

October 24, 2024

第61回日豪経済会議 <一般公開不可：第61回日豪経済会議参加者限定資料>

61st Japan-Australia Joint Business Conference



# Pioneering the Future - Innovation, Technology and Manufacturing

**Akira Okada, Ph.D.**  
**Senior Vice President of R&D,**  
**Head of NTT Science and Core Technology Laboratory Group,**  
**NTT Corporation**



# Position and Role of NTT Laboratories



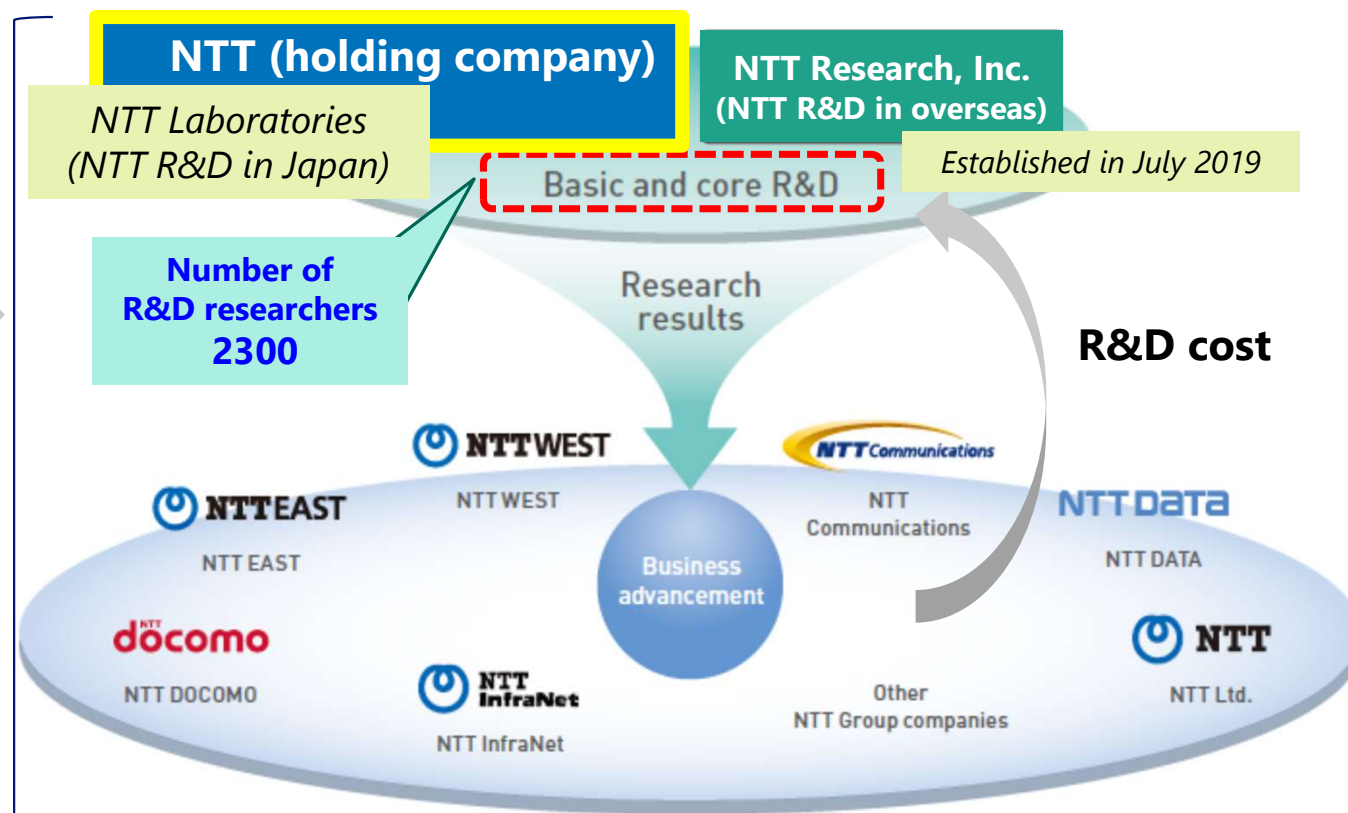
NTT: Nippon Telegraph and Telephone Corporation

As an organization that reports directly to the NTT Holding Company, *NTT Laboratories play the role of driving basic and core R&D for the whole NTT Group*, and that of enabling group companies to utilize R&D results for advancement of their business operations.

## NTT Group

- ✓ **Number of employees**  
**338,467** (as of the end of March 2024)
- ✓ **Sales**  
**13,374.6 billion yen** (FY2023)
- ✓ **Consolidated subsidiaries**  
**967** (as of the end of March 2023)

Apply our technologies through operating companies and business partners and solve social issues and realize a prosperous future.



# Organizational structure of NTT R&D



NTT's R&D activities are managed in Japan by the following four laboratory groups, and overseas by NTT Research Inc..

※ IOWN: Innovative Optical and Wireless Network

### IOWN Integrated Innovation Center

- IOWN Project Design Center
- Network Innovation Center
- Software Innovation Center
- Device Innovation Center

*R&D across technical fields that embody the IOWN concept*

### Service Innovation Laboratory Group

- Human Informatics Laboratories
- Social Informatics Laboratories
- Computer and Data Science Laboratories

