D3 CENTER

Digital design, Datability, Decision intelligence

Cybermedia Center

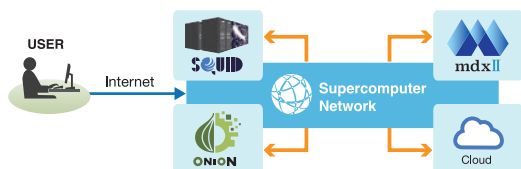**Osaka University, Japan**

Large-scale Computing Systems at the D3 Center

Overview of High-Performance Computing Environment at the D3C

Large-scale computing systems (SQUID) and data aggregation infrastructure (ONION) are deployed on D3C-Supercomputer network, a.k.a D3C-SCinet, a low-latency and wide-bandwidth network. This architectural design allows users to access large-scale storage systems, perform large-scale high-performance computation and analysis on our large-scale computing systems.

*Cybermedia Center (CMC) has been reorganized into the D3 Center. *

Large-scale Computing Systems

SQUID

SQUID is short for **S**upercomputer for **Q**uest to **U**nsolved **I**nter-disciplinary **D**atascience. SQUID is a cluster system being operated since May 2021. This system is composed of General purpose CPU nodes, GPU nodes, and Vector nodes, total 1,598 nodes. These nodes and large-scale storage EXAScaler (Lustre 21.2 PB) are interconnected on InfiniBand HDR (200 Gbps) and form a cluster.

Data Sheet of SQUID

Type of nodes	General purpose CPU	GPU	Vector
CPU	Intel Xeon Icelake (2.4 GHz, 38 cores) x 2		AMD EPYC Rome (2.8 GHz, 24 cores)
OS	Rocky Linux 8.8		
# of nodes (total)	1,520	42	36
# of cores (total)	115,520	3,192	864
Memory capacity (total)	389 TB	22 TB	5 TB
Peak performance	8.871 PFLOPS	6.797 PFLOPS	0.922 PFLOPS
Accelerator		NVIDIA HGX A100 8-GPU x 42	NEC SX-Aurora TSUBASA Type20A x 288

mdx II

mdx II is a system composed of compute nodes and storage built on OpenStack. Each resource is provided through virtual machines, delivering an isolated environment for each project. In addition to supercomputer-like applications such as large-scale data processing and high-performance computing, it can be used for a broader range of flexible purposes, including hosting data repositories and data platforms. (GPU nodes are currently under procurement.)

*mdx I and II are jointly operated by 9 universities and 2 research institutes in Japan. *

For more information: https://mdx.jp/en/

Data Sheet: mdx II

| CPU	Intel Xeon Platinum 8480+ (56 cores) x 2
# of nodes (total)	60
# of cores (total)	6,720
Memory capacity (total)	30 TB
Peak performance	430.08 TFLOPS

Features of the mdx II User Portal

・**Resource Monitoring:**
View real-time CPU, memory, and storage usage on a simple dashboard.

・**Virtual Machine Management:**
Create, edit, or delete VMs from the portal.

・**Network Management:**
Set up networks, floating IPs, and security settings.

・**Storage Management:**
Manage, expand, or delete volumes.

Overview of mdx II User Portal

Data Aggregation Infrastructure
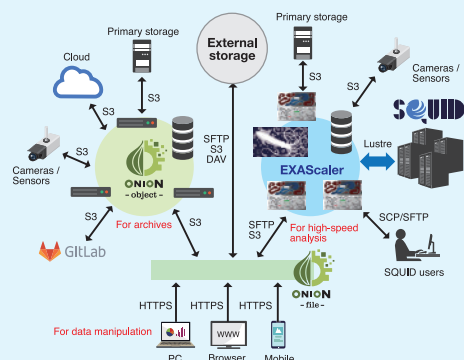
ONION

ONION stands for **O**saka university **N**ext-generation **I**nfrastructure for **O**pen research and open innovatio**N**. ONION is a new data aggregation infrastructure that is linked to SQUID. ONION consists of ONION-object (AWS S3 compatible object storage), ONION-file (storage service using Nextcloud), and EXAScaler (a parallel file system based on Lustre).

ONION makes it easy for users to transfer data between your PC and large-scale computing systems. In addition, ONION can be used in a variety of ways, such as immediate sharing of calculation results with those who do not have a SQUID account and manipulating data from a smartphone. Of course, it can also be used to store and share research data in the laboratory.

Data Sheet: EXAScaler (on SQUID)

Effective capacity (HDD)	20 PB
Effective capacity (NVMe)	1.2 PB
Max number of inodes	Approx. 8.8 Billion
Max expected effective throughput (HDD)	Over 160 GB/s
Max expected effective throughput (NVMe)	Write : Over 160 GB/s Read : Over 180 GB/s

Data Sheet: ONION-object

Effective capacity	950 TiB
Data protection method	Erasure Coding (Data chunk:4 + Parity chunk:2)