The Potential of IOWN and “GPU over APN” in Shaping Future AI Infrastructure

MWC26

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01 Overview of IOWN

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IOWN

What Is It?

And Why Do We Need It?

What is IOWN?

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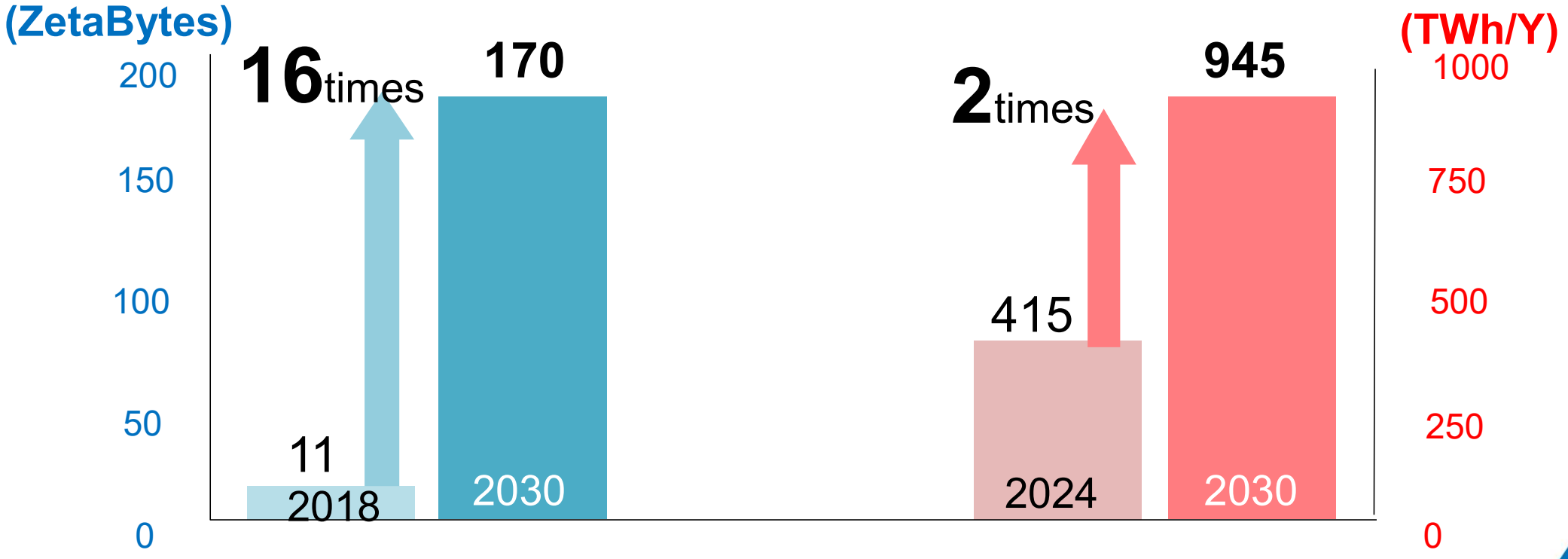
Innovative Optical and Wireless Network

Large Capacity, High Quality	Low Latency	Low power consumption
Transmission capacity **125x**	End-to-end latency **1/200**	Power efficiency **100x**

Why IOWN?

Problem: power consumption on Global Datacenter



Data volume

※Center for Low Carbon Society Strategy, Japan Science and Technology Agency

Power consumption

※Source: IEA “Energy and AI” (published April 2025) Figure 2.11

Key Technologies for IOWN

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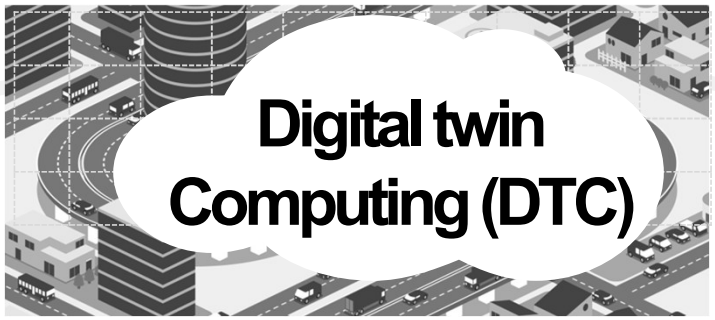