*R&D leading to the creation of communication services*

### Information Network Laboratory Group

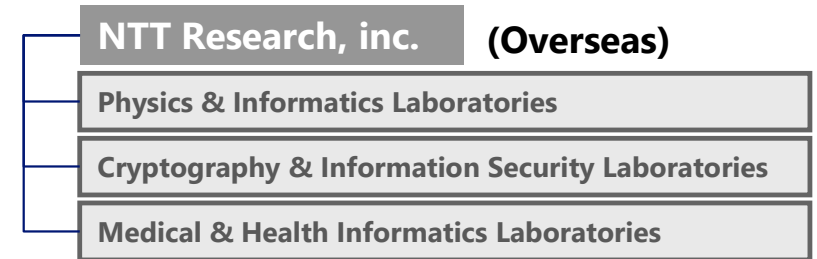
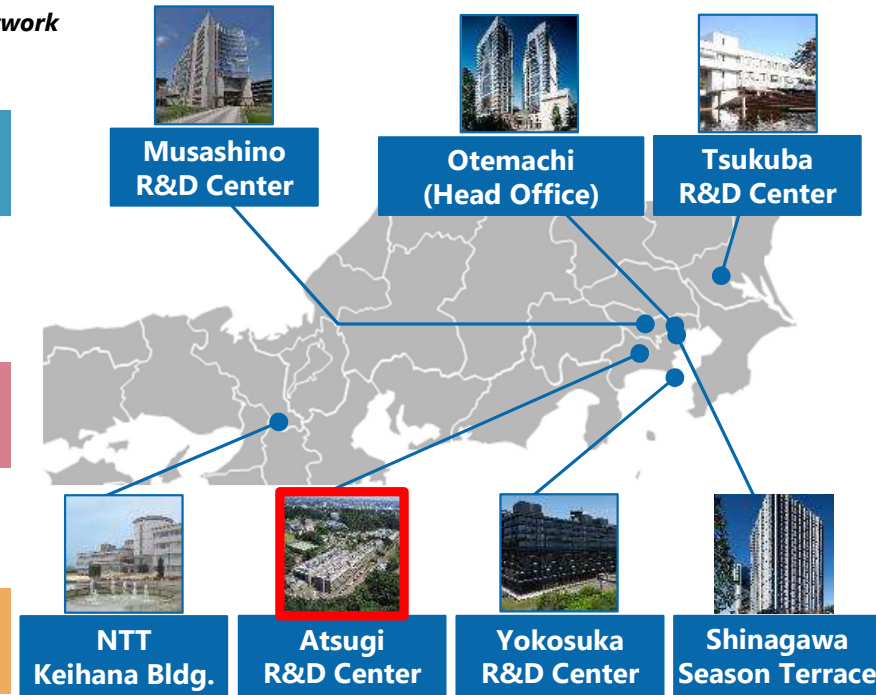
- Network Service Systems Laboratories
- Access Network Service Systems Laboratories
- Space Environment and Energy Laboratories

*R&D of future network infrastructure technologies*

### Science and Core Technology Laboratory Group 先端技術総合研究所

- Network Innovation Laboratories
- Device Technology Laboratories
- Communication Science Laboratories
- Basic Research Laboratories

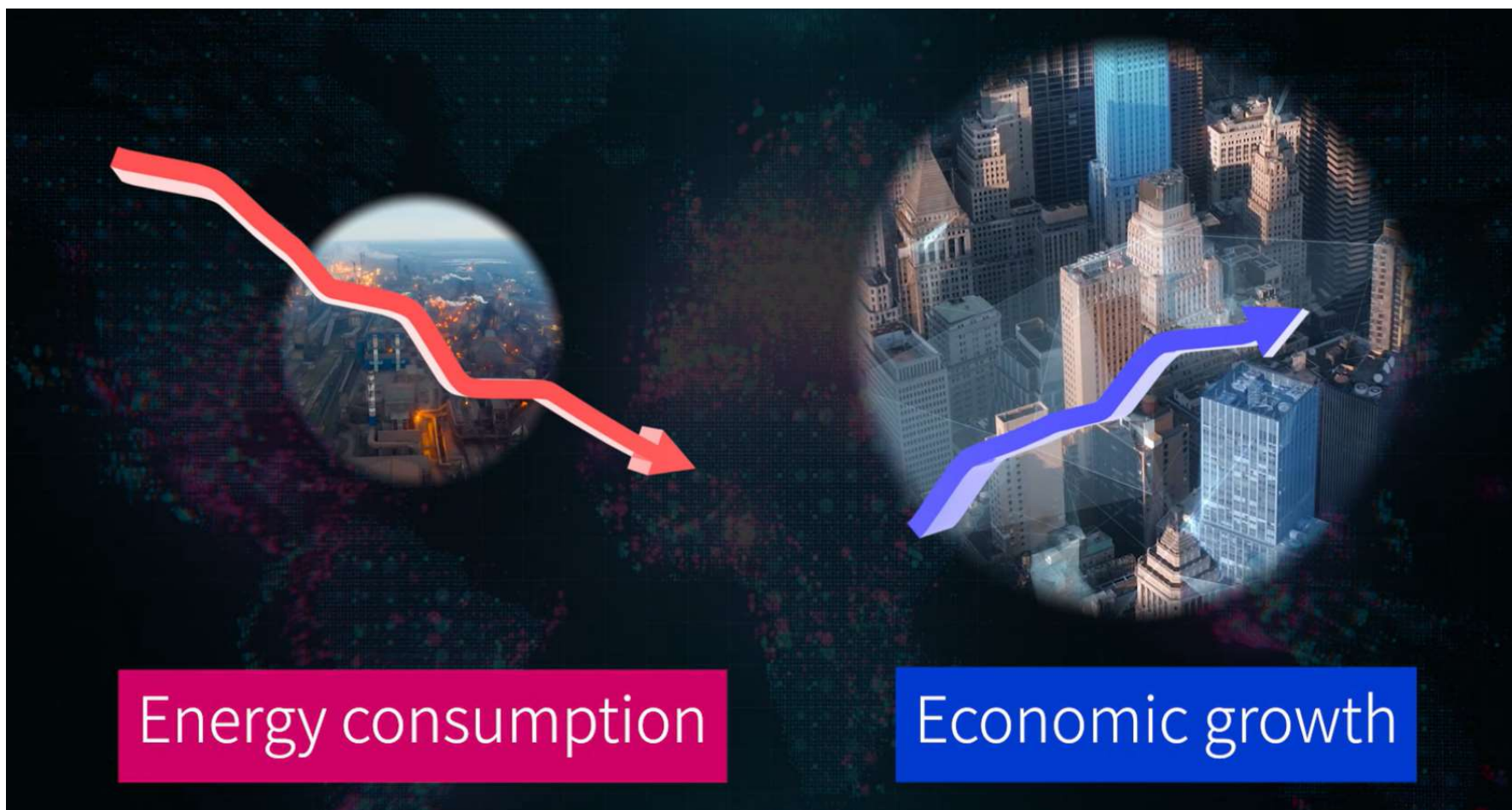
*R&D of cutting-edge technologies for the next 10 years*



