

ISC 2016

Frankfurt

June 19th, 2016



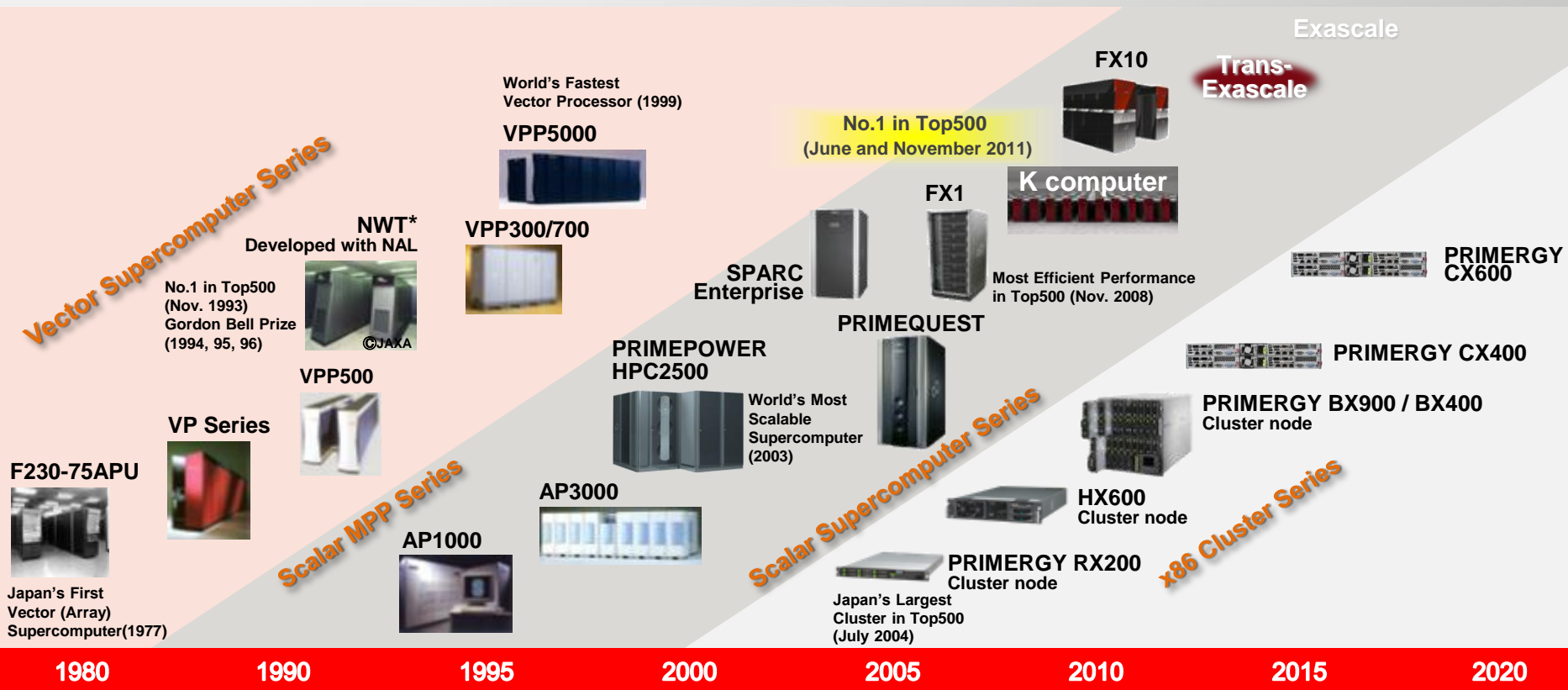
shaping tomorrow with you

New Fujitsu PRIMERGY CX600 M1

Your platform for highly parallel computing

Alexander Bob
Portfolio Manager HPC EMEA

Fujitsu's has a leading role in HPC for >30 years



*NWT: Numerical Wind Tunnel

World-wide Fujitsu's HPC competency network



FUJITSU Japan

- Global lead in High Performance Computing
- Strategy, Development, Services and Support