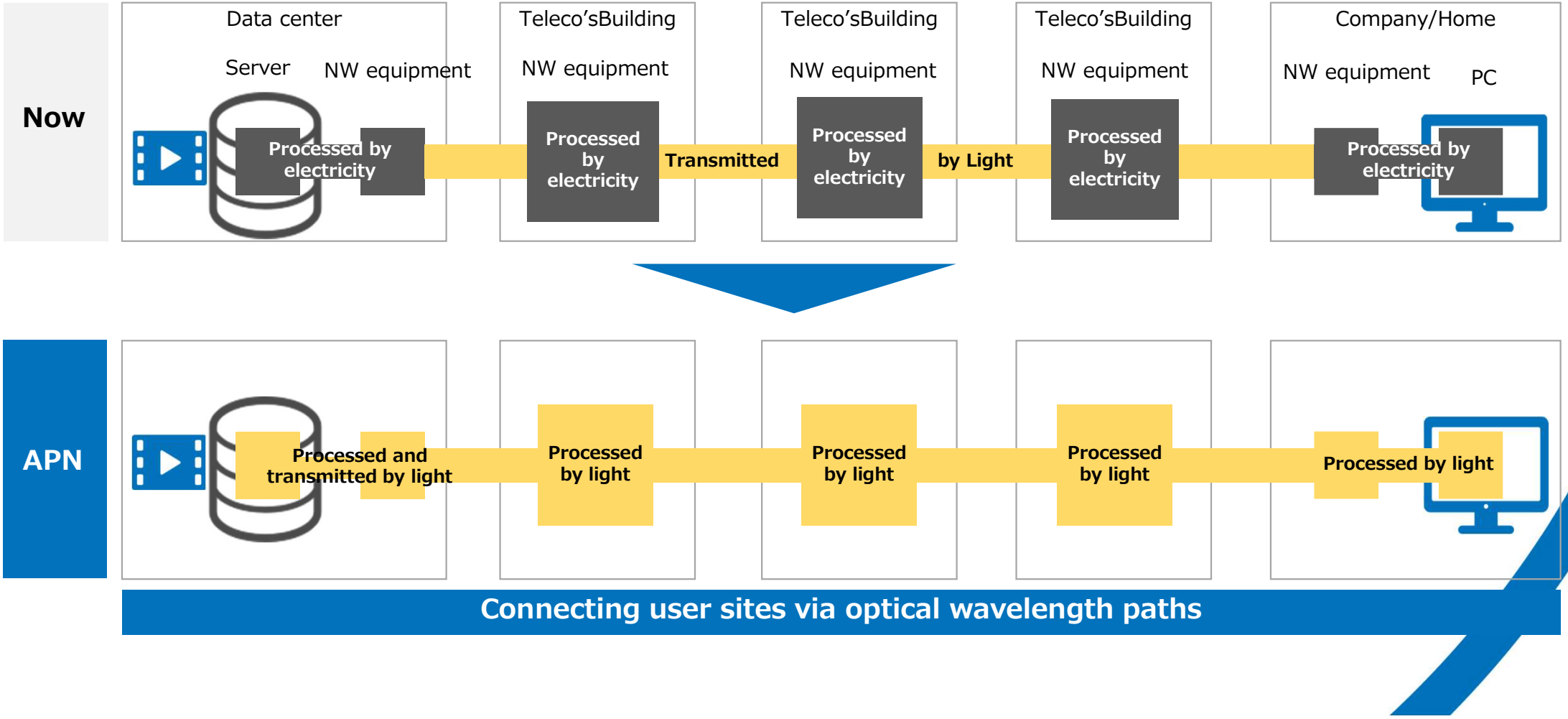
Cognitive
Foundation (CF)

IOWN Optical Computing

Photonics-
Electronics
Convergence
technology
(PEC)

All Photonics Network (APN)