<一般公開不可：第61回日豪經濟會議參加者限定資料>

# Balancing Sustainable society and Economic growth

<一般公開不可：第61回日豪経済会議参加者限定資料>



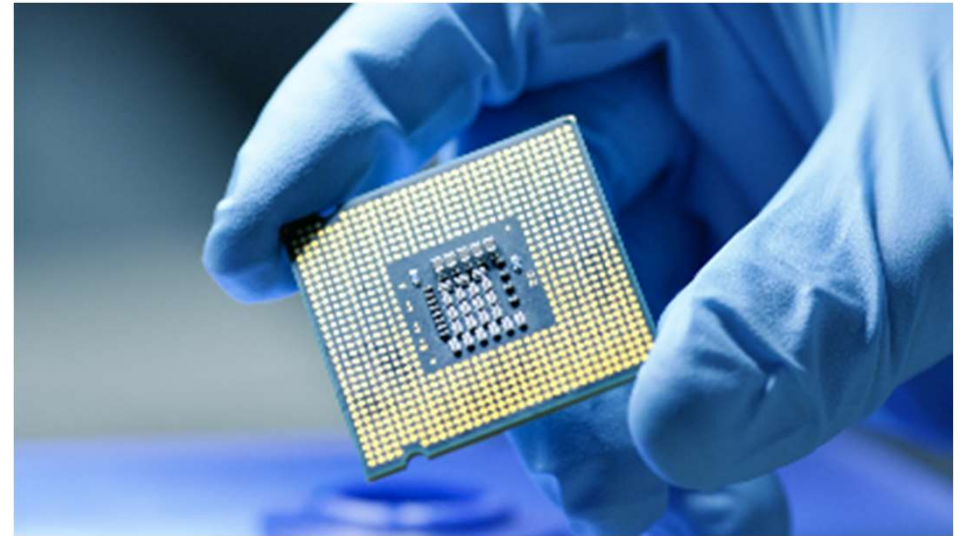
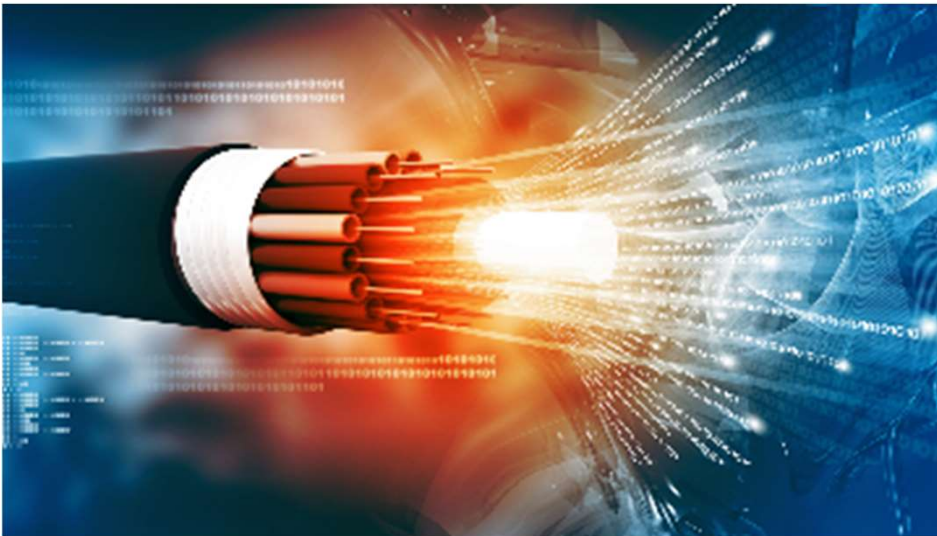


