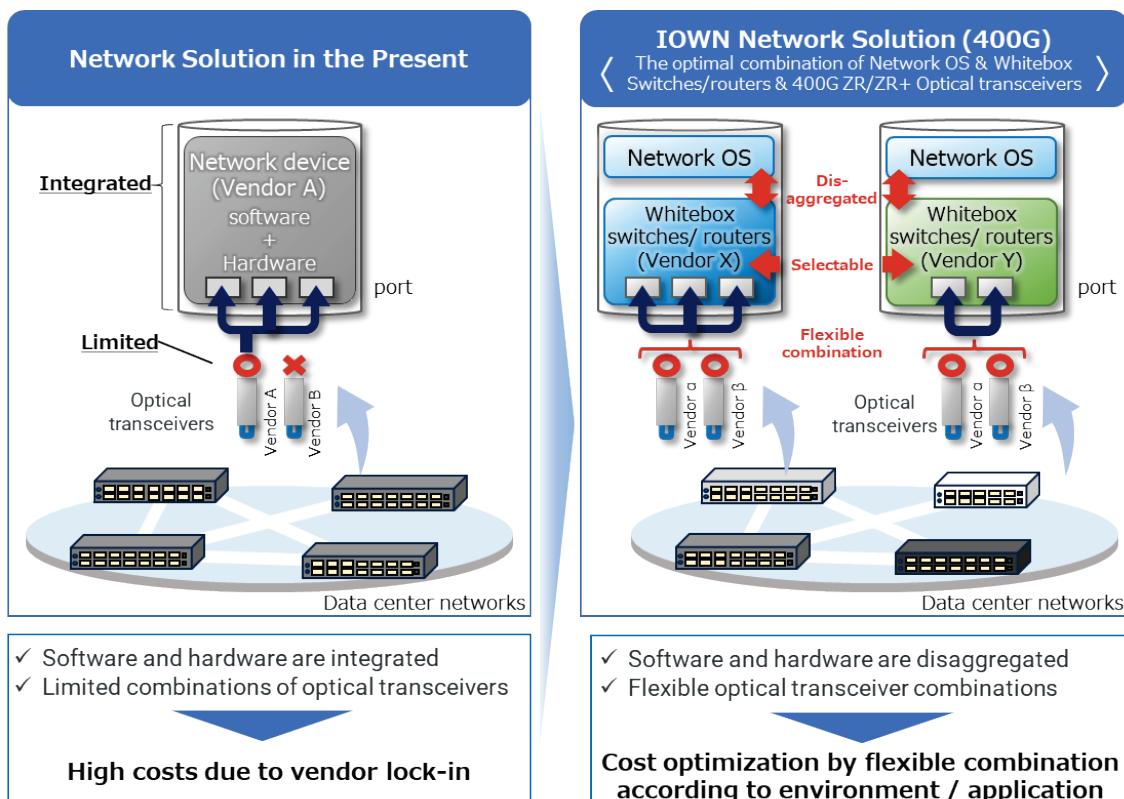
**Figure 1. IOWN Network Solution (400G) Overview**



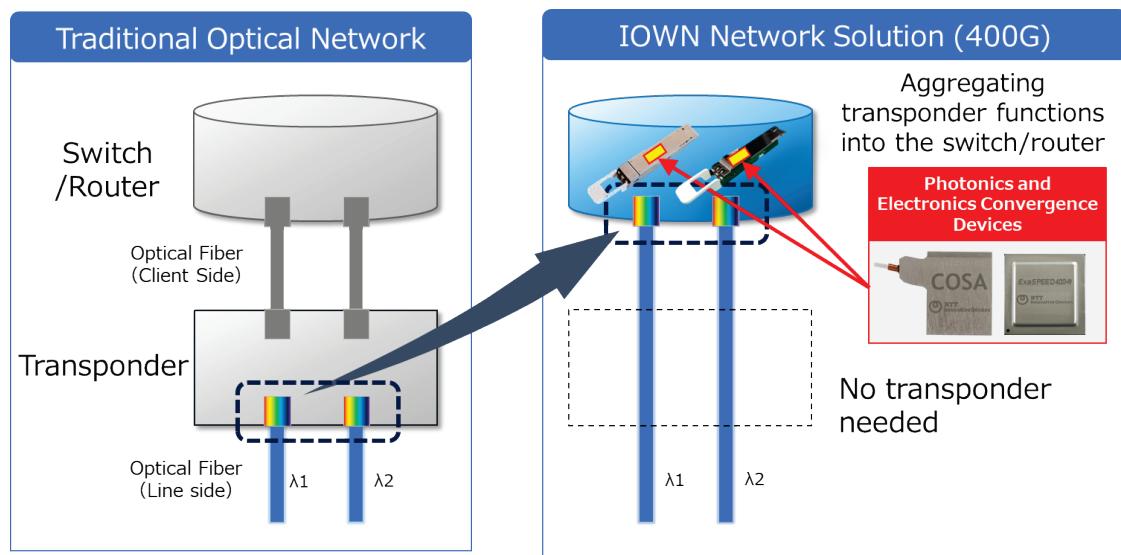
## Features of IOWN Network Solution (400G)

