

# RED ONION project: Accelerated ONION based on DTN experience

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# What is ONION?

# SQUID since May 2021



Supercomputer for Quest to Unsolved Interdisciplinary Datascience

- Cloud-linked High Performance Computing and High Performance Data Analysis Supercomputer System (Supercomputer for Quest to Unsolved Interdisciplinary Datascience)

- Peak Performance 16.591 PFlops



mini GRP at SCA2025



## SQUID システム構成

CPU nodes	
1520 nodes x peak perf. 5.837 TFlops 8.871 PFLOPS	
プロセッサ	Intel Xeon Platinum 8368 (Ice Lake / 2.40 GHz 38コア) 2基
主記憶容量	256 GB

GPU nodes	
42 nodes x peak perf. 161.836 TFlops 6.797 PFLOPS	
プロセッサ	Intel Xeon Platinum 8368 (Ice Lake / 2.40 GHz コア) 2基
主記憶容量	512 GB
GPU	NVIDIA HGX A100 8 GPU ボード (Delta)

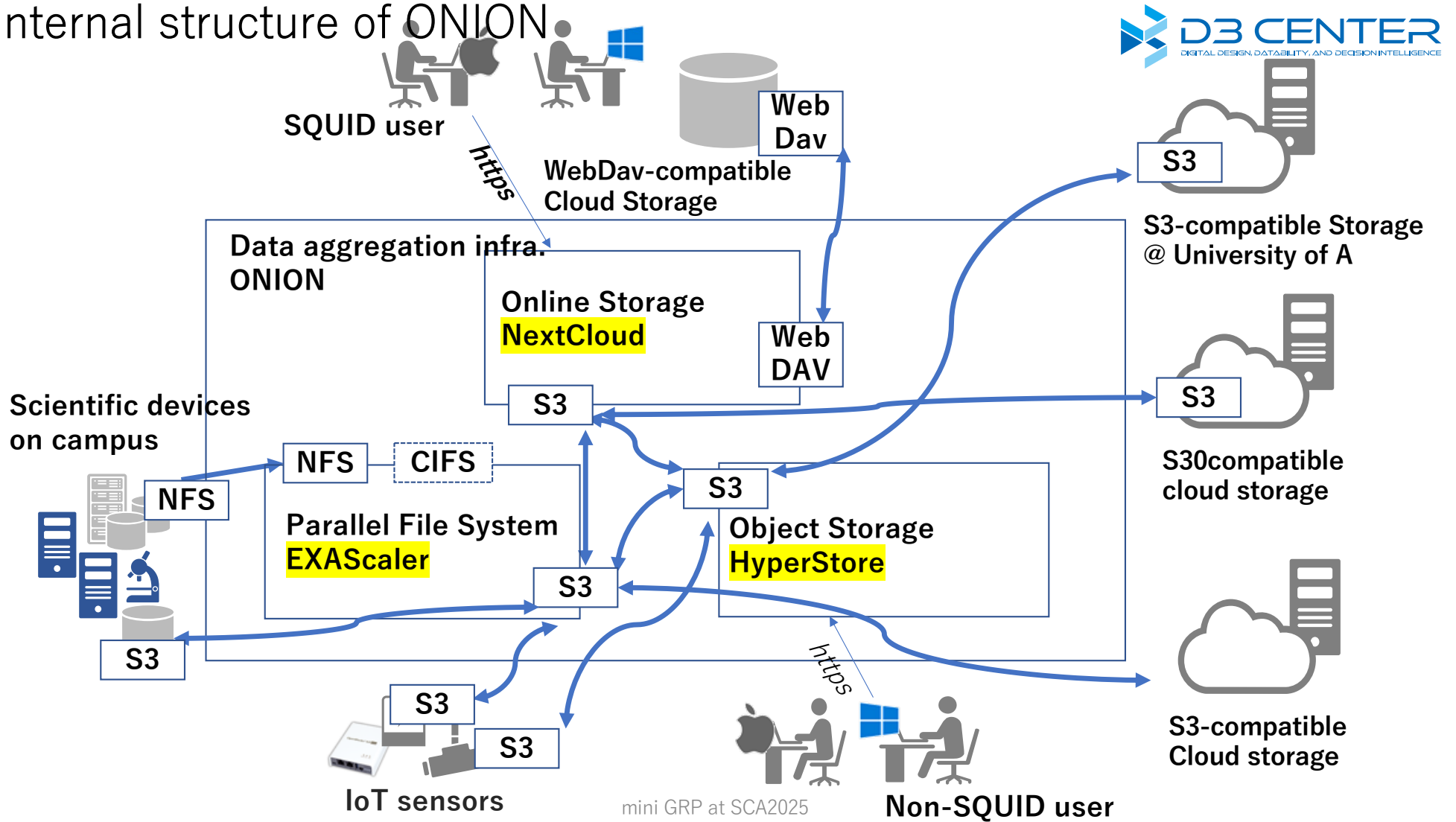
Vector nodes	
36 nodes x peak perf. 25.611 TFlops 0.922 PFLOPS	
プロセッサ	AMD EPYC 7402P (2.8 GHz 24コア) 1基
主記憶容量	128 GB
Vector Engine	NEC SX-Aurora TSUBASA Type 20A 8基

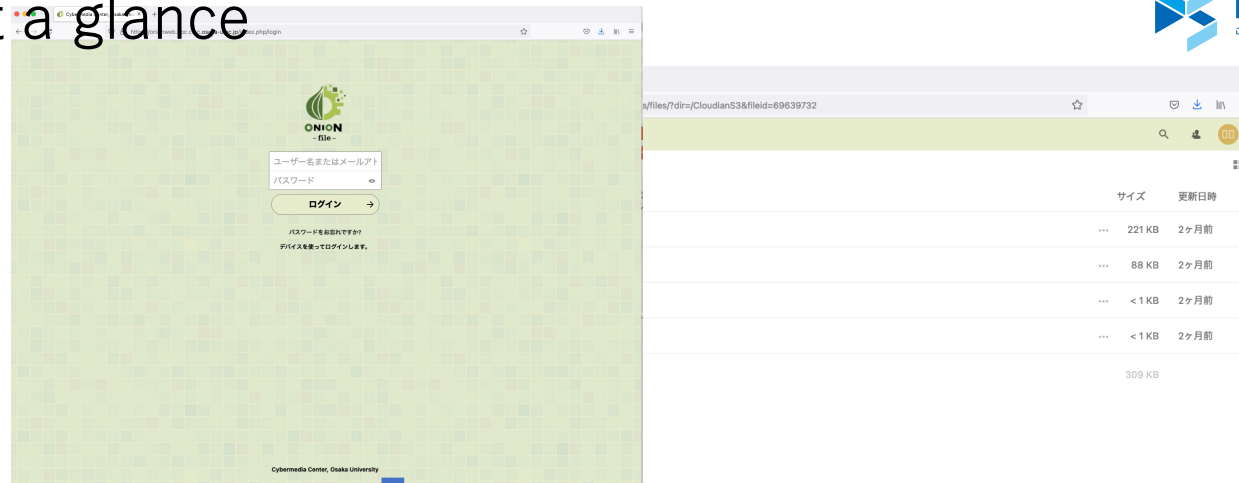
Interconnect	
ノード間接続	Mellanox InfiniBand HDR (200 Gbps)

ONION data aggregation Infra.	
<b>S3-compatible Parallel File System 21.2PB</b>	
ファイルシステム	DDN EXAScaler (Lustre)
HDD	20.0 PB
SSD	1.2 PB
<b>S3-compatible Object Storage 500TB</b>	
オブジェクトストレージ	CLOUDIAN HyperStore
HDD	500 TB

# Internal structure of ONION



# ONION at a glance



**DDN EXAScaler**

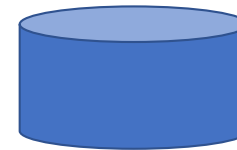


**Clouidian HyperStore Appliance 1610**



mini GRP at SCA2025

**labo's webdav**



**Research institutes S3**



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# Efficient utilization and aggregation of scientific data from scientific measurement devices.