# Electronics to Photonics



**“Transmission”**  
**Photonics**

**“data Processing”**  
**Electronics ⇨ Photonics**



# Cutting-edge technologies by photonics

# Next-generation communication infrastructure platform

# IOWN's vision of society

**Computing**  
Photonic disaggregated computing

**Network**  
Optical and wireless communication technology

**Device**  
Photonics-electronics convergence technology

**High capacity and high quality**

**Low latency**

**Lower power consumption**

**Digital Twin Computing**

**AI・Application**

**Remote World**

**Smart Society**

**low-carbon society**

**wellbeing**

<一般公開不可：第61回日豪経済会議参加者限定資料>



***Your Value Partner***



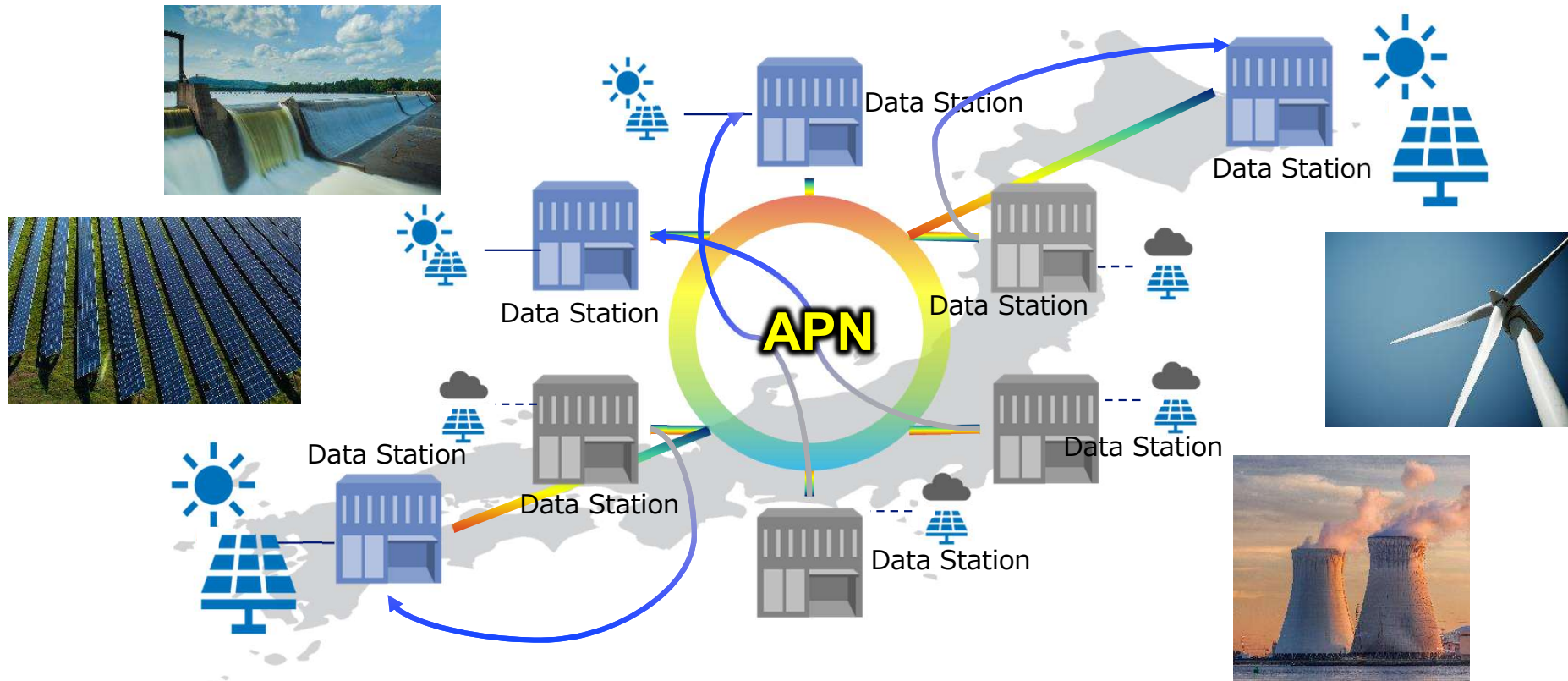


# References

# Datacenter Interconnection via APN



- Enables performance almost equivalent to a single datacenter
- Promote green energy usage



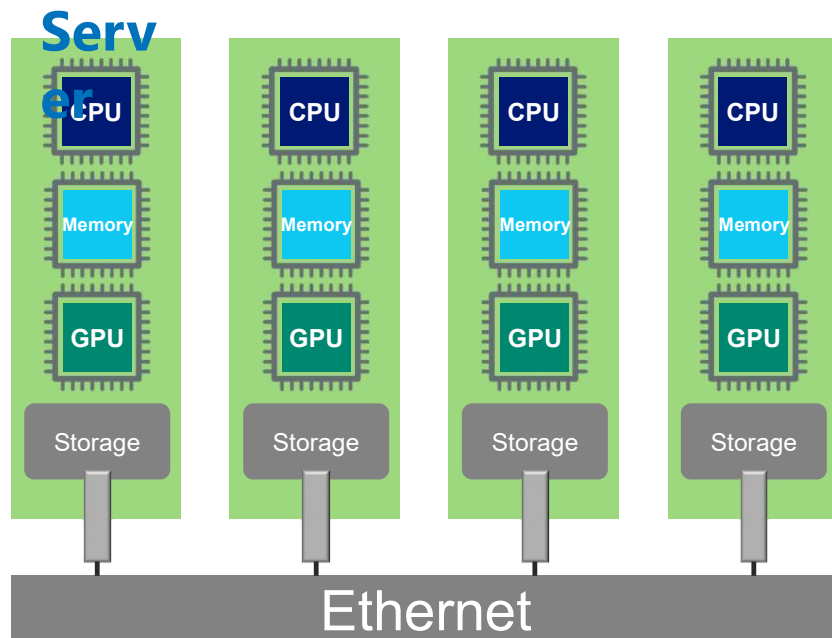
# Photonic disaggregated computing

## Data Centric Infrastructure (DCI)

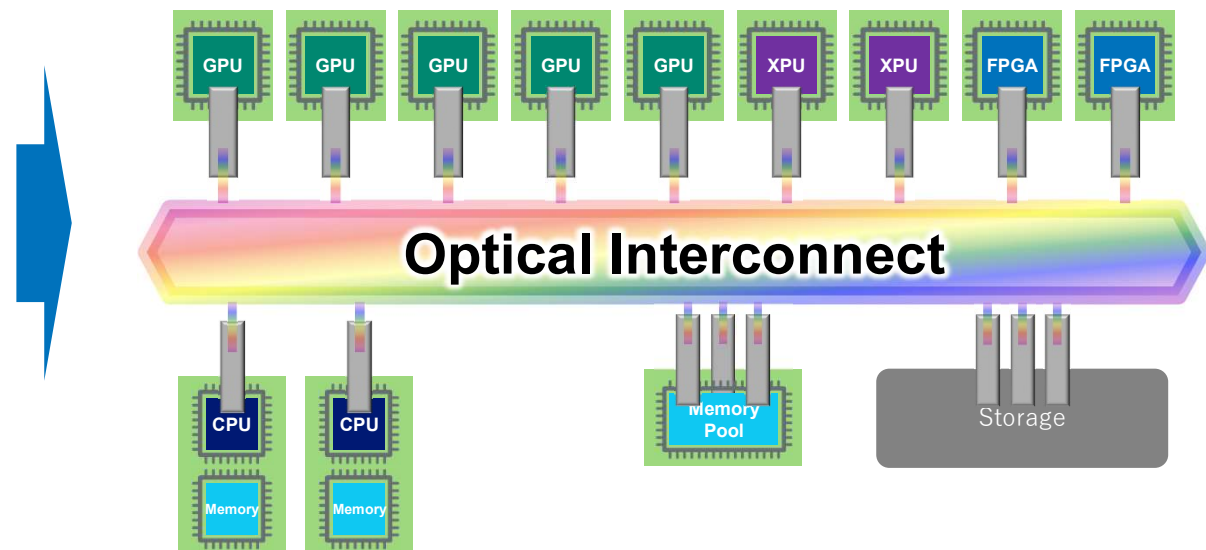
**Computing components with Embedded Optical Interfaces for:**