FUJITSU Technology Solutions

- PRIMERGY based HPC Ecosystem
- Services and Support

FUJITSU Systems Europe, ict GmbH - a FUJITSU company

- HPC certified expert partner program
- HPC application champions
- Benchmarking

FUJITSU Laboratories

- Research & Development

e.g. Open PetaScale Libraries Network



Fujitsu PRIMERGY Portfolio



TX Family



Expandable and rack-mountable tower servers ideal for branch offices, remote offices and small businesses

RX Family



Versatile and scalable rack-optimized servers with leading efficiency and performance

HPC

BX Family



Platform for converged infrastructures engineered to maximize every hour, watt, and dollar

CX Family



Density optimized cloud server infrastructures for HPC, cloud and hyper-converged computing

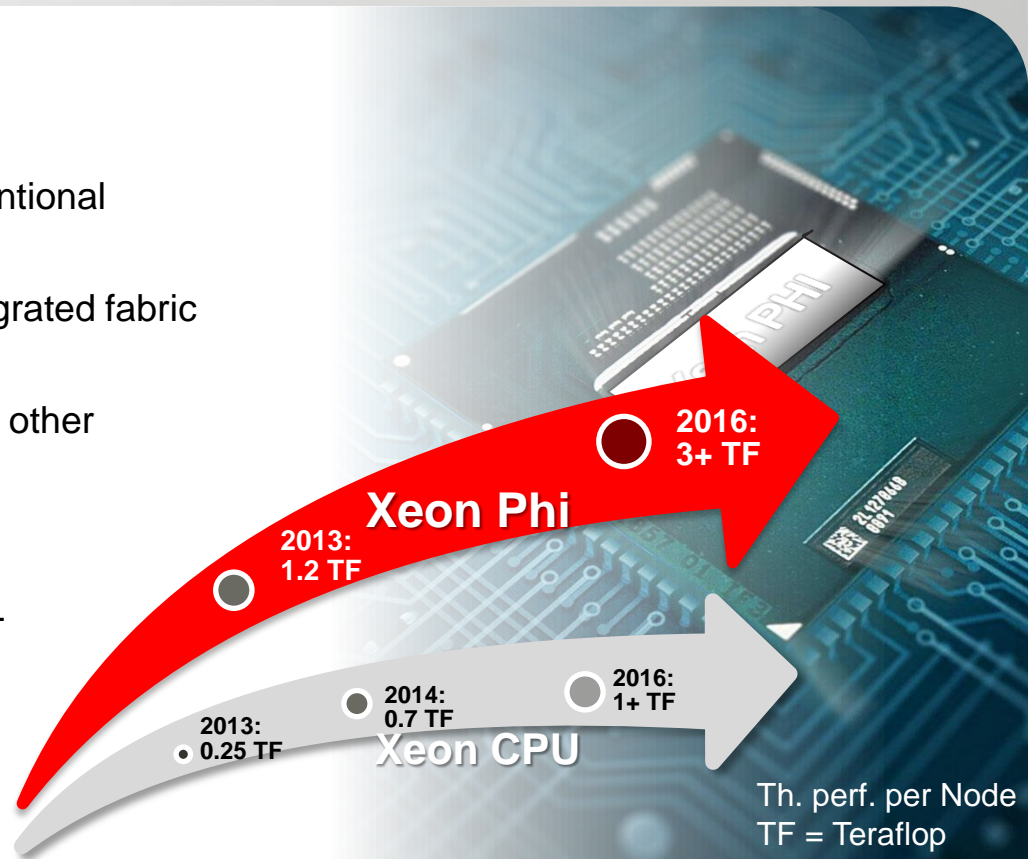
Intel® Xeon Phi™ “Knights Landing” Ecosystem