Joint use of scientific devices on campus

Every scientists in university can use scientific devices.

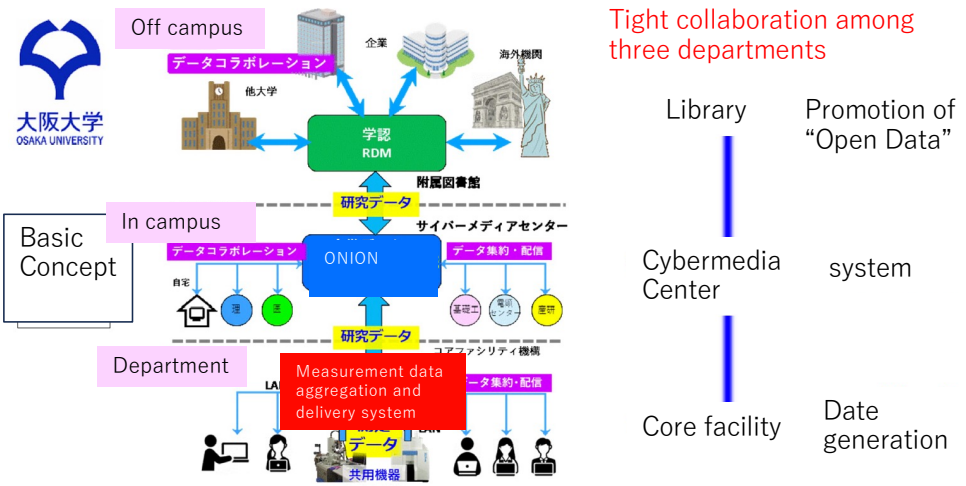


Approximately 300 scientific devices is used. 80,000 measurements /year. Generates a lot of measurement (research) data



Core Facility center is in charge of these scientific devices.

Concept: Realization of Data utilization infrastructure that aggregates and deliver the data daily generated from scientific devices to collaborators

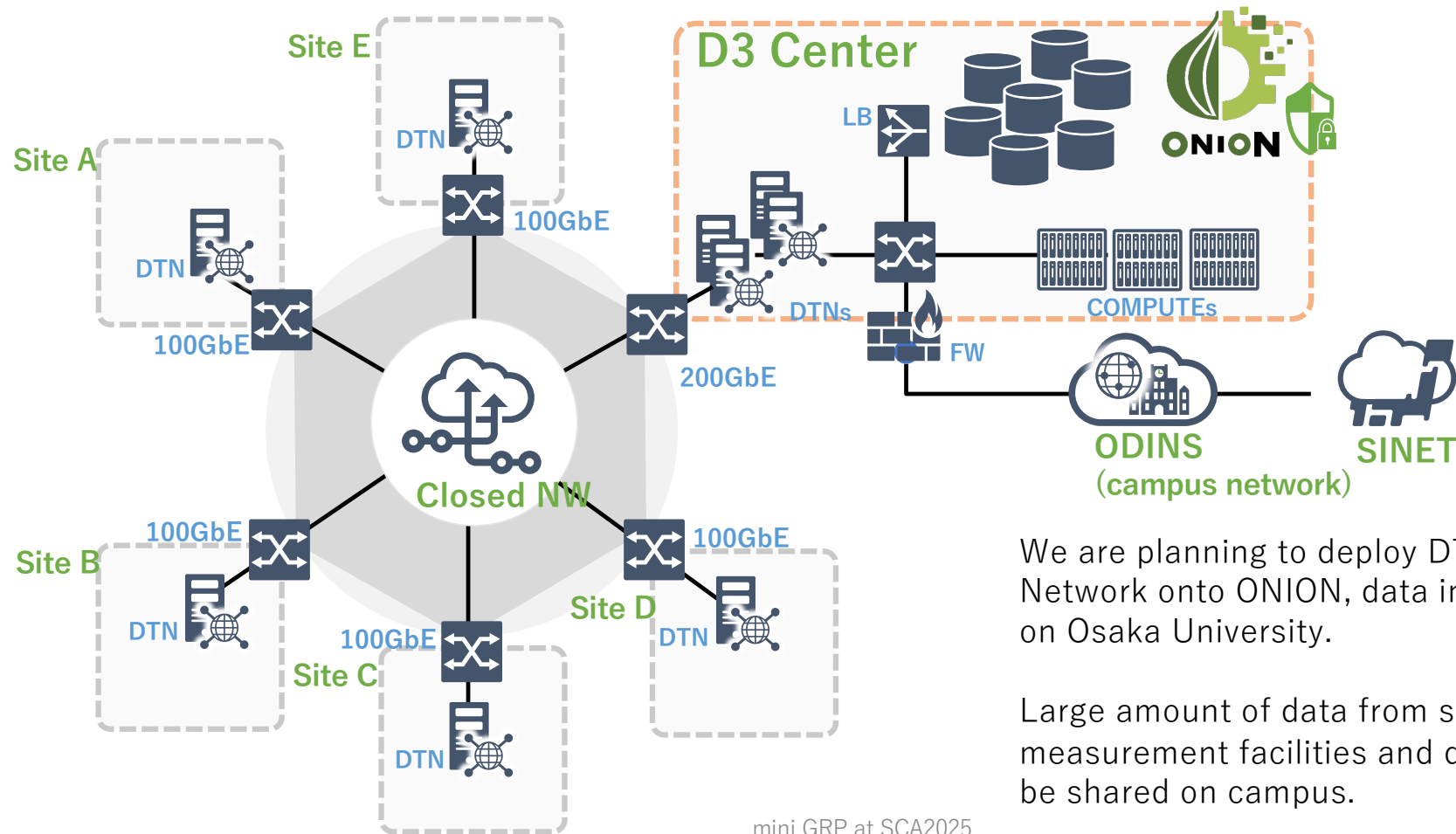


Tight collaboration among three departments

- Library: Promotion of "Open Data"
- Cybermedia Center: system
- Core facility: Date generation