Comparison of Conventional Networks and IOWN APN



IOWN RoadMap

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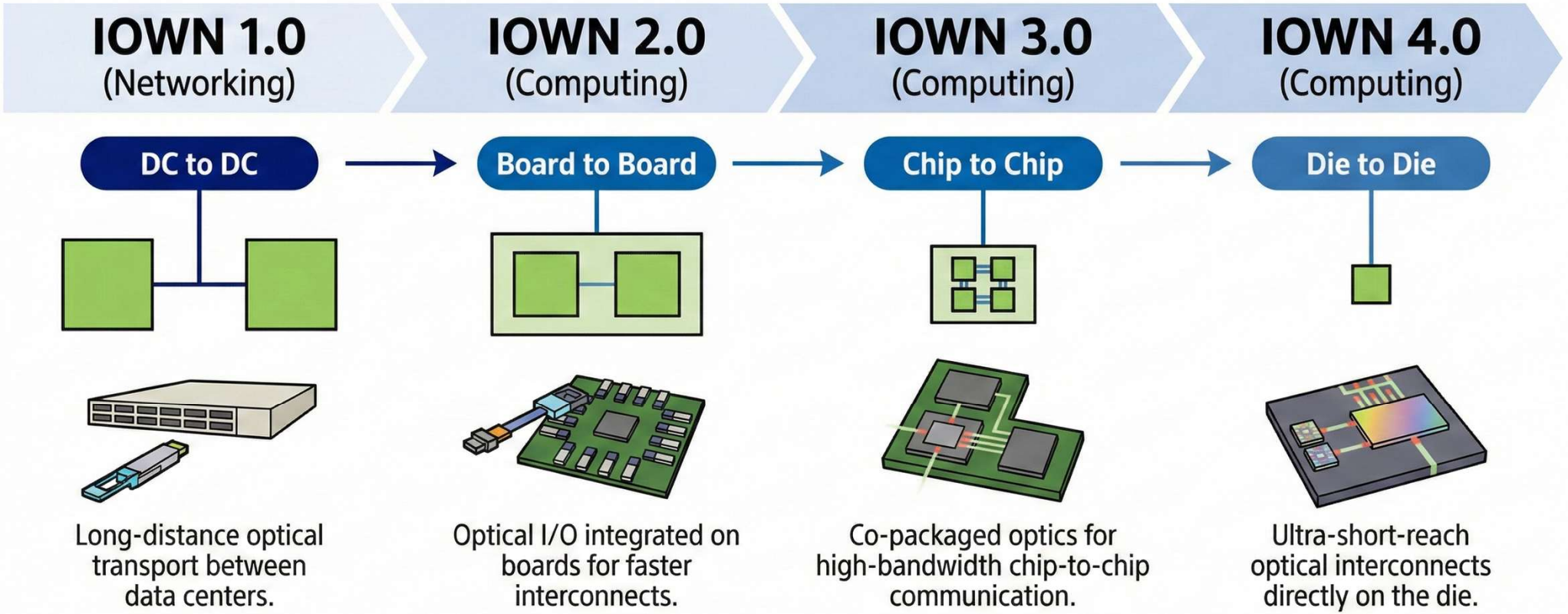

Progression towards smaller, faster, and more integrated optical-electrical convergence.

02 AI infrastructure and distributed data centers

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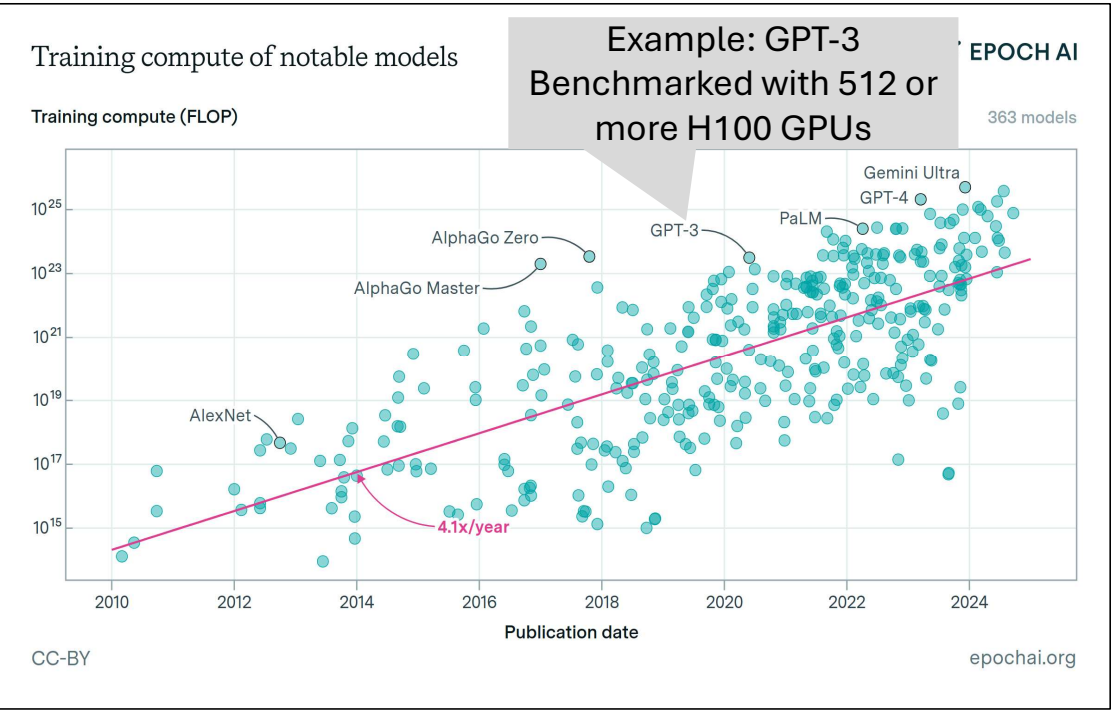
Backgrounds