■ Second Intel Xeon Phi generation

- Single socket compute node
- Significant performance boost versus conventional Xeon CPU
- Integrated high bandwidth memory and integrated fabric increases price/performance and density
- Eliminates cost overhead by Xeon CPU and other components

■ Fujitsu's offering:

- PRIMERGY CX600 based on Xeon Phi KNL
- Rollout including
 - Parallel application enablement and optimization program by Intel, Fujitsu and Partners
 - Enhanced HPC Software Stack



Intel Xeon Phi – application scalability

Business Processing	Analytics	Scientific	Cloud Services	Visualization & Audio	Comms	Storage
OLTP	Data Analysis & Mining	Simulation/CAE & CFD	Front End Web	Media Delivery and Transcode	Wired Networking	Analytics
File & Print	Big Data Analytics	CAD	Data Caching	Remote Visualization	Packet Processing	Business Processing
Email	Machine/Deep Learning - Training	Life Sciences – Genomics/ Sequencing	Search	Remote Gaming	Virtual Switching	Cloud Storage Object Storage Active-Archive
ERP	Machine/Deep Learning - Evaluation	Life Science - Molecular Dynamics		VDI (Clients)	Network Security	Archive/ Regulatory Compliance
CRM		Financial - Trading		Image & Video Analytics	Wireless Access	Backup/ Recovery
Application Servers		Financial - Risk		Speech & Audio	Wireless Core	Disaster Recovery
		Energy – Seismic/Reservoir		Scientific Visualization		
		Weather		Professional Rendering		
		Defense/Security				

Very Applicable
Applicable
Less Common

* Source: Intel

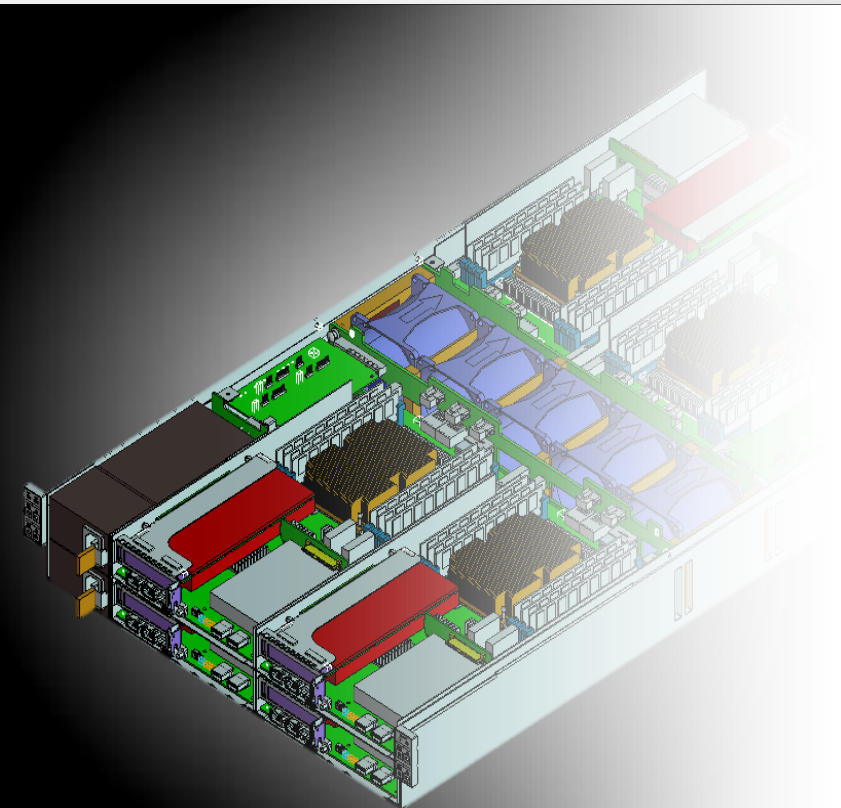
Best scalability and price performance in different verticals, e.g.