# What is RED ONION?

# RED (Research-EnhanceD) ONION (towards Science DMZ)

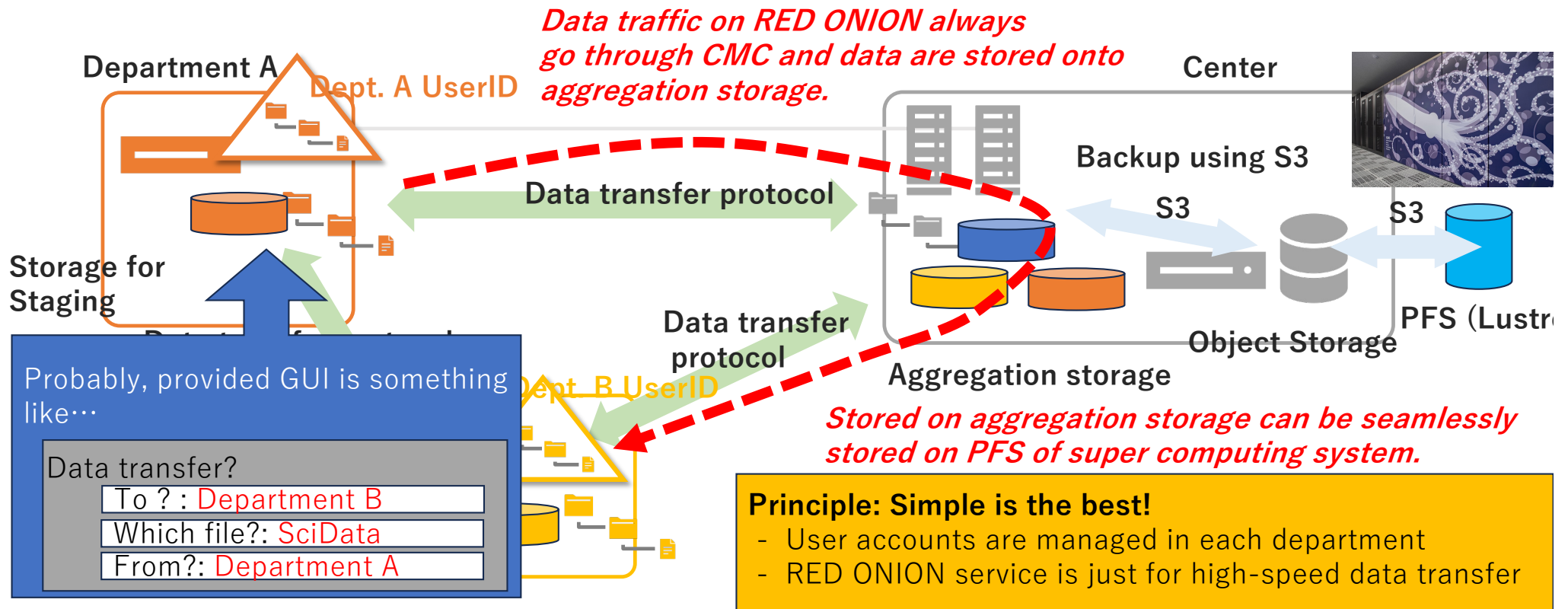


We are planning to deploy DTN and high-speed Network onto ONION, data infrastructure on Osaka University.

Large amount of data from scientific measurement facilities and devices can be shared on campus.

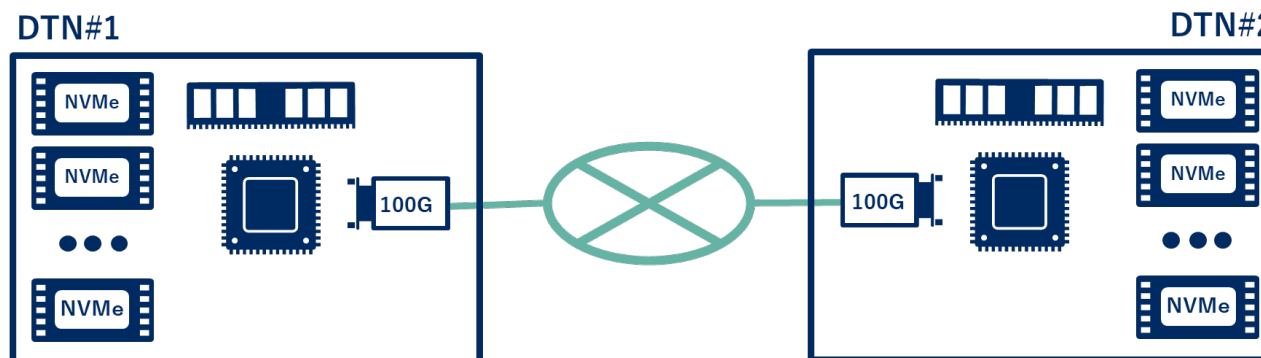
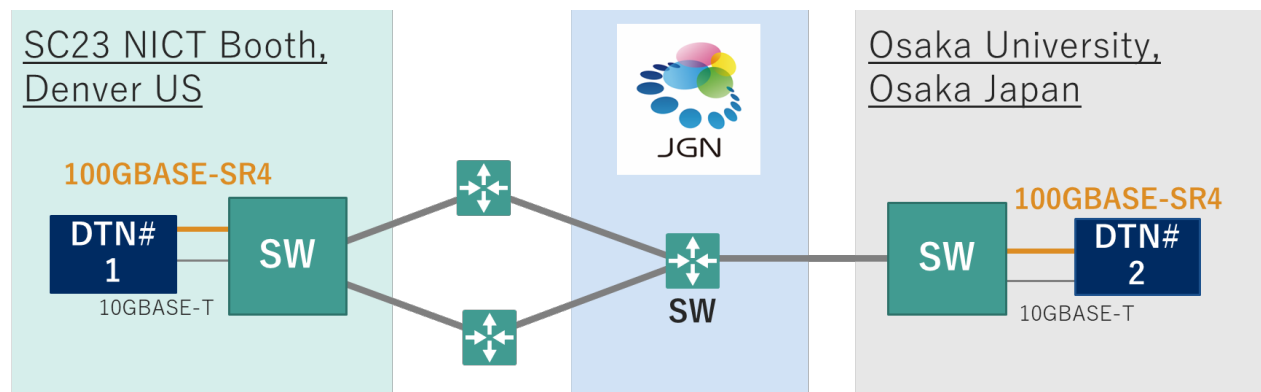