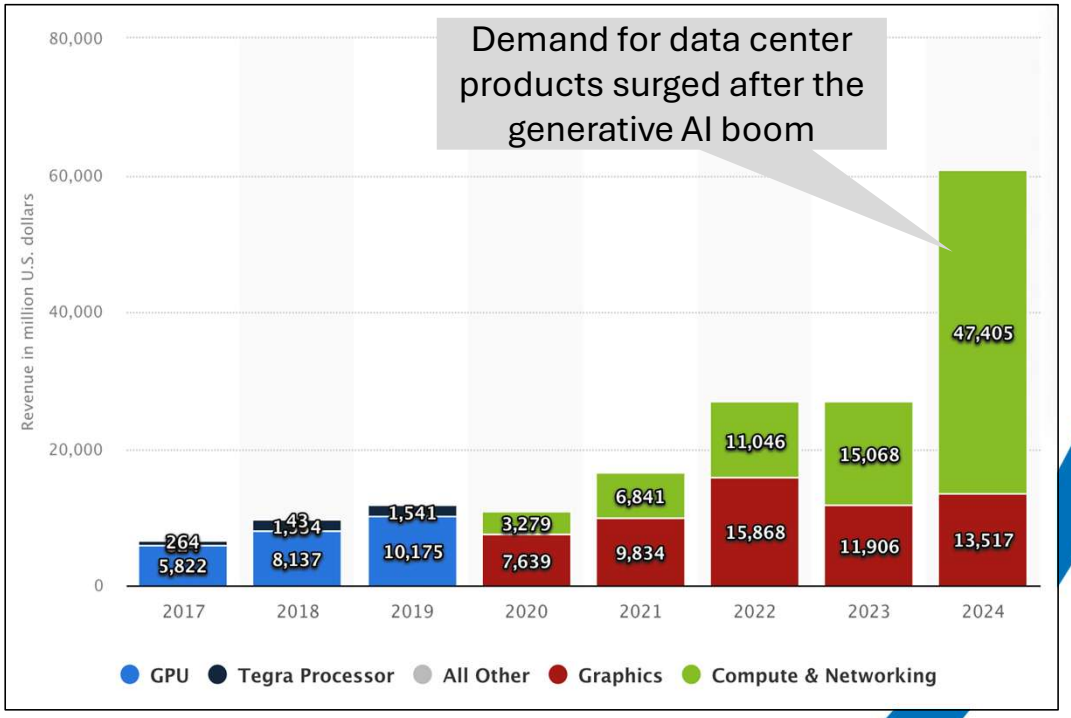
More and more GPUs as compute resources are needed, in areas such as generative AI, data science, and media processing.

Computational complexity of AI model training



https://epochai.org/data/notable-ai-models

Sales of NVIDIA Corporation of the GPU industry



https://www.statista.com/statistics/988034/nvidia-revenue-by-segment/

GPU Infrastructure Requirements and Challenges

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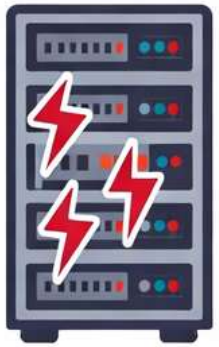
From the perspective of infrastructure constraints