- Flexible Scalabilities adapting to dynamic demands
- High Energy Efficiency by optimizing components management

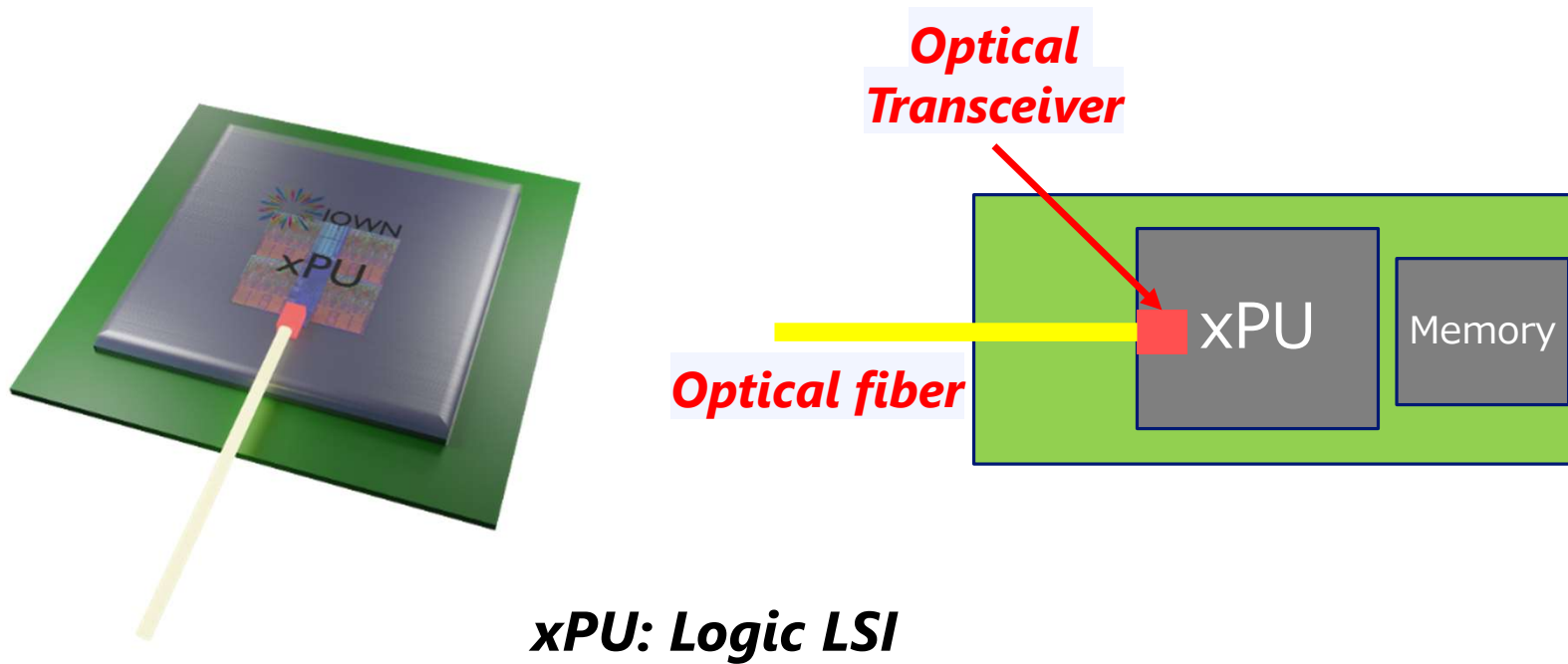
### Conventional computing system



### IOWN Photonic disaggregated computing



# Photonics-Electronics Convergence Technology



**xPU: Logic LSI**

# PEC\* Technology Penetration from data transmission to data processing acceleration

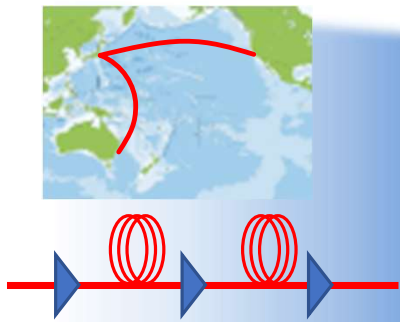
\*PEC: Photonics-electronics convergence

Transmission using **photonics**  
Processing using **electronics**



**Optoelectronic integration**  
brings photonics closer to the processing unit

*The application of optical communication to short-range data communication advances*



