Cybermedia Center

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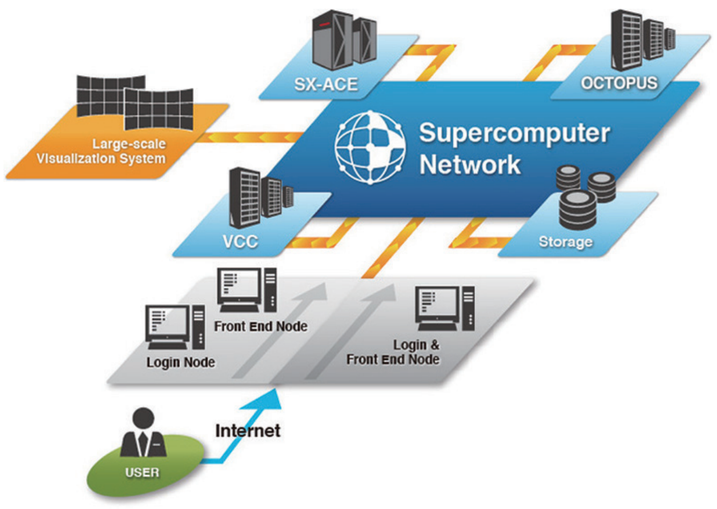
SC18 BOOTH 1825

Large-scale Computing and Visualization Systems at the Cybermedia Center



Overview of high-performance computing environment at the CMC

Large-scale computing systems (SX-ACE, VCC, and OCTOPUS), and large-scale visualization systems are deployed on CMC-Supercomputer network, a.k.a CMC-SCinet, a low-latency and wide-bandwidth network. This architectural design allows users to access to large-scale storage systems, perform large-scale high-performance computation and analysis on our large-scale computing systems, and then visualize its computation and analysis results without losing any important information on our large-scale visualization system.

Large-scale Computing System

The large-scale computing systems at the CMC are classified into (1) Vector-typed Supercomputer and (2) Scalar-typed Supercomputer.

SX-ACE

Type: Vector
OS: Super UX
# of nodes: 1536
# of cores: 6144
Peak performance: 423 TFlops

SX-ACE is a “clusterized” vector-typed supercomputer, composed of 3 cluster, each of which is composed of 512 nodes. Each node equips 4-core multi-core CPU and a 64 GB main memory. These 512 nodes are interconnected on a dedicated and specialized network switch, called IXS (Internode Crossbar Switch) and forms a cluster. Note that IXS interconnects 512 nodes with a single lane of 2-layer fat-tree structure and as a result exhibits 4 GB/s for each direction of input and output between nodes.

Library

MathKeisan(BLAS, LAPACK, etc)
ASL, ASLSTAT, ASLQUAD
MPI/SX
HPF/SX
XMP

Application

AVS/Express	TensorFlow	OpenFOAM
FreeFEM++	Torch	GAMESS
VisIt	Caffe	FLASH
Gaussian09/16	Theano	Octave
IDL	Chainer	Relion
LAMMPS	Quantum Espresso	GROMACS

OCTOPUS

Type: Scalar
OS: Linux
# of nodes: 319
Peak performance: 1.463 Pflops
Interconnect: InfiniBand EDR

OCTOPUS means Osaka university Cybermedia cenTer Over-Petascale Universal Supercomputer. OCTOPUS is a new cluster system supposed to start its operation in December 2017.This system is composed of different types of 4 cluster, General purpose CPU nodes, Xeon Phi nodes, GPU nodes and Large-scale shared-memory nodes, total 319 nodes. These nodes and large-scale storage “EXAScaler” are interconnected on InfiniBand EDR and form a cluster.

Library

Intel MKL(BLAS, LAPACK, etc)	IntelMPI, OpenMPI, MVAPICH2
ASL, ASLSTAT, ASLQUAD	XMP

General purpose CPU node × 236

CPU: Intel Xeon Gold 6126 × 2 (2.6 GHz, 12 cores)
Memory: 192 GB
Performance: 1.996 TFlops

Xeon Phi node × 44

CPU: Intel Xeon Phi 7210 (1.3 GHz, 64 cores)
Memory: 192 GB
Performance: 2.662 TFlops

GPU node × 37

CPU: Intel Xeon Gold 6126 × 2 (2.6 GHz, 12 cores)
Memory: 192 GB
Accelerator: NVIDIA Tesla P100×4
Performance: 23.196 TFlops

Large-scale shared-memory node × 2

CPU: Intel Xeon Platinum 8153 × 8 (2.0 GHz, 16 cores)
Memory: 6 TB
Performance: 8.192 TFlops

Storage

File system: DDN EXAScaler (Lustre)
Capasity: 3.1PB

VCC (PC Cluster for large-scale visualization)

Type: Scalar
OS: Linux
# of nodes: 69
Peak performance: 100.1 TFlops
Accelerator: NVIDIA Tesla K20×59

Library

Intel MKL(BLAS, LAPACK, etc)
Intel MPI, Open MPI

VCC is a cluster system composed of 69 nodes. These nodes are interconnected on InfiniBand FDR and form a cluster. Also, this system has introduced ExpEther, a system hardware virtualization technology. Each node can be connected with extension I/O nodes with which GPU resource, and SSD on 20Gbps ExpEther network. A major characteristic is that this cluster system is reconfigured based on user’s usage and purpose by changing the combination of node and extension I/O node.

Large-scale Visualization System

The large-scale visualization systems at the CMC are set up on Campus and on CMC’s Umekita Office. Large-scale and interactive visualization processing becomes possible through the dedicated use of PC cluster for large-scale visualization (VCC) on these systems. The visualization system in Campus is composed of 24 50-inch Full HD (1920x1080) stereo projection module (Barco OLS-521). Also, OptiTrackFlex13, a motion capturing system has been introduced in this visualization system. By making use of the software corresponding to the motion capturing system, interactive visualization leveraging Virtual Reality (VR) becomes possible.

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