Power density per rack

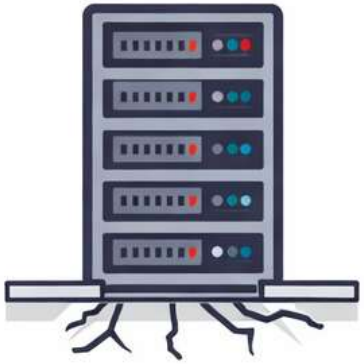


Exceeds power supply capacity

Cooling capacity

Insufficient air cooling

Floor Load Limit



Exceeds floor load limits

-> "Unavoidably" to Distribute

Distributed Data Center x IOWN

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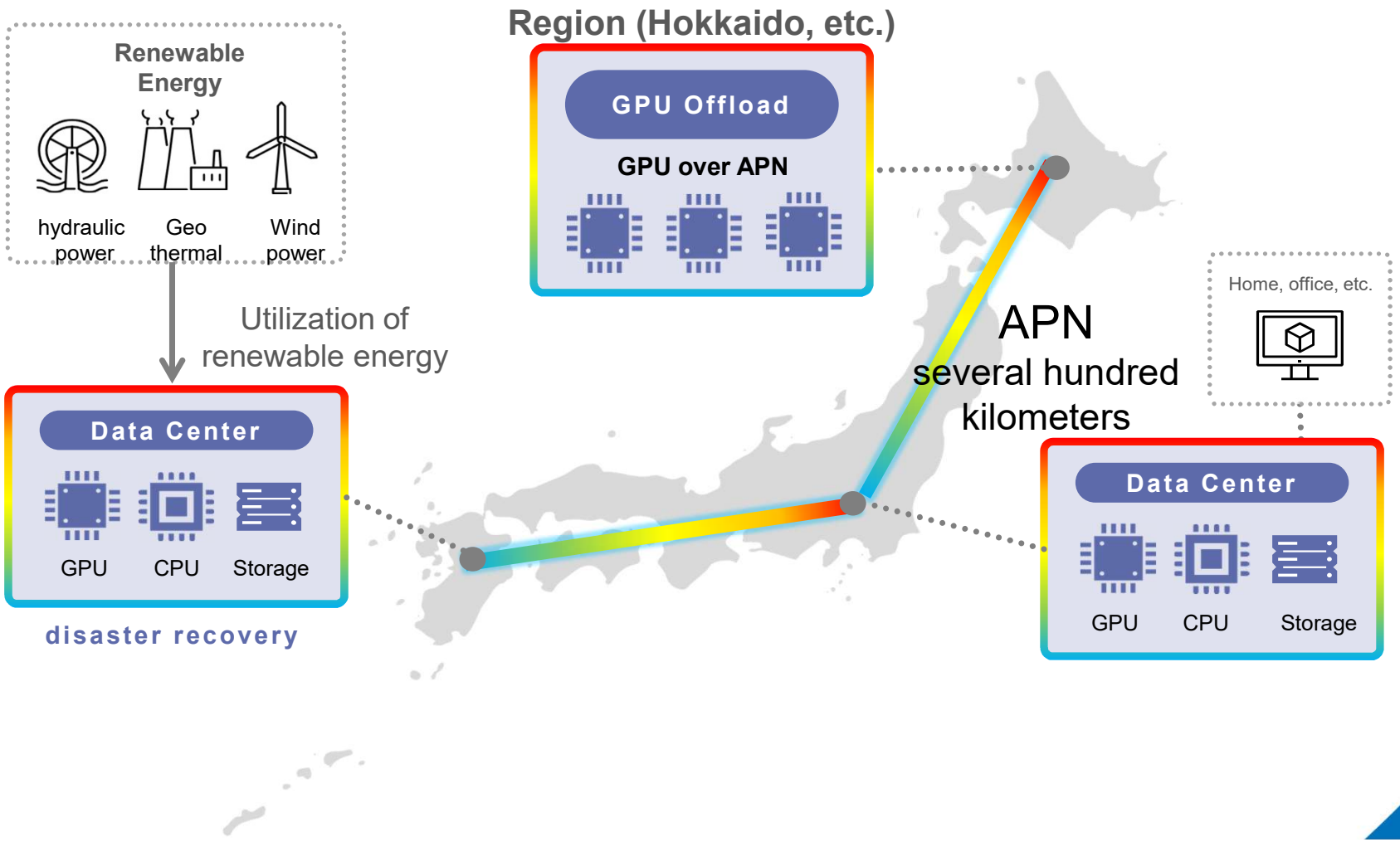
Across distributed data centers Connect with IOWN APN



03 Latest Case Studies : GPU over APN

AI Training / AI Inference / Data Transfer

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The Concept of “GPU over APN”