# 1. Designing RED ONION from actual operation perspective



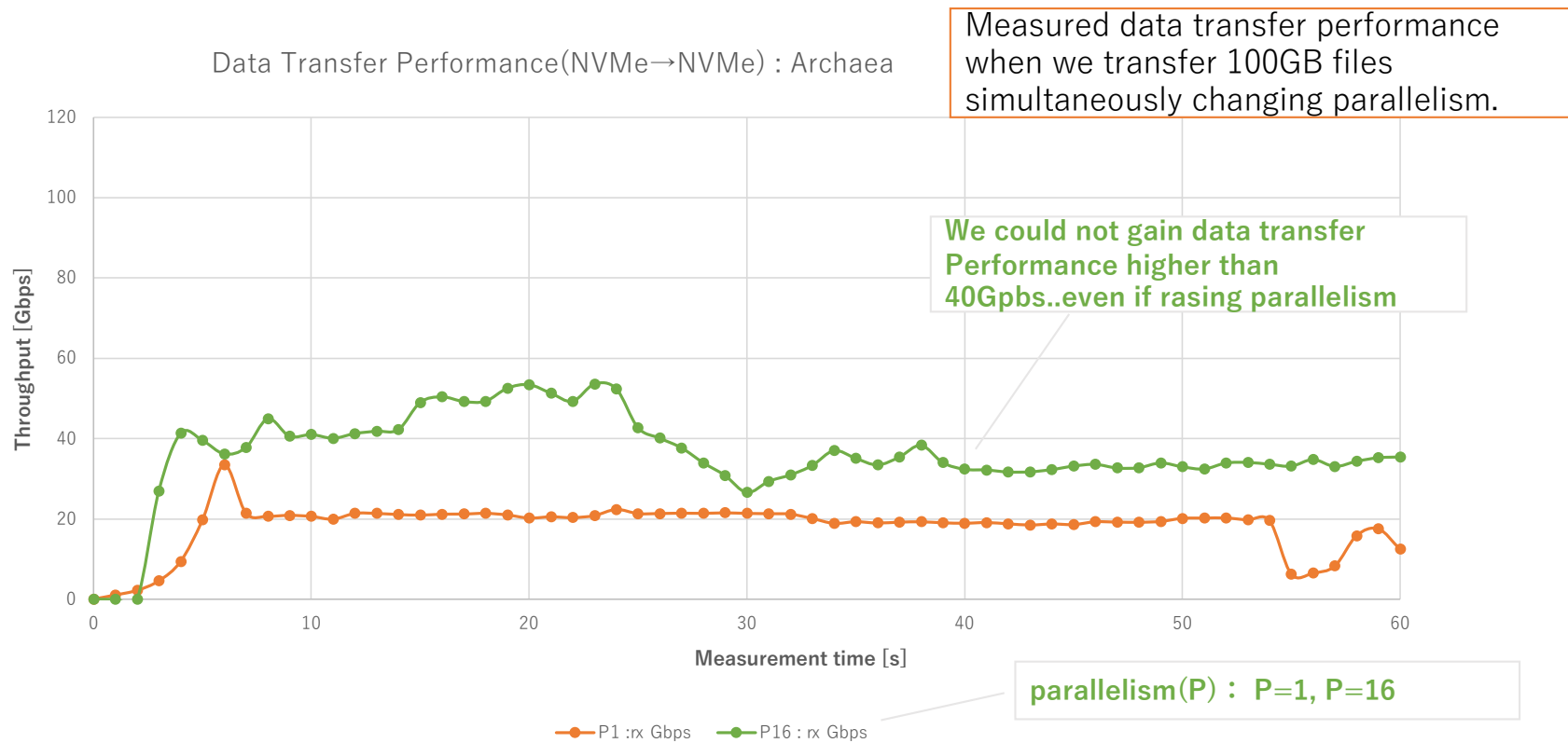
# For high-speed data transfer

- Experiment at SC2023

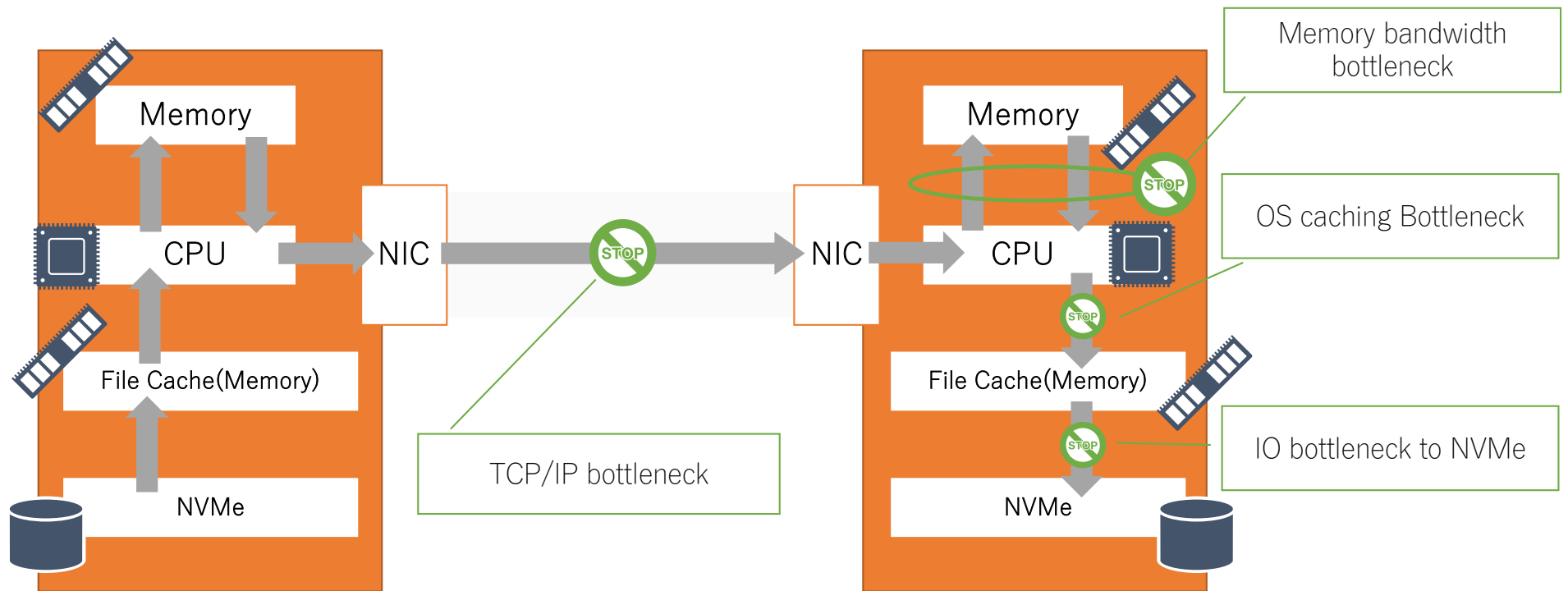


mini GRP at SCA2025

