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shaping tomorrow with you

Towards Exascale Computing

Fujitsu offers full range of HPC platform solutions

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Petascale supercomputer

Fujitsu developed SPARC chips and Tofu interconnect for high performance, high reliability, and high operability

K computer
Developed with RIKEN

PRIMEHPC
FX10

x86 Clusters

PRIMERGY supports latest x86 CPU & MIC and GPGPU etc. and adopts Fujitsu's latest packaging technologies for high performance and high operability

PRIMERGY
CX400

BX900/BX400
RX200/RX900

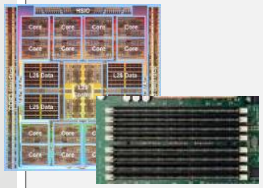
Fujitsu HPC R&D focus

PRIMEHPC FX10

x86 clusters

Scalable parallel file system (FEFS)

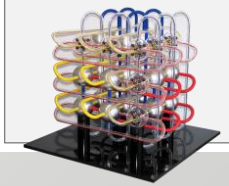
Compute node



- SPARC64 IXfx 16 core (236 GF)
- Memory 32/64GB

- General purpose CPU
- SIMD & software controlled cache (HPC-ACE)
- Single socket compute node
- High-memory BW (85 GB/s)

Interconnect



- Tofu 6D mesh/torus 5 GB/s x bi-dir x 10

Low-latency and high BW interconnect with collective communication support (Tofu)

- High performance & practical use for real applications
- High reliability & scalable performance w/ lower power consumption
- Software stack on Linux OS for both SPARC & x86 platforms

Architecture continuity and improvement

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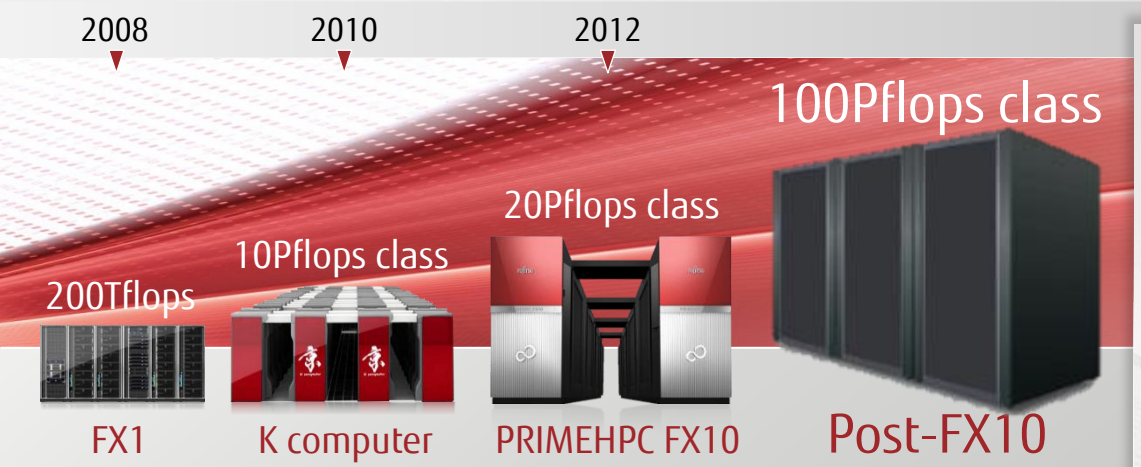

- Uncompromised bandwidth and calculation performance promise superb application performance
- Ultimate energy efficiency
- Super reliable

CPU technology development

40GF, 4-core VISIMPACT	128GF, 8-core VISIMPACT & HPC-ACE	236.5GF, 16-core VISIMPACT & HPC-ACE	VISIMPACT & HPC-ACE

Interconnect technology development

IB DDR Fat tree & Collective ops	6D mesh/torus Tofu interconnect with Tofu barrier for collective operations	Tofu interconnect with Tofu barrier

VISIMPACT: Virtual Single Processor by Integrated Multi-core Parallel Architecture, HPC-ACE: High Performance Computing - Arithmetic Computational Extensions

Approach toward Exascale computing

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2011	2012	2013	2014	2015	2016	2017	2018	2019

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PRIMEHPC FX10

- 1.85 x CPU performance
- Easier installation

Post-FX10 system

- Improved CPU & network performances
- High-density packaging & low power consumption

National projects

Development

Operation of K computer

HPCI strategic applications program

App. review

FS projects

Exa-system development project
(Proposing)

- Fujitsu is developing a Post-FX10 system
  - 100 PFLOPS capable
  - New technologies toward Exascale
- Two-year FS projects sponsored by Japanese government (MEXT)
  - Plan and propose a future direction of future system development

Feasibility study toward Exascale

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This study is a part of the "Feasibility Study on Future HPC R&D" program led by MEXT, Japan.

Post-petascale Machine

- Evolution of the K computer architecture
- Co-design with various target applications
- Novel system software stack covers x86 clusters and post-petascale machines

Revolutions by co-design

Target Applications selected in FY2012

ALPS

Algorithms and Libraries for Physics Simulations

RSDFT

Real-Space Density-Functional Theory

COCO

CCSR Ocean Component Model

NICAM

Nonhydrostatic Icosahedral Atmospheric Model


10^{16}
100
How can we reach the Exascale?