- ① FOC and NEC optical transceivers are equipped with NTT Innovative Devices Corporation's Photonics-Electronics Convergence devices that achieve low-power and stable transmission performance and comply with the open standard specifications.
- ② A switch/router is realized by combining Network OS and white box switch/router, and customers can select the appropriate combination from the multiple white box switches/routers and optical transceivers to meet the needs. (Fig. 2)
- ③ By combining the transponder functions in switches/routers, it reduces procurement and maintenance cost, power consumption, rack space usage, and construction lead time (Fig. 3).
- ④ Network OS that combines technologies of NTT and ACCESS/IP Infusion that provides a rich set of functions that contribute to advance maintenance and operation quality improvement of customer networks.

**Figure 2. Combination of Network OS, White Box Switch/router, and Optical Transceiver for the IOWN Network Solution (400G)**



**Figure 3. Switch/router Integration of Transponder Functions with IOWN Network Solution (400G)**



### 3. Solution Providing Formation

This solution is provided as a package of components from the following formation with one-stop and total support, from construction to 24/7 maintenance and operation.

**Figure 4. Formation for Providing IOWN Network Solutions (400G)**

Network OS	NTT/NTT-AT (*5), ACCESS/IP Infusion
White Box Switches/Routers	Edgecore, UfiSpace
Switch/Routing, High-speed ASIC silicons	Broadcom
400G ZR/ZR+ Optical Transceivers	FOC, NEC

**Sales and Support  
NTT-AT, IP Infusion**

### 4. Customer Inquiries

Please contact the sales representative of NTT-AT and IP Infusion.

### 5. Future Developments

NTT, NTT-AT, ACCESS, IP Infusion, Broadcom, Edgecore, UfiSpace, FOC, and NEC will keep

collaborating with their technologies and products to meet the needs for high-speed and large-capacity connections between data centers, high-speed and large-capacity back-end networks in data centers, and reduction of power consumption.

In addition, we will meet the needs for the advancement of the data center related networks, such as the realization of high-capacity, low-delay, and low-power communication between data centers and various sites by connecting to IOWN APN.

## **6. Endorsement**

### **<Network OS Contributors>**

#### **Takehiko Kawazoe, Senior Executive Vice President, NTT**

"The presence of various global partners is essential to the promotion of IOWN. We are pleased that a new IOWN solution combining the technologies of NTT's IOWN and each company will be offered to the world. The NTT Group will continue to work with global partners to release IOWN products as soon as possible and contribute to advance the customer networks. By implementing IOWN, which is a next-generation communication platform with high capacity, low latency, and low-power consumption, we will contribute to realize a well-being society."

#### **Tadashi Ito, President, NTT-AT**

"As a member of the NTT Group, NTT-AT is working on the distribution of IOWN technologies. We expect that the launch of IOWN network solutions will accelerate the spread of IOWN technologies. We will provide total systems/solutions that combine the network OS "Beluganos", which NTT has developed together with IP Infusion, the optical transceivers and white box device, and will actively contribute to the realization of the software-based and open architecture that NTT has been leading. Although Beluganos has been primarily deployed in data center networks so far, we will expand it into new business areas such as carrier and enterprise networks, and even as an IOWN solution from now on, aiming to develop our business as a system and service provider of IOWN solutions together with domestic and overseas partners."

#### **Kiyo Oishi, President and CEO, ACCESS**

"ACCESS has grown by developing products and services that leverage innovative new telecom technologies, such as mobile Internet and IP-TV, to deliver new experiences in our daily lives. As generative AI technology rapidly advances, the high-speed, low-power communication technology realized by IOWN can overcome the challenges faced by modern data centers. IOWN will provide a

new business opportunity for ACCESS by making widespread AI experiences available to everyone. We are extremely proud to be able to expand this solution globally alongside our wonderful partners."

**Atsushi Ogata, CEO and President, IP Infusion**

"We are proud to partner with NTT in the development, go-to-market, and distribution with 24/7 support through a single point of contact for the NTT IOWN Network Solution, based on OcNOS. OcNOS continues to be relevant as the industry's most mature and supported networking operating system for white box deployments in the industry and is positioned to be the platform for powering the next generation of computing and network applications."

