AIST — NATIONAL INSTITUTE OF ADVANCED INDUSTRIAL SCIENCE AND TECHNOLOGY (AIST)

Tokyo Tech

RWBC-OIL

TSUBAME3.0 : Cloud/Big-Data/Green Supercomputer @ Tokyo Tech

Overview

Compute Node
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Compute Node

Intel Omni-Path Network
Full-bisection Bandwidth Fat-Tree

DDN EXAScaler Lustre File System
Total Capacity: 15.9PB, Peak: 150GB/s

Compute Node
SGI ICE-XA (HPE SGI 8600) IP139-SXM2
Total 540 nodes
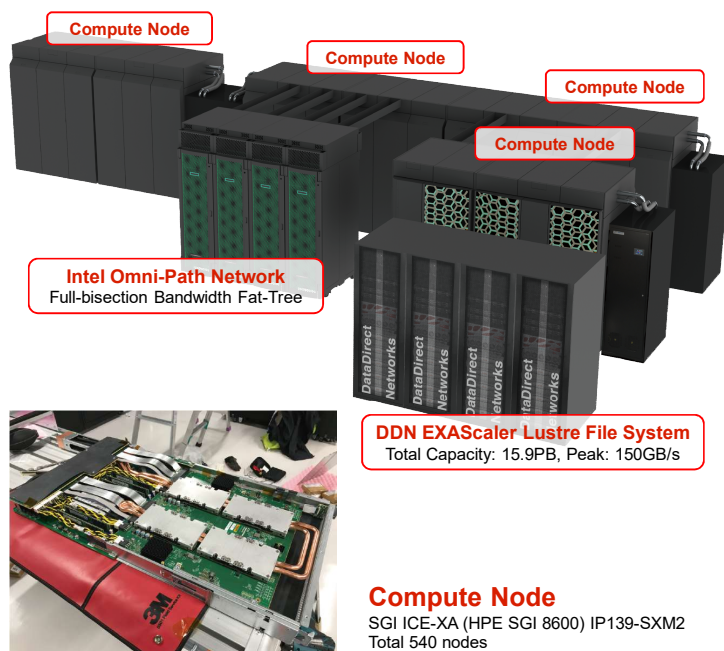
System Total
Peak Flops: 12.15PF(FP64), 47.2PF(FP16)
Memory: 168.7TiB, 1.66PB/s
Local SSD: 1.08PB, Read 1.45TB/s, Write 0.97TB/s

Compute Node

- Compute node consists of four layers: CPU and Memory on 1st, OPA HFI (connected to CPU) and GPU board on 2nd, OPA HFI(via PLX) on 3rd, and Power board on 4th.
- CPUs and GPUs are directly water cooled. The other components are air-cooled indirectly using water.

Compute Node Specification
CPU: Intel Xeon E5-2680 2 sockets
    14 cores per socket, total 28 cores per node.
GPU: NVIDIA TESLA P100 for NVLink-Optimized servers ×4
    5.3TFlops, 16GB HBM2 @ 732GB/s.
Mem: 256GB (DDR4-2400 32GB module ×8)
SSD: Intel DC P3500 2TB (NVMe, PCI-E 3.0 x4)
    sequential read 2700MB/s, sequential write 1800MB/s.
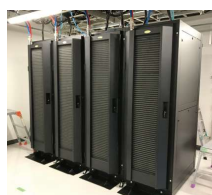Network: Intel Omni-Path Architecture HFI (100Gbps) ×4
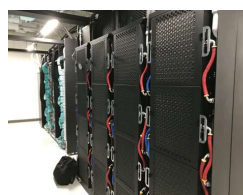
Data Center Facilities

Cooling System
- Cooling of the supercomputers is very important in term of power consumption. TSUBAME3.0 employs a free cooling using warm water cooling technology to minimize power consumption.
- An evaporative, closed type cooling tower is installed on the roof of the building. This tower provides 32℃ or lower water to the system even in the summer in Tokyo.
- For storage, network, and other management servers, rear doors are attached to the racks, which cool the hot air from the servers to reduce the load on air conditioners.
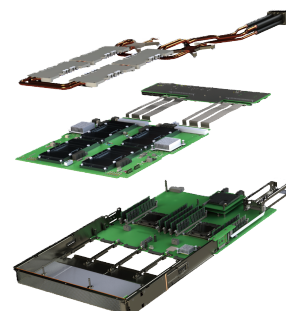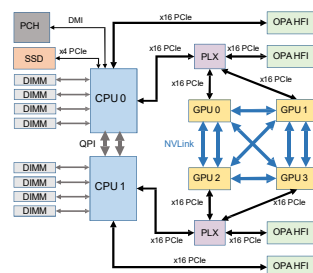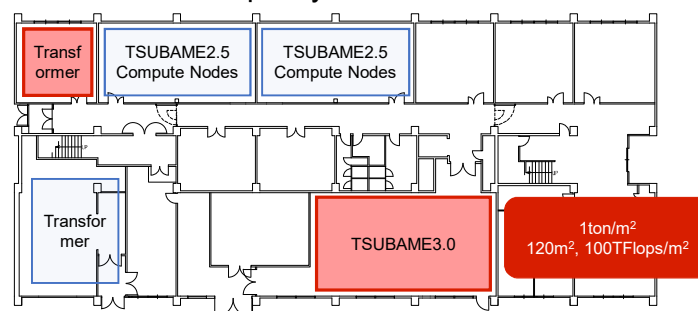
Floor Space
- The water cooled compute nodes also increase their weight. For a high density installation in the server room, we reconstructed the floor base to have 1ton/m^2 capacity.

Transformer
TSUBAME2.5 Compute Nodes
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Transformer
TSUBAME3.0
1ton/m^2
120m^2, 100TFlops/m^2

Power Supply
- We introduced 420V high voltage power supply to reduce power loss.

Cooling Tower

Rear Door Cooling (Storage)

Rear Door Cooling (Network and Others)