- Life Science
- Financial Simulations
- Big Data / analytics
- Rendering
- ...

■ Fujitsu has started performance evaluations for above verticals

- To evaluate real / measured price / performance improvements
- To evaluate application optimization needs and capabilities
- To prepare reference architecture design for projects

PRIMERGY based on Xeon PHI – where to use



■ Positioning

	HPC Market	SMALL	MID	HIGH
Usage				
General purpose HPC solution		Xeon CPU		
Hybrid parallel / throughput oriented solution			Xeon PHI	

■ Target market

- ✓ University / Academic for scientific research
- ✓ Market expansion
 - ✓ Business intelligence / Analytics (BA)
 - ✓ Graphic analysis (rendering)
- ✓ HPC expertise leverage
 - ✓ Product development / optimization (ISVs like LS-DYNA, ANSYS-FLUENT, Nastran, etc)

Fujitsu view for Xeon PHI positioning



Academic and Research market

- Fujitsu with capabilities for application porting and tuning

Large Scale Systems focus in the industry

- With significant effort on specific applications, ie. legacy well vectorized applications with real potential on MIC technology, large computers focusing on specific scientific domain will emerge, e.g. Petroleum, Oil and Gas industry, car manufacturing

SMEs / ISVs

- SMEs are using a known set of ISVs applications, some already running on Intel Xeon PHI (RADIO, ANSYS, etc..) and are optimized for KNL.
- More ISVs are joining the trend
- Focus on “ready to use” HPC solution and appliances

Our value – your benefit



Compared to today's Xeon technology, KNL will provide significant improvements in the following areas

High density platform



Reduces DataCenter OPEX



Better price / Performance ratio



Reduce TCO, improved ROI



Higher Performance per density / watt*



Reduces simulation time, higher productivity



Leveraging Liquid Technology



Improved reliability, higher energy efficiency reduces DC OPEX and carbon foot print



Fully integrated in SW stack



Stable, validated, ready for production



*) For applications which are highly vectorised

Technical specification

- The **NEW**
PRIMERGY CX600 M1
PRIMERGY CX1640 M1



FUJITSU Server PRIMERGY Scale-out Systems



Platform for HPC, cloud and hyper-converged stacks

- More computing power in less space
- Lower costs for energy due to shared power & cooling
- Optional liquid cooling for lower cooling costs and higher density



CX400

Compact server nodes with high power efficiency to realize large scale-out solutions for HPC, hosting, and hyper-converged computing at lower overall costs

Chassis



CX2550

Dual socket server node in a highly condensed half-wide, 1U form factor

Server Nodes



CX2570

Dual socket server node for ambitious HPC, analytics and visualization solutions



CX600

HPC optimized scale-out server platform based on Intel Xeon Phi x200 ("Knights Landing") technology

Chassis



CX1640

Single socket Xeon Phi server node for significant performance boost in parallel-processing

Server Node

CX400 or CX600: When to choose what?