# Performance Evaluation on SC23

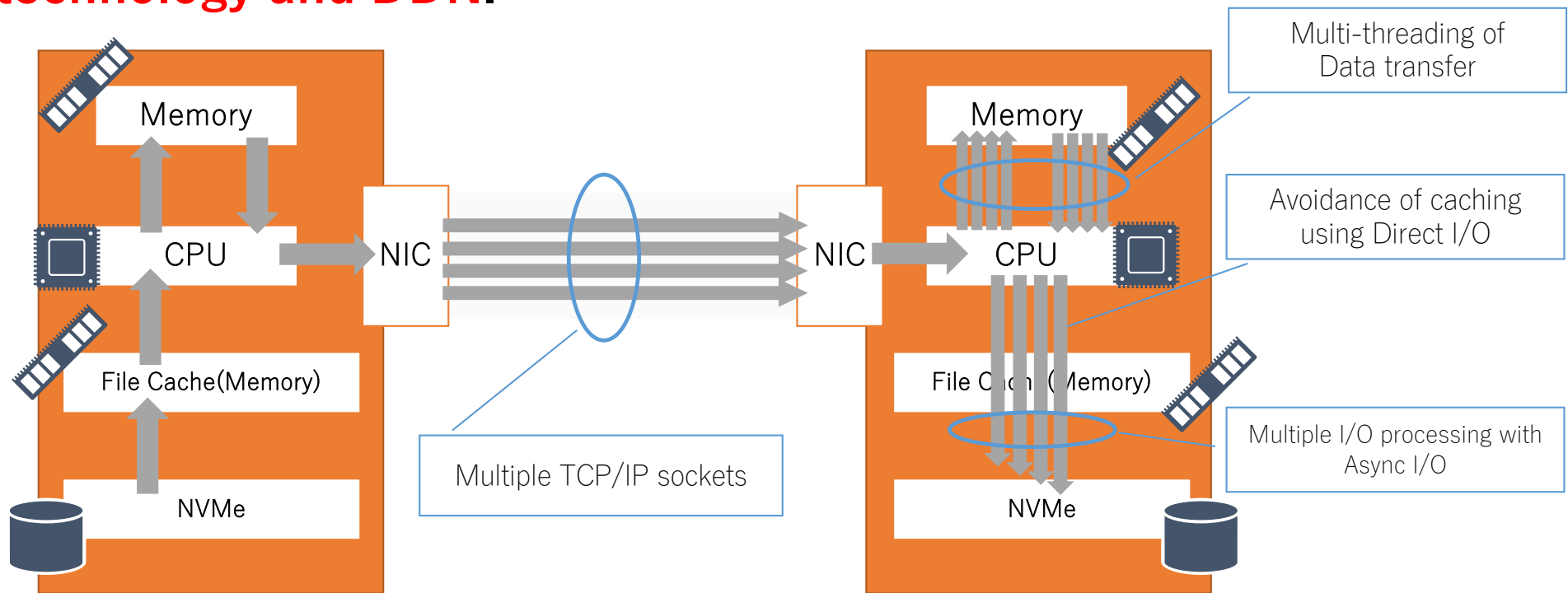


# Possible Bottleneck

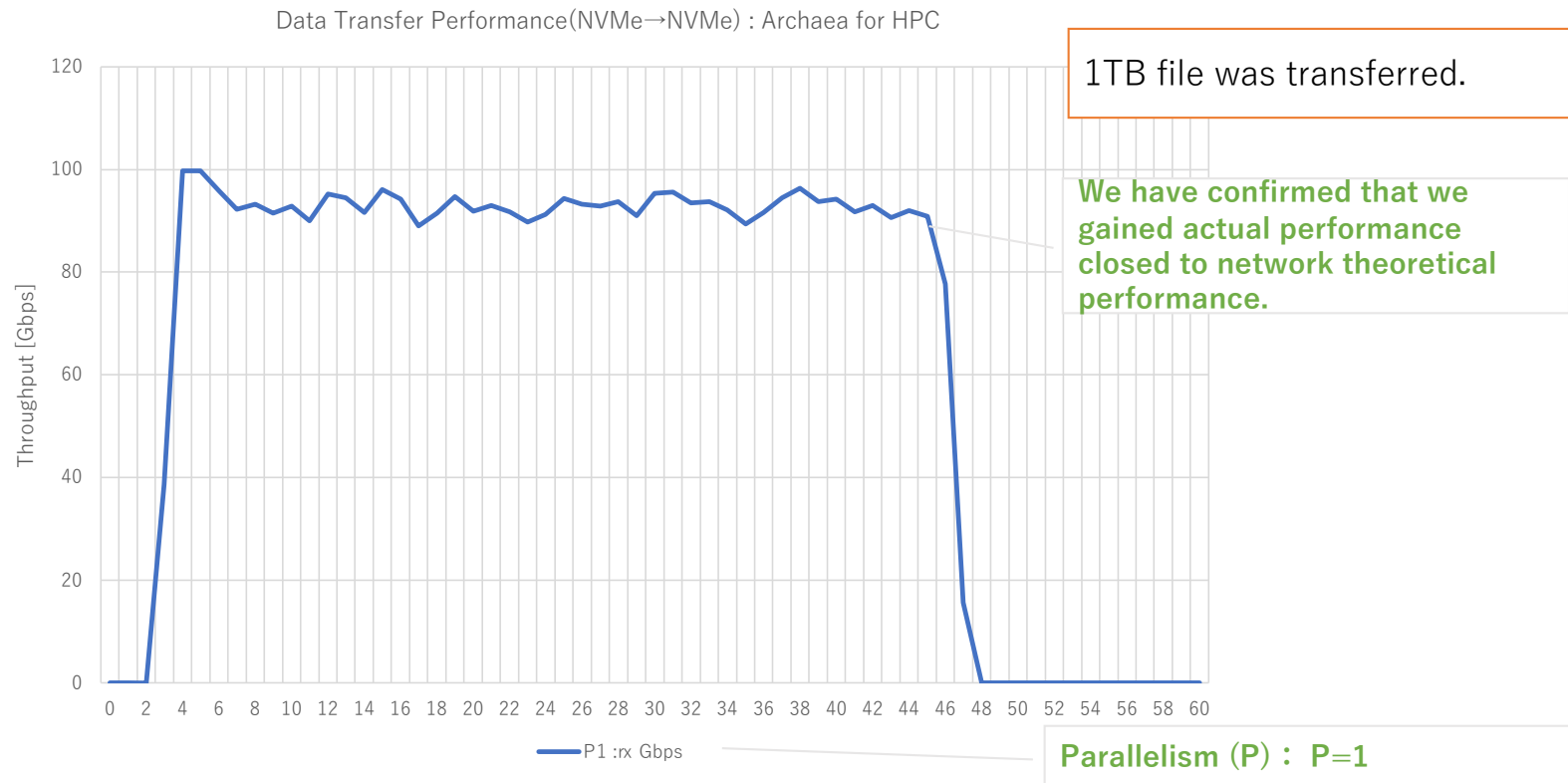


# For high-speed data transfer

- Removal of bottlenecks through collaboration with **NEC, CLEARLINK technology and DDN.**