**<White Box Switch/Router Contributors>**

**Ram Velaga, Senior Vice President and General Manager, Core Switching Group, Broadcom**

"As a provider of switching, routing, and high-speed digital signal processing technology for AI/ML and data center networking, Broadcom is committed to the vision of the IOWN Global Forum. We are excited to collaborate with NTT and other members of the community to drive transformative changes in the connected world."

**Andy Wu, Chairman and President, Edgcore**

"Edgcore is thrilled to collaborate with NTT, to drive the collective success of IOWN journey. With the robust design and manufacturing quality from our experienced team, Edgcore provides 400G open networking switches/routers to meet market requirements. Together, we are not just building a network, but fostering an ecosystem for growth, creativity, and excellence through our long-term partnership."

**Vincent Ho, CEO, UfiSpace**

"UfiSpace leads in open networking innovation, fulfilling the need for high-speed, large-capacity inter-data center connectivity. Our participation in the IOWN Network Solution (400G) ensures our customers' benefit from greater choices, flexibility, and optimized total cost of ownership."

**<Transceiver Contributors>**

**Takashi Yamane, President, FOC**

"FOC has been providing cutting-edge optical transceivers that contribute to developing the communication infrastructure of society since coherent transmission was first introduced. We are pleased that our open standards-based coherent optical transceivers are recommended for use in the IOWN network solutions ecosystem. We will continue to contribute to the realization of a sustainable society by developing and providing cutting-edge technologies that meet the needs of our customers."

**Michio Kiuchi, Corporate Executive Vice President and President of the Telecom Services Business Unit at NEC Corporation**

"NEC is pleased to announce co-creation activities with IOWN Network Solutions. The optical transceivers provided by NEC conform to open standard specifications and achieve low power consumption by incorporating Photonics-Electronics Convergence devices and optical integrated components from NTT Innovative Devices. Going forward, NEC will continue to provide optical transceivers that support open networks and contribute to large-capacity, low-power networks between next-generation data centers."

**Customer Contact Information for this Solution**

NTT-AT	IOWN Product Business Division	<a href="mailto:beluganos@ml.ntt-at.co.jp">beluganos@ml.ntt-at.co.jp</a>
IP Infusion	Customer Contact Form	<a href="https://www.ipinfusion.com/contact-us/">https://www.ipinfusion.com/contact-us/</a>

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- \*1. IP Infusion, a 100% subsidiary of ACCESS, has network OS technology, knowledge, and support capabilities, as well as a global delivery and operation structure. IP Infusion's OcNOS network operating system has been named as a "Leader" and "Outperformer" in GigaOm's Radar Report for all 3 network operating systems categories for 4 consecutive years and has sold over 50,000 licenses worldwide.
- \*2. ACCESS provides advanced IT solutions centered on mobile and network software technologies for telecommunications, energy infrastructure, and other industries around the world. It has the capability and know-how to develop virtualization technology in over 1.5 billion mobile software and network software that has been widely adopted by hundreds of companies.
- \*3. NTT and ACCESS Sign Capital and Business Alliance for Development of IOWN (2023.12.12)  
Related Links: <https://group.ntt/jp/newsrelease/2023/12/12/pdf/231212aa.pdf>
- \*4. On our assumed environment
- \*5. Within the NTT Group, NTT conducts R & D and NTT-AT commercializes the technology.

## Appendix Product Information

The following are representative combination of products of white box switches and routers and optical transceivers in this solution. Please contact your sales representative for more details as we continue to expand our product mix.

### White Box Switches and Routers

Manufacturer	Product name	Port		ASIC
Edgecore	CSR440-AS7535-28XB	50G/100G/400G QSFP-DD ports 50G/100G QSFP28ports 10G/25G SFP28 ports	2 Ports 2 Ports 24 ports	Broadcom Qumran2a
UfiSpace	S9610-36D	40/100/400G QSFP-DD ports	36 ports	Broadcom Jericho2c+
UfiSpace	S9510-28DC	100/400G QSFP-DD ports 40/100G QSFP28 ports 10/25G SFP28 ports	2 Ports 2 Ports 24 ports	Broadcom Qumran2a

### 400G ZR/ZR+ Optical Transceivers

Manufacturer	Product name	Form factor type	Bit rate	Type
FOC	FIM38900	QSFP-DD	400G	400G ZR
FOC	FIM38950	QSFP-DD	100G/200G/300G/400G	400G ZR+
NEC	OD-QD337SCLS00N	QSFP-DD	100G/200G/400G	400G ZR/ZR+