PRIMERGY CX400

Parallel, Fast Serial Multicore + Vector applications

Diverse workloads

Excellent single and Multi-Thread Performance requirements

CX400



PRIMERGY CX600

Highly parallel and highly vectorized application profile

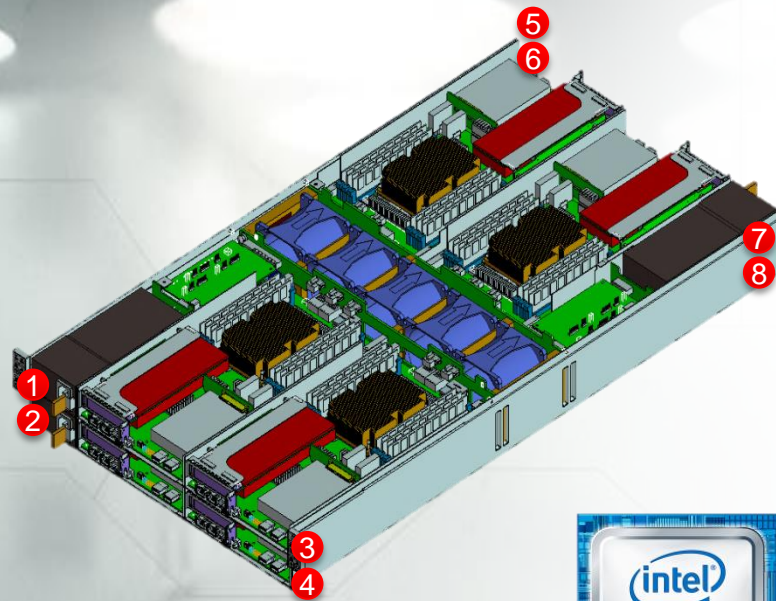
Applications requiring improved performance that achieves maximum FLOPs

Applications requesting highest sustaining memory bandwidth

CX600



New HPC Platform: PRIMERGY CX600



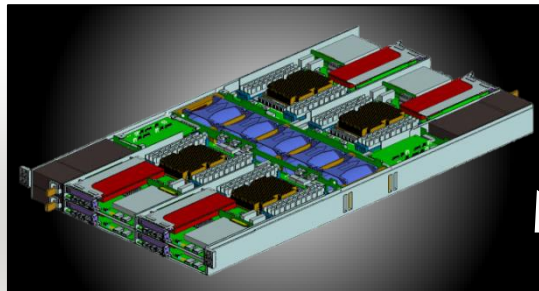
PRIMERGY CX600 M1

- Leveraging Intel Xeon Phi x200 “Knights Landing” multicore platform
- Up to 8x compute nodes in 2U (4x front / 4x rear)
- Fujitsu parallel application enabling program to support application adoption, porting and tuning
- Significant performance boost for parallel-processing
- Cool-Central Liquid Cooling support

Target markets

- University / academic for scientific research
- Business intelligence / Analytics (BA)
- Graphic analysis (rendering)
- Product development / optimization

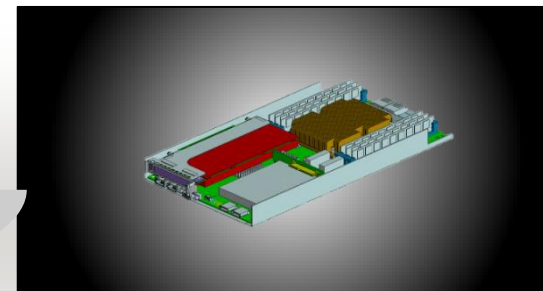
New PRIMERGY CX600 – specifications



- ✓ High-density server with air or liquid-cooling for HPC market
- ✓ Up to 12K cores & 64TB memory in a rack *
- ✓ Up to 0.5 PF in a rack *

*: depends on DC environment

8x per 2U



PRIMERGY CX600 M1

PRIMERGY CX1640 M1

Type	Chassis for KNL Node	KNL Node
Chassis PSU / cooling	2 U / up to 8 nodes (4x front / 4x rear) 4x 1.200W PSU red, 5x fans, non hot-plug / red	1U, half-width air or liquid cooling support
Processor / performance		1x Intel® Xeon® Phi™ x200 Product Family, up to 72 Cores, +3TF/Node
Memory		16GB high-bandwidth on-package MCDRAM memory ~465GB/sec Additionally 6x memory slots, up to 384GB DDR4 2400 MHz
Storage		At air cooling: 1x SATADOM or 1x 2.5" non hotplug SATA HDD or 2x SSD At liquid cooling: 1x SATADOM only
Networking / Interconnect	Node individual LAN	2x GbE Onboard (1x shared service from iRMC), Integrated Intel Omnipath or Mellanox EDR (PCIe) interconnect
I/O expansion slots	Node individual expansion	1x PCIe Gen3 x16 for interconnect