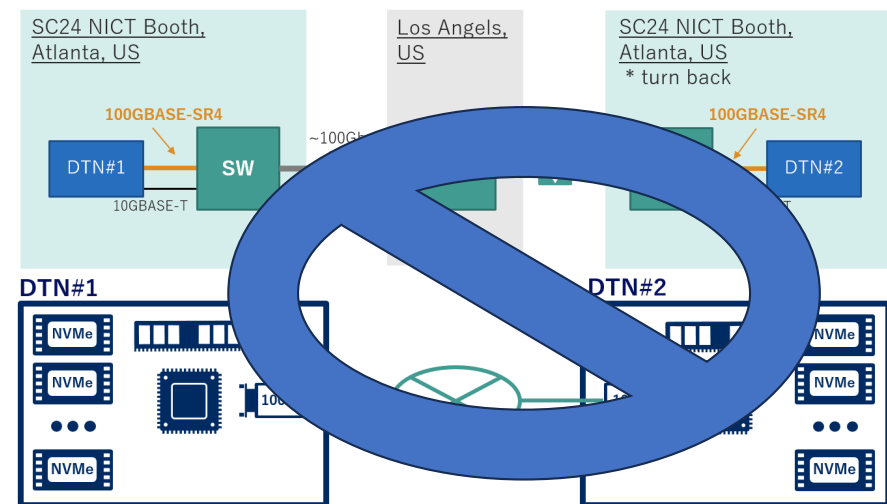
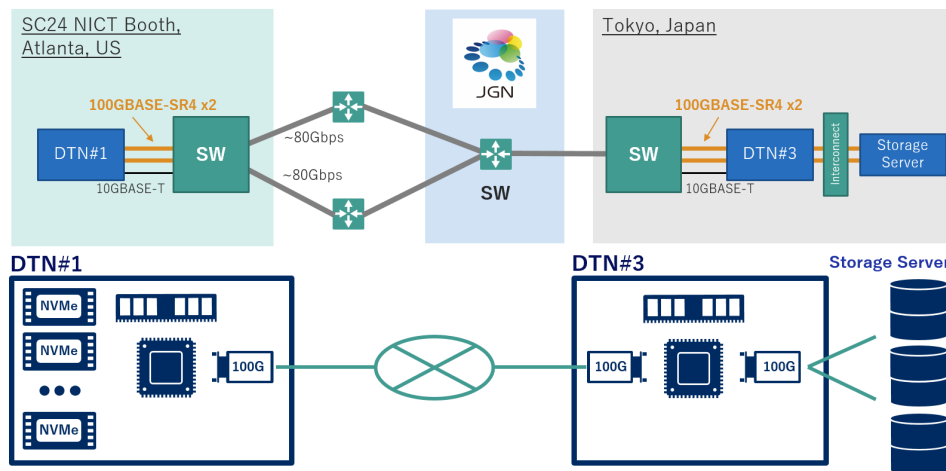


# Preliminary evaluation before SC24



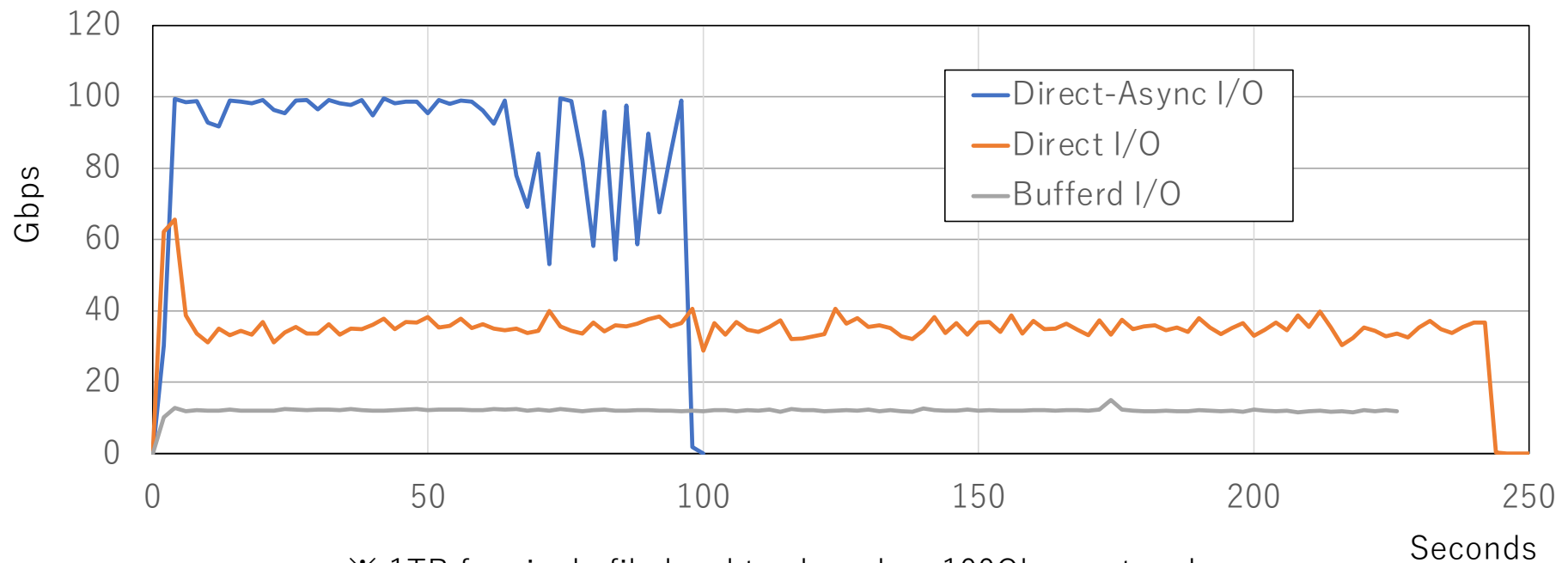
# SC24 demonstration of RED ONION

- We showcased RED ONION solution using USA-Japan network and U.S. domestic networks on NICT booth (3155).



## Performance difference by file I/O configurations

Direct-Async I/O is a key to get high performance for disk-to-disk transfer.



※ 1TB for single file local to shared on 100Gbps network.

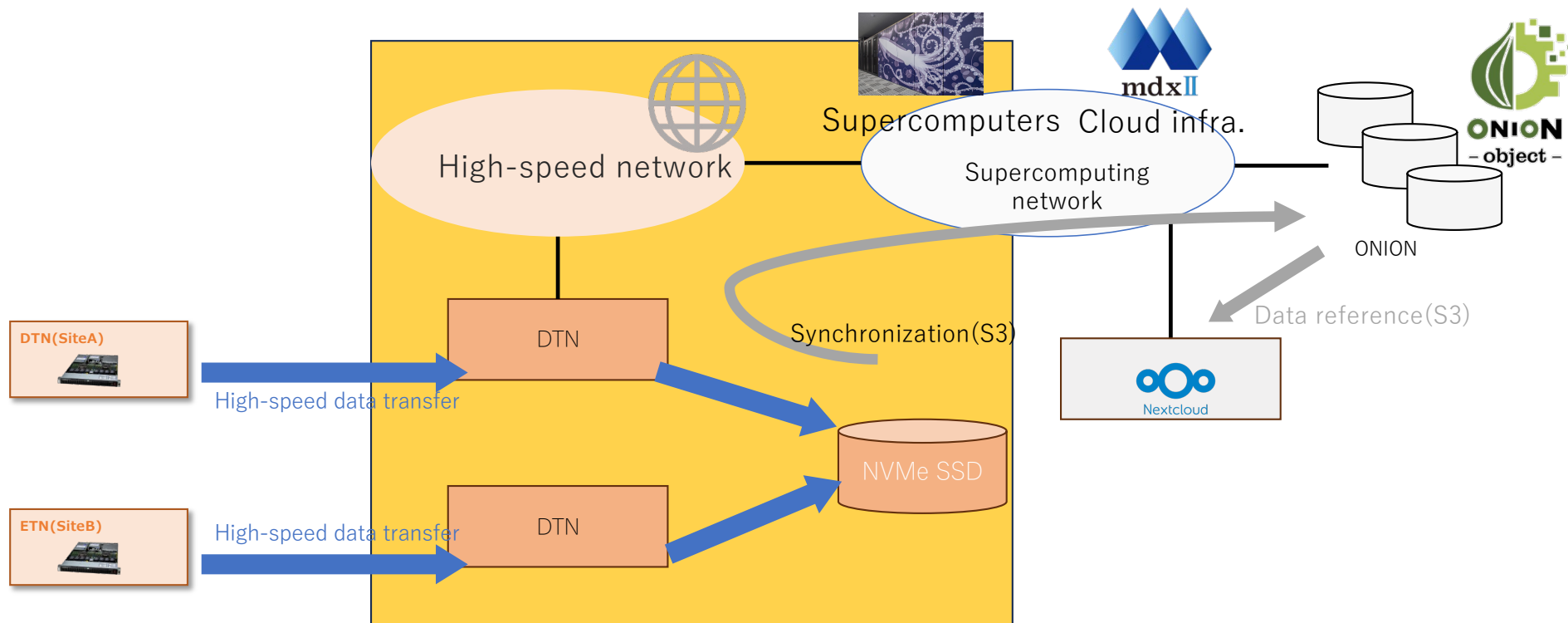
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Measured by Hosomi & Kataoka (NEC)