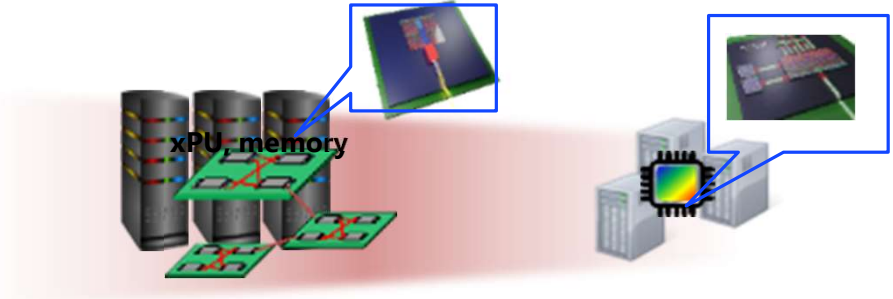
**Long distance transmission**



**Data center interconnection**



**Intra data center interconnection**



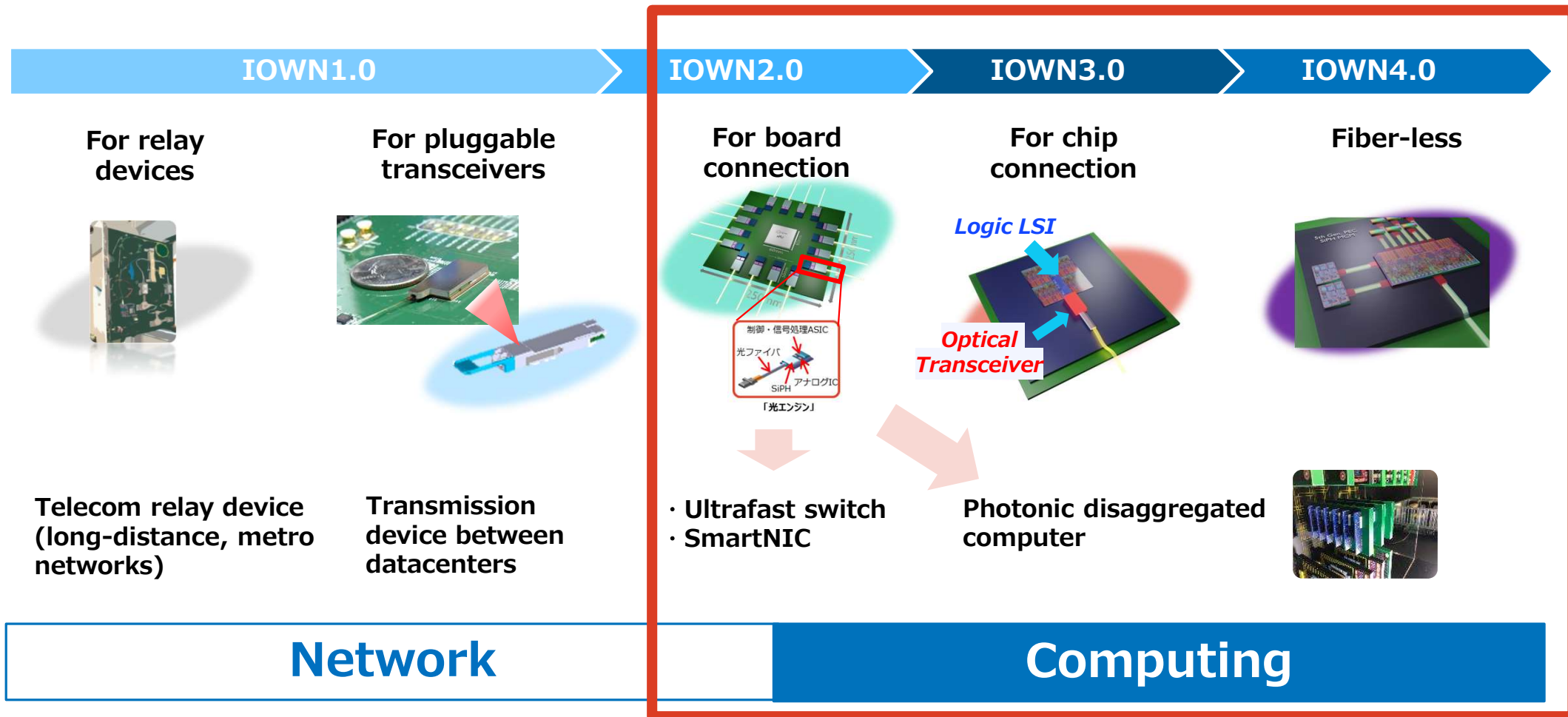
**Inter-board, inter-chip interconnection**