Fujitsu PRIMERGY CX600 M1 at a glance



Your platform for highly parallel computing

**Maximum
density with
8 nodes in 2U**

6x the performance
per U in comparison
with standard rack
servers for
extremely high
density

**Specialized for
parallel
workloads**

Significant
performance boost
for parallel-
processing versus
Intel Xeon platforms

**Compliant to
conventional
datacenter
environment**

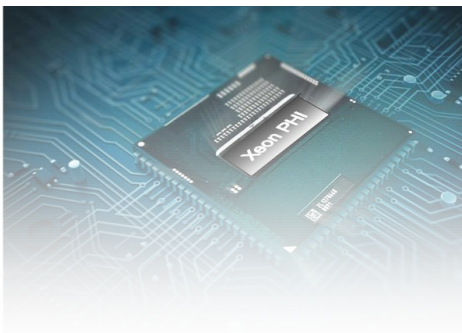
Easy rack-wide team
play with already
existing datacenter
infrastructure –
including Cool-
Central Liquid
Cooling

**Optimized
software stack**

Supports the same
software stack as
conventional Intel
Xeon platforms



PRIMERGY CX600 / CX1640



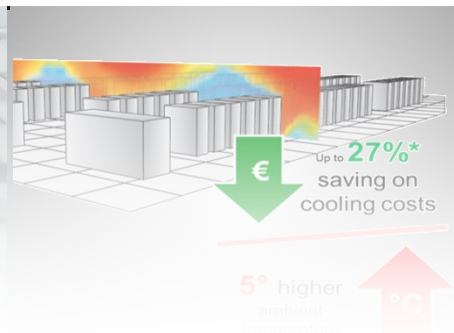
Performance ¹⁾

- 2.3x DP Peak Performance (TF/s)
- 3.9x Memory Bandwidth (GB/s)



Density / Scalability / Reliability

- 2x Density / Rack Height Unit, up to 168 Nodes / Rack ²⁾
- Support of Intel OmniPath and Mellanox IB EDR Technology
- Power Supply and Fan redundancy



Cooling

- Air Cooling with up to 40°C ambient
- or
- Hot water (45°C) Liquid cooling ensures reduced TCO by higher density and OPEX reduction

1) vs. CX2550, based on E5-2697 v4

2) Physical density per 42U Rack / air cooling

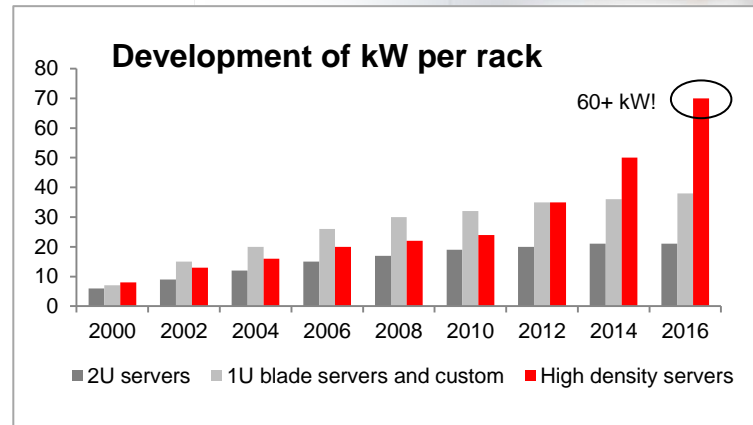
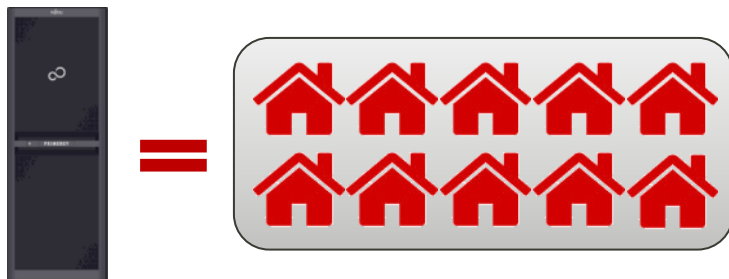
Data Center = Thermal Power Station