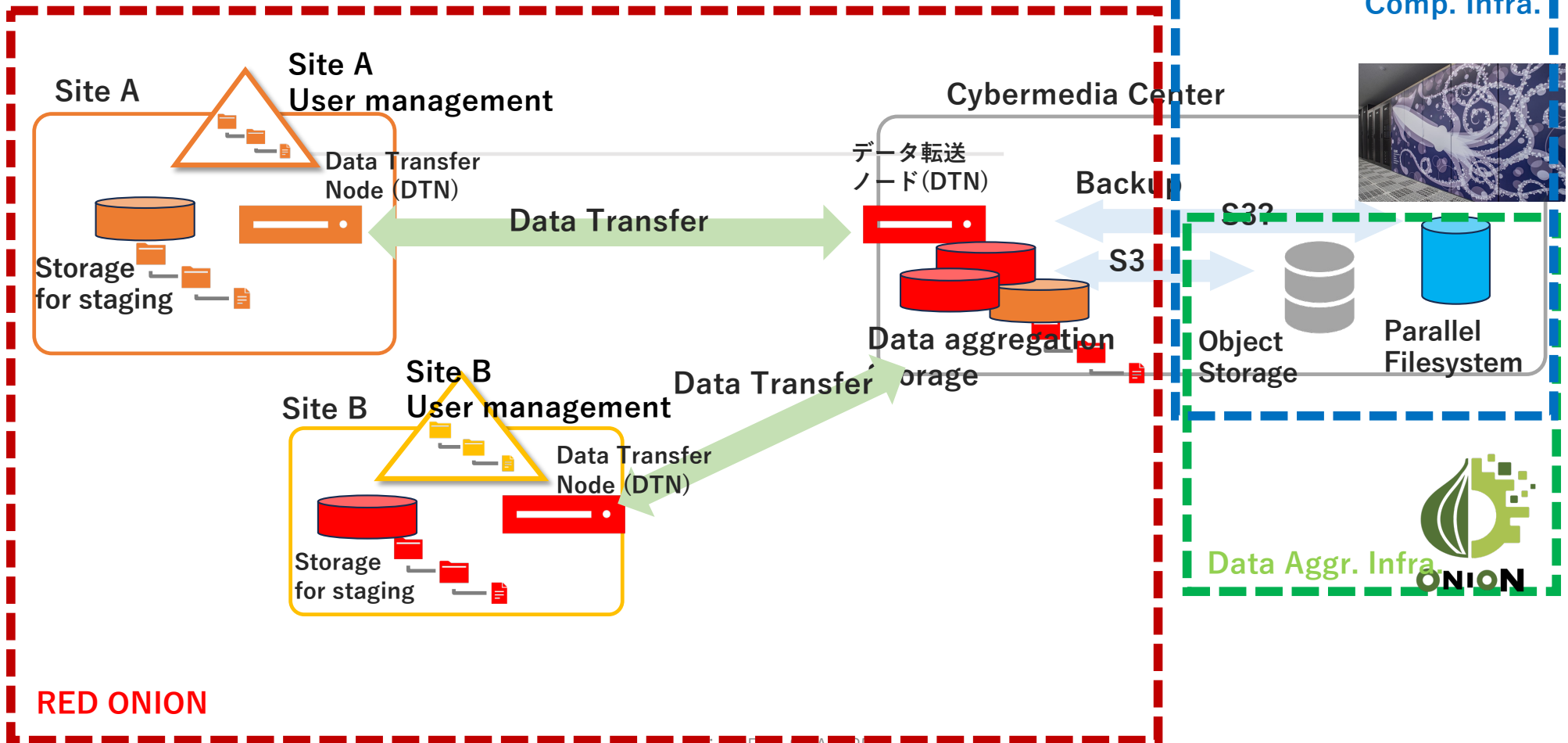
# Overview of RED ONION – Data Transfer Service

- RED ONION allows users to quickly aggregate large amount of data to ONION (data aggregation infrastructure) with ease.