**Photonics in Chip  
Inner-chip interconnection**

**Shortening distance of optical transmission**

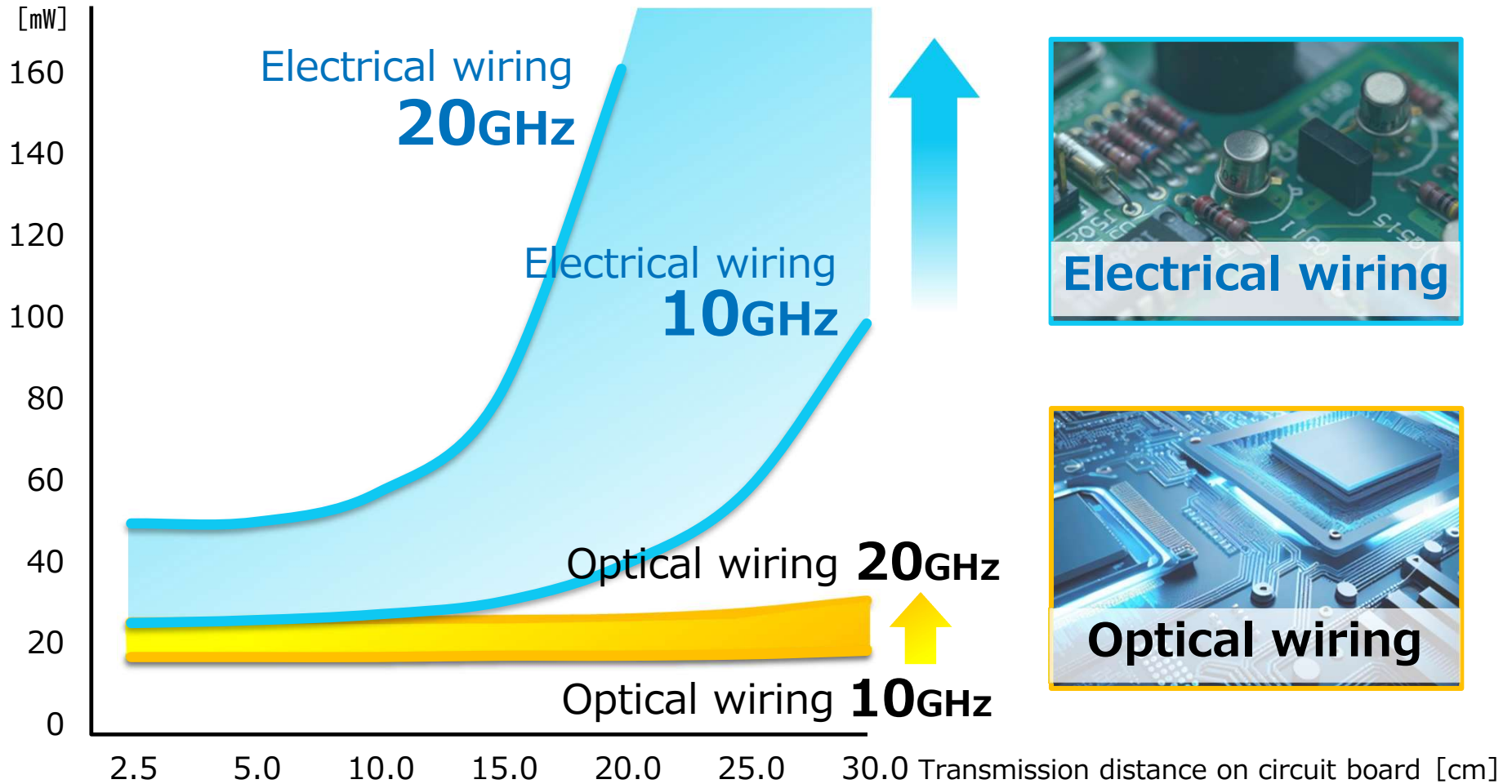


# Introducing Photonics into Computing

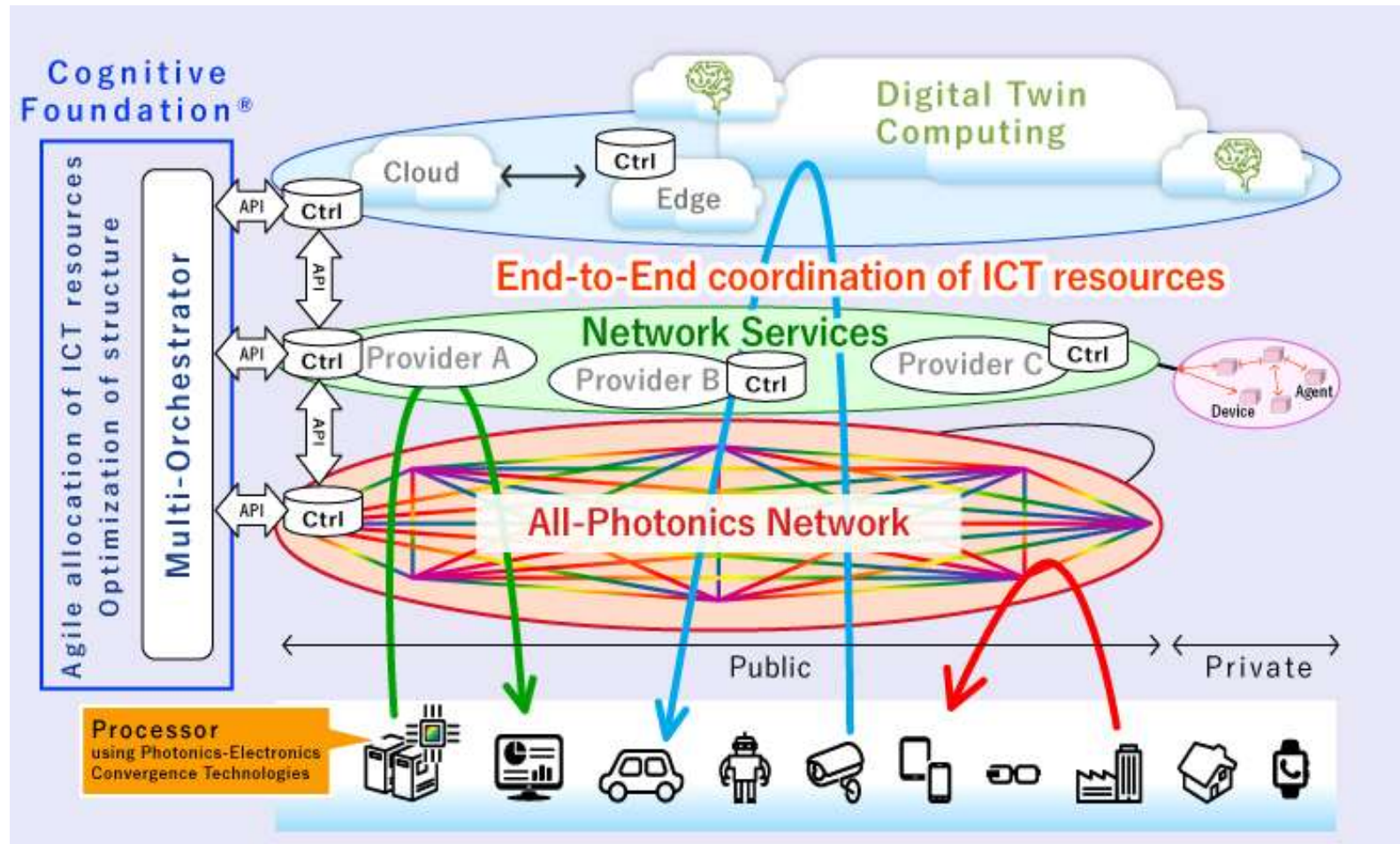


# Why Optics?

Circuit Power Consumption



# Functional configuration image of IOWN



# IOWN Global Forum



Global Collaboration is crucial for developing cutting-edge IOWN technologies and global eco-system



- ✓ In January 2020, NTT, Intel and Sony established Innovative **O**ptical and **W**ireless **N**etwork (**IOWN**) Global Forum for the future communication
- ✓ Global non-profit organization for developing the next generation communication and computing infrastructure with new technologies, frameworks, specifications and reference architectures

# IOWN Global Forum Members

〈一般公開不可：第61回日豪経済会議参加者限定資料〉

As of July 17, 2024



## Sponsor Members (37)

Accenture Japan	Ericsson	Microsoft	Oracle Japan	SK Telecom
AKKODIS Consulting	Fujitsu	Mitsubishi Electric	ORANGE	Sony Group
Chunghwa Telecom	Furukawa Electric	Mizuho Bank	Pegatron	Sumitomo Electric Industries
Ciena	Google	MUFG Bank	PwC Japan	Toyota Motor
Cisco Systems	HAKUHODO	NEC	Rakuten Mobile	VMware
Dell Technologies	Intel	NICT	Red Hat	
Deloitte Tohmatsumi	KDDI	Nokia	Samsung Electronics	
Delta Electronics	KIOXIA	NTT	SK Hynix	

