SPARC64™ VIIIfx

Superscalar Multi-core processor

|	Specification
Performance (peak)	128 GFLOPS (16 GFLOPS x 8 cores)
Core	8
Clock	2.0 GHz
Floating-point Execution units (Core spec)	FMA x 4 (2 SIMD) DIVIDE x 2 COMPARE x 2
	Floating-point register (64bit) : 256 General purpose register (64bit) : 188
Cache	L1I$: 32 KB (2way) L1D$: 32 KB (2way) L2$: Shared 6 MB (12way)
Memory throughput	64 GB/s (0.5B/F)

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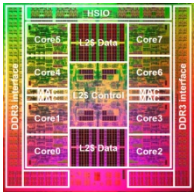
SPARC64™ VIIIfx

Node
CPU × 1
ICC × 1
memory
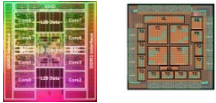
128 GFLOPS
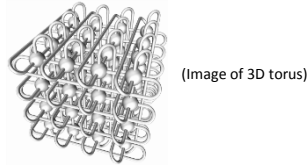16 GiB

System Board (SB)
Node × 4

512 GFLOPS
64 GiB

Tofu (Torus Fusion) interconnect

- High communication performance and fault-tolerant network
- Network topology : 6D mesh / torus network
- 10 links (5 GiB/s x 2 bandwidth) on each node
- Axis : X, Y, Z, a, b, c
  - X,Z,b : torus (Z=0: IO node), Y, a, c : Mesh
- Network size : (X, Y, Z, a, b, c) = (24, 18, 17, 2, 3, 2)
- 1, 2 or 3D torus network configurable from user's programming point of view

(Image of 3D torus)

Compute Rack
SB × 24
IOSB × 6

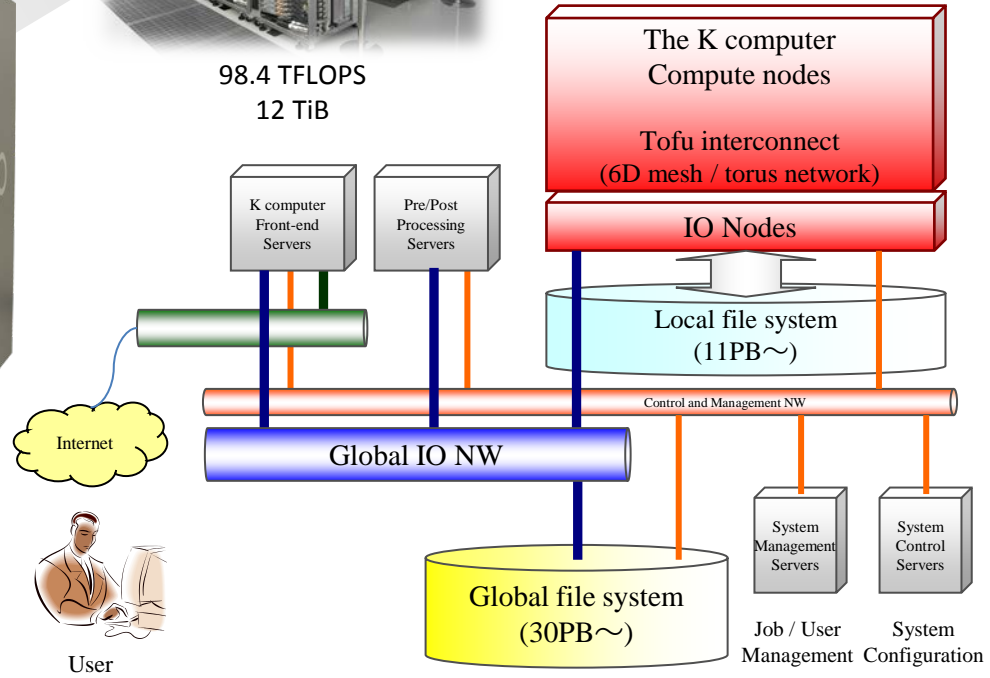12.3 TFLOPS
1.5 TiB

Racks
Compute Rack × 8
Disk Rack × 2

98.4 TFLOPS
12 TiB

Full System
Compute Rack × 864

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- Peak Performance : 10.62 PFLOPS
- Total Memory Capacity : 1.26 PiB (16 GiB/ node)
- Logical-3D torus network
- Peak bandwidth : 5 GiB/s x 2
- Bisection bandwidth : 30 TiB/s

The K computer
Compute nodes

Tofu interconnect
(6D mesh / torus network)

IO Nodes

K computer Front-end Servers

Pre/Post Processing Servers

Internet

User

Local file system
(11PB〜)

Control and Management NW

Global IO NW

Global file system
(30PB〜)

System Management Servers

System Control Servers

Job / User Management

System Configuration

System Configuration

System Environment

- Linux-based OS on each compute and IO node
- two-level distributed file system (based on Lustre) with a staging function
  - Local file system for temporary files used in a job
  - Global file sysmte for users' permanent files
  - The staging function copies/moves files between them before/after the job execution.

Programming Environment

- Fortran 2003, C99 and C++2003 with the GNU extensions
- OpenMP 3.0 and automatic thread-level parallelization
- MPI-2.1 (based on OpenMPI)
  - low-latency and high-throughput
  - collective communications optimized for Tofu
- numerical libraries (BLAS, LAPACK, Fujitsu's SSL II, etc.)
- debugger and performance profiler

Job Execution Environment

Front-end Server

Login, Job handling, Programming, Debugging, File handling, etc.

Remote Login

- Web browser
- Terminal
- IDE

- Web Portal
- CUI

Programming Environment
- compiler
- debugger
- profiler
- etc.

Job Manager

Job handling, Debugging, etc.

Compute Nodes

Parallel job

Parallel job

Debugger
Parallel job

Access

Input data

Global File System

Input data

Stage-in

File Staging

Stage-out

Output data

IO

Output data

Local File System