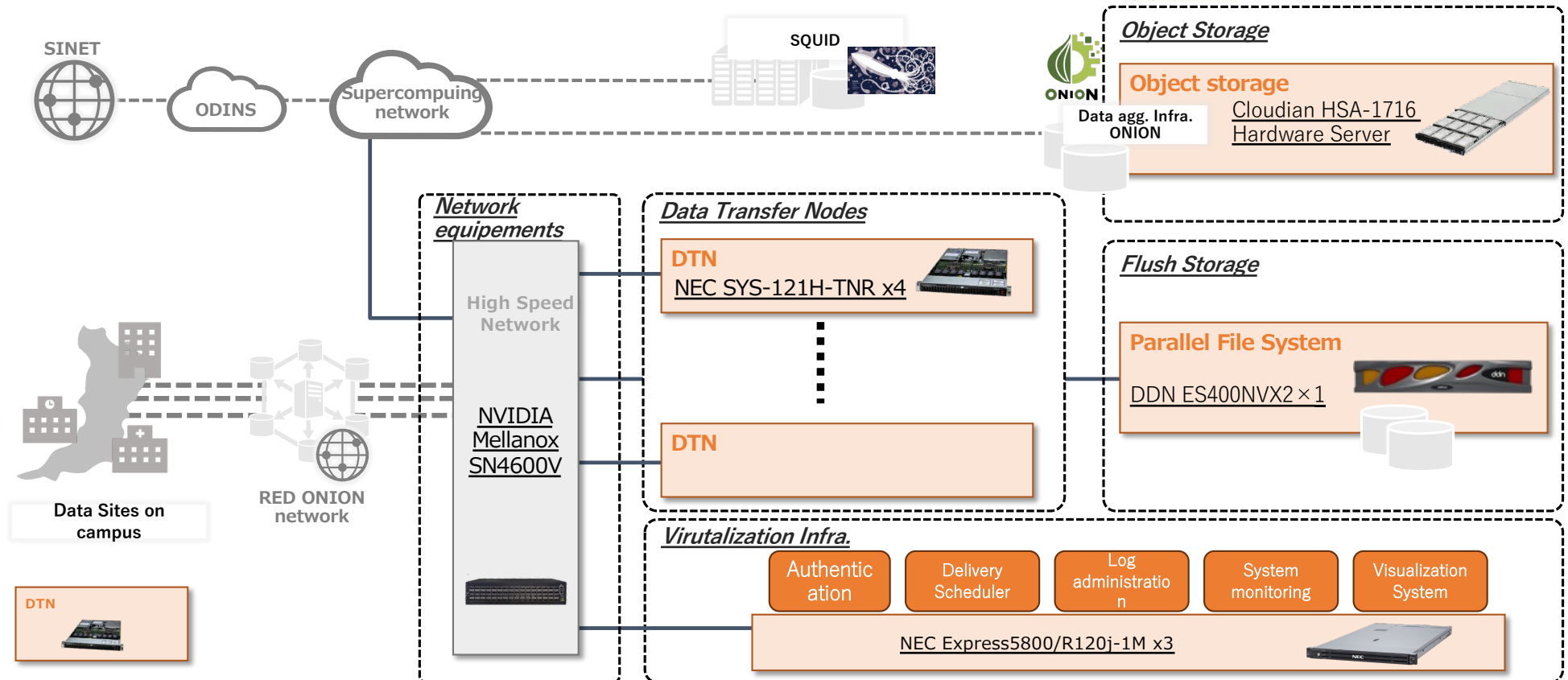
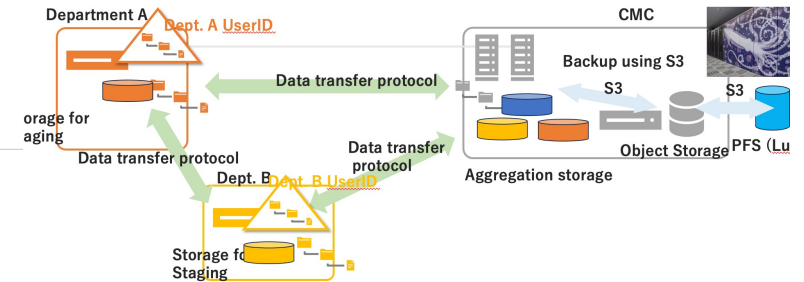
This part is now under procurement and we will finish by March 2025.

# Aggregation of computing and Data Infrastructure



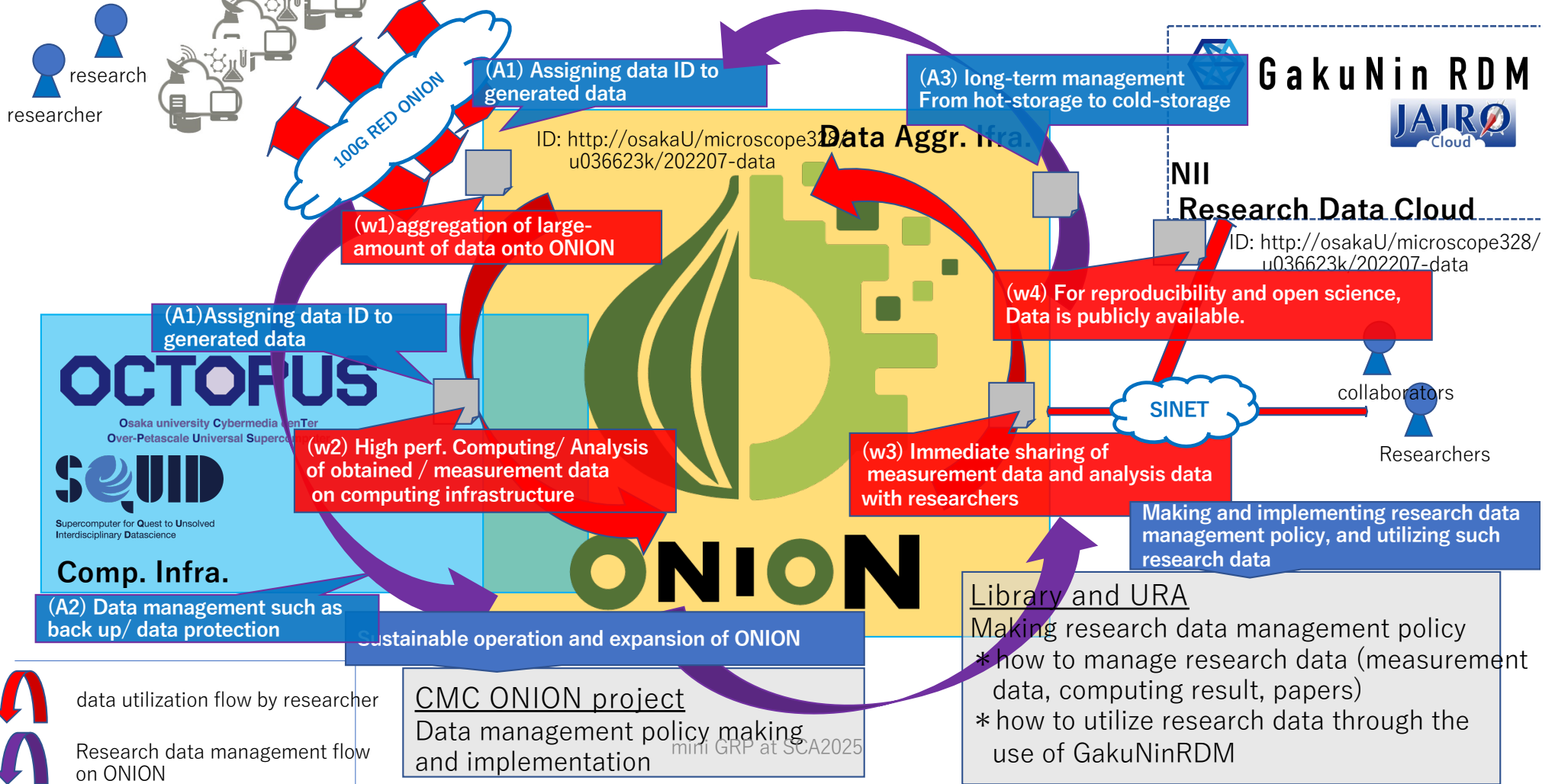
# Current Status towards RED ONION

D3 Center's side will be deployed in March 2025 thanks to MEXT's Open Access Acceleration Project.



Data source : measurement devices and sensors on campus

# Towards highly productive CI for data science.



# Summary



- Towards the realization of RED ONION environment that allows our departments in campus to easily transfer large amount of data with each other, we are now installing RED ONION in detail.
- Technology is not a problem but business model for sustainable operation of RED ONION on campus will become a problem.