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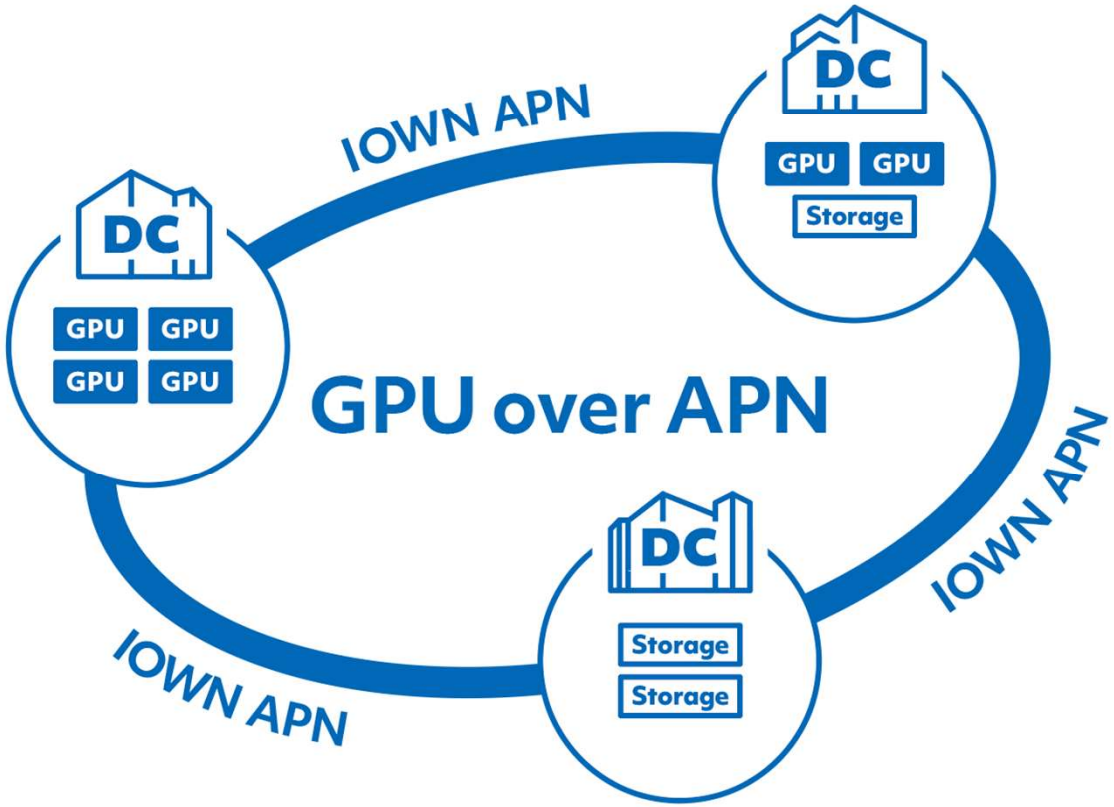
Scale GPUs across Multiple Sites via All-Photonics Network



Ultra-High Bandwidth

Ultra-Low Latency

Ultra-Low Jitter

GPU over APN Use cases

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A AI Training

B AI Inference

C Data Transfer

. . .

A Distributed AI Training (2 sites, Short distance)

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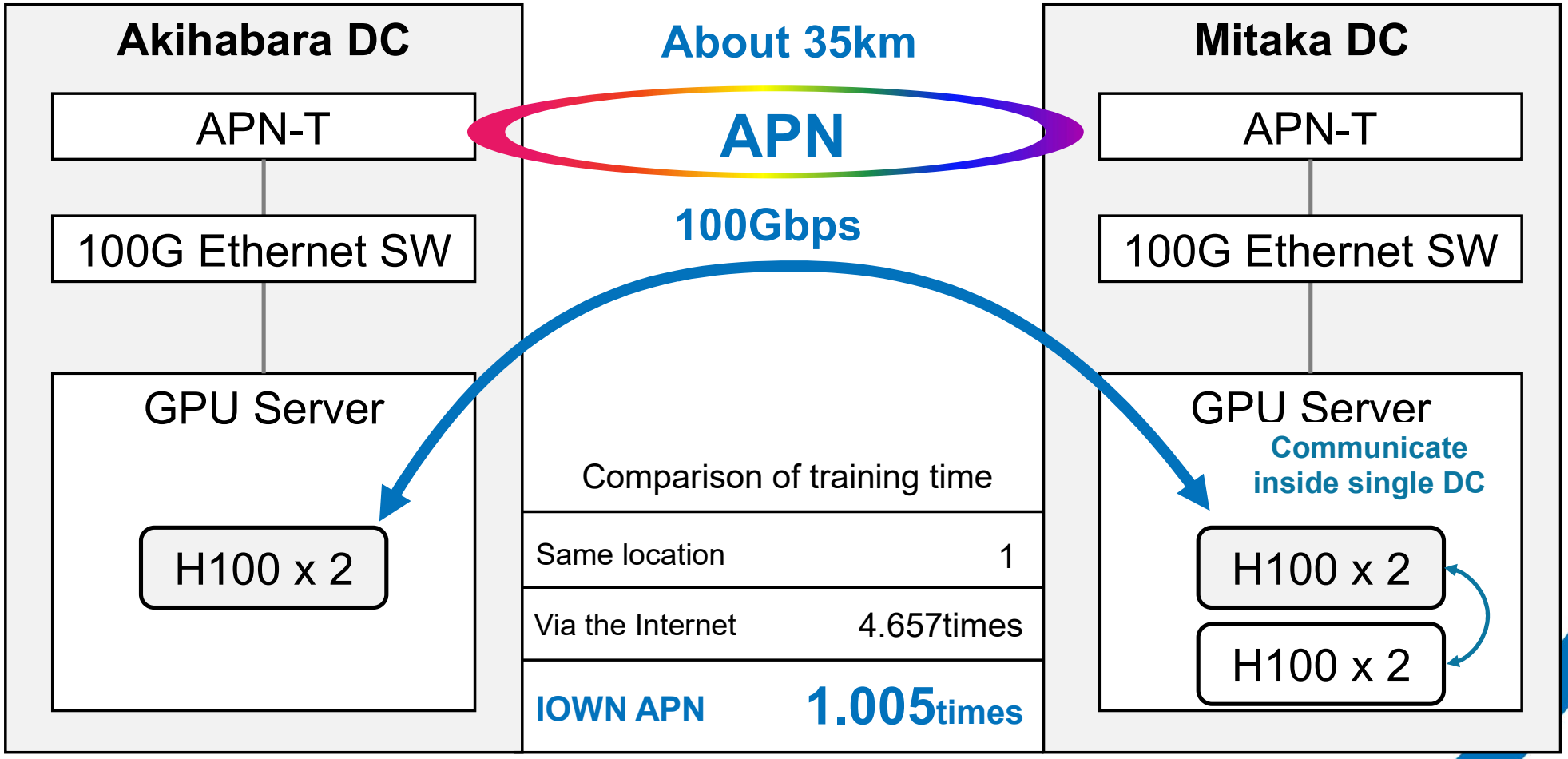
Connect remote GPUs with APNs to achieve close to the same performance as having all the GPUs in the same location.