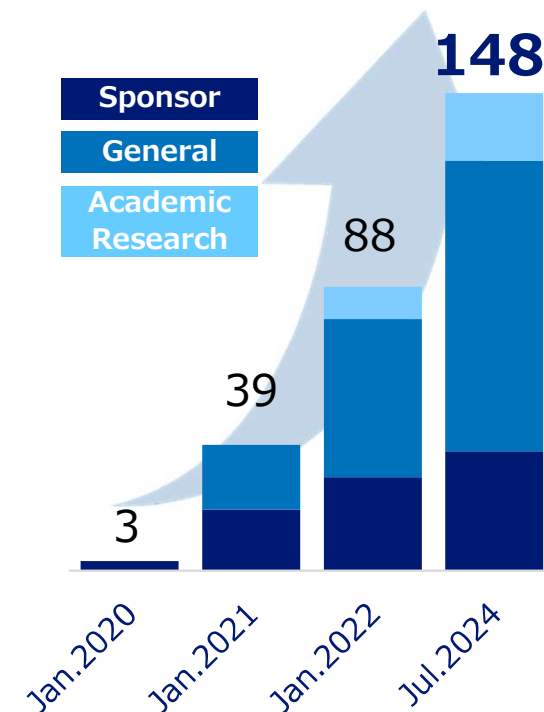
## General Members (90)

Accton Technology	Honda Motor	Mitsui Knowledge Industry	ServiceNow
Advanced Micro Devices	HONDA TSUSHIN KOGYO	Murata Manufacturing	Shin-Etsu Chemical
ADVANTEST	I-PEX	NetApp	SHINKO ELECTRIC INDUSTRIES
AGC	IBIDEN	Net One Systems	SKY Perfect JSAT
AIOCORE	Infinera	NGK Insulators	Sompo Holdings
AJINOMOTO	IP Infusion	NISSHO ELECTRONICS	SUMITOMO BAKELITE
ANRITSU	ITOCHU Techno-Solutions	Nissan Chemical	SUMITOMO CHEMICAL
APRESIA Systems	Japan Broadcasting Corporation	Nitto Boseki	Sumitomo Corporation Kyushu
AZUSA INSTITUTE OF RESEARCH	JGC Japan	NVIDIA	Suncall
Chubu Electric Power	JTOWER	OISHII FARM	Super Micro Computer
Dai Nippon Printing	Juniper Networks	OKI Electric Industry	Taisei
Dentsu Group	JX Nippon Mining & Metals	Olympus	TBS Holdings
Dexerials	KEL	OPTAGE	TELEFÓNICA
DriveNets	Keysight Technologies	Panasonic Holdings	Tokio Marine & Nichido Fire Insurance
East Japan Railway Company	KYOCERA	Peers	Toppan
e-solutions.inc	Kyushu Electric Power Transmission and Distribution	Preferred Networks	Toshiba
EXEO Group	MIRAIT	Qualcomm	Toyo Ink SC Holdings
Fujikura	MIRISE Technologies	Renesas Electronics	Ufi Space
GeNopsys Technologies	Mitsubishi Corporation	Resonac	UNIADDEX
HAKUSAN	Mitsubishi Chemical Group	Ribbon Communications Operating Company	VIAVI Solutions
HAZAMA ANDO	Mitsubishi Heavy Industries	Santec AOC	Yazaki
Hewlett-Packard Japan	Mitsubishi Research Institute	SCSK	
Hitachi	Mitsui Chemicals	SENKO Advanced Components	

## Academic or Research Members (21)

The National Institute of Advanced Industrial Science and Technology (AIST)	National Research Institute for Earth Science and Disaster Resilience (NIED)
Central Research Institute of Electric Power Industry (CRIEPI)	Osaka University
Cloud Computing & IoT Association in Taiwan (CIAT)	Photonics Electronics Technology Research Association (PETRA)
Hiroshima University	PhotonDelta Foundation
Institute for Information Industry(III)	Photonics Industry & Technology Development Association (PIDA)
Industrial Technology Research Institute (ITRI)	SBI Graduate School
Japan Aerospace Exploration Agency (JAXA)	Shiga University
Keio University	Taiwan Association of Information and Communication Standards (TAICS)
Nagoya University	Tohoku University
National Institute of Informatics (NII)	The University of Tokyo
	Waseda University

Copyright 2024 NTT CORPORATION



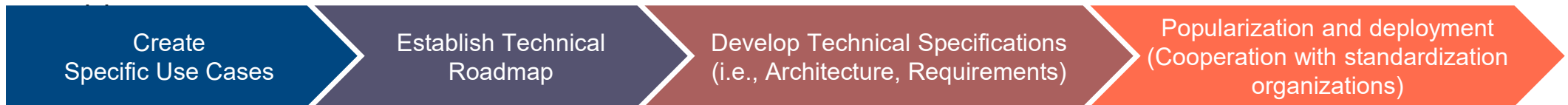
As of July 17, 2024



# Forum Activities



IOWN Global Forum will work on both technology components and use cases for enabling a smarter



## Use cases and applications

*(IOWN Global Forum vision, motivating use cases, potential business impact estimations, technology requirements)*



Smart Energy



Smart Cities



Smart Mobility



Smart Finance

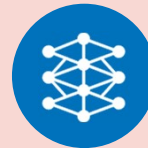


Smart Entertainment

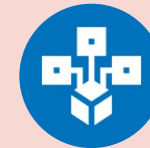
More Use Cases and Applications

## Technical solutions

*(reference architectures, protocols, interfaces, specifications)*



Networking  
Optical & Wireless



Distributed  
Computing



Photonics &  
Optoelectronics



Devices,  
Interfaces  
& Terminals

More Technologies