B Parallel inference over long distances

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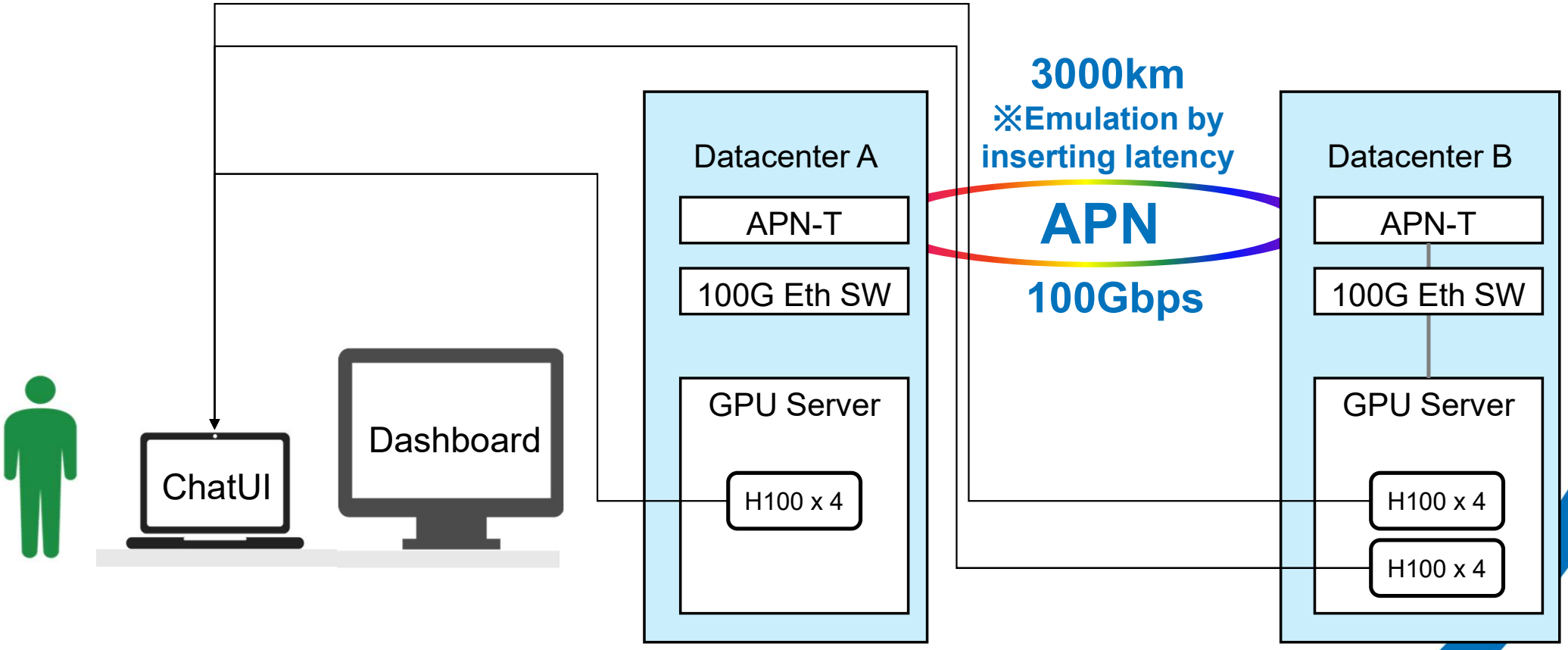
Assuming the inference time in a single data center is set to 1,

the distributed data center (via APN) takes approximately **1.009** times as long



C 800Gbps High-Bandwidth Data Transfer PoC

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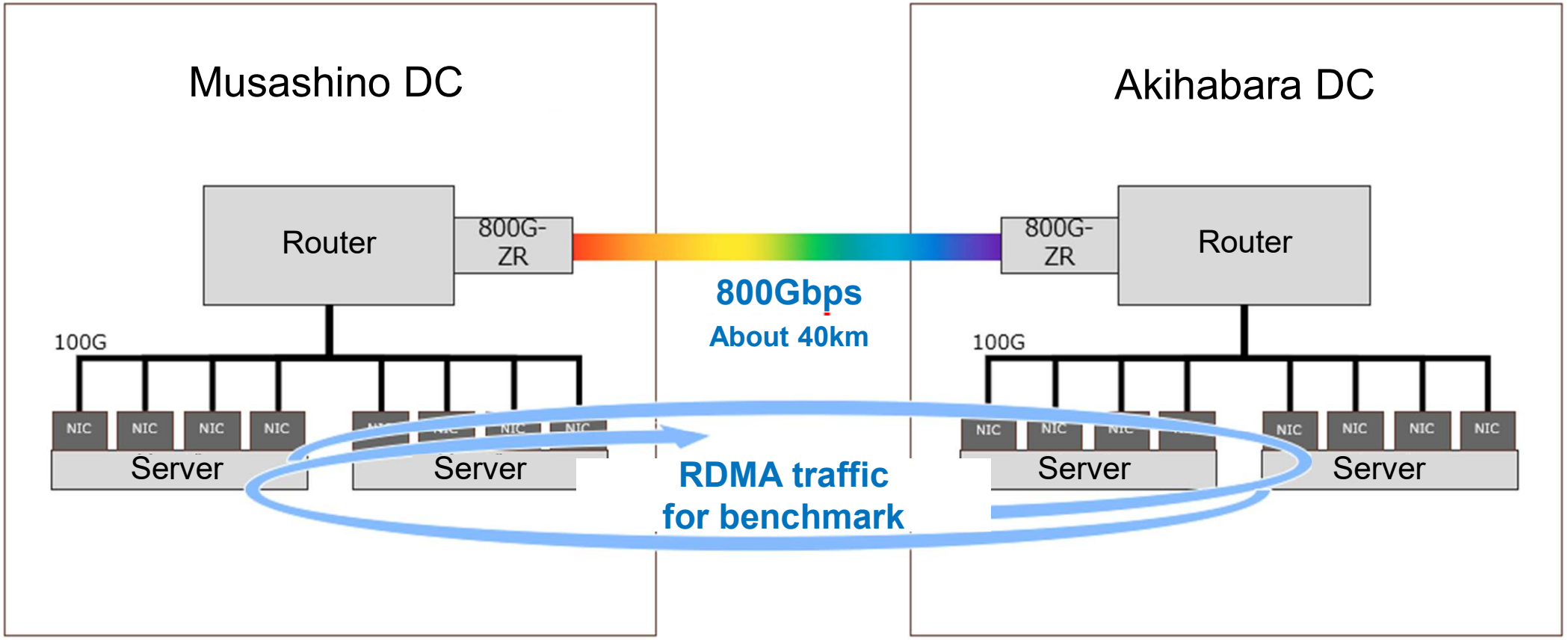
Transfer time: When using our RDMA transfer tool, the data transfer became **5.6** times faster compared to other methods.



Summary of the PoCs Results and Future Prospects

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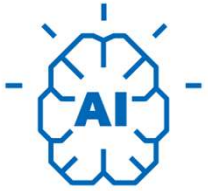
Distributed Training

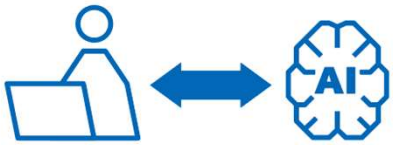


Training Time (LLM 7B)

1.005 x

vs. Single-DC

Distributed Inference

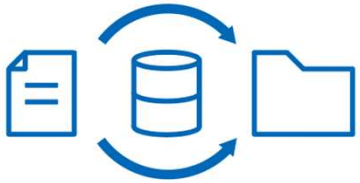


Inference Time (LLM 27B)

1.009 x

vs. Single-DC

Inter-Site Data Transfer



800G RDMA Transfer Speed

5.6 x

vs. Conventional TCP Tools

- Further expand “GPU over APN” environments and its possibilities
- Reflect the know-how gained from the experiment into our commercial services, aiming for providing customers a **one stop solution**.
- **Invite partners** who are interested and co-create PoC together.

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