■ Future-proofing the PRIMERGY portfolio

- Today: 35+ kW per rack
- Future: >60 kW by 2016
- kW per rack will further rise and traditional air cooling will not be sufficient

■ Putting things into perspective

- One 30 kW rack could supply ten houses with heating and warm water



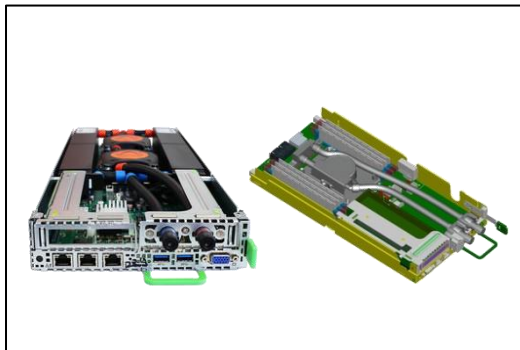
High density servers will reach up to 70 kW per rack by 2016

Fujitsu's hot water (in 45°C – out 60°C) Liquid Cooling Offering



Consulting

- Professional services to evaluate the customers cooling infrastructure
- Sizing of (liquid) cooling installation
- TCO calculations



Servers & Infrastructure

- Tested and designed for PRIMERGY CX400 / CX600
- Rack Coolant Distribution Unit (CDU)
- Integration in ServerView Management



Out of one hand

- Pre-installed ex factory
- Full warranty and support

Cool-Central® Liquid Cooling Technology



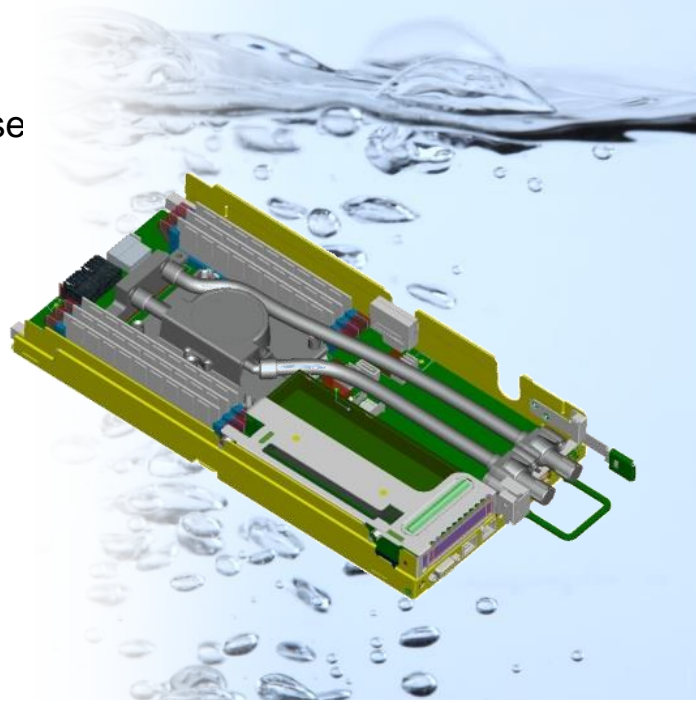
Efficient cooling

- The liquid cooling is a direct-to-chip hot water (45 °C / 113 °F), based cooling solution that captures up to **75 %** of the **PRIMERGY CX600 server** heat
- Removes heat from Xeon Phi CPU and voltage-regulator-module (VRM) within the server, eliminating the need for chilling to cool these components



Cool-Central® Liquid Cooling Technology is a reliable and effective solution to relieve the burden on data center cooling

- Helps to reduce data center cooling costs by over 50 %
 - Less air needs to be cooled and moved
 - Liquid cooled systems need less airflow
- Allows for 2.5-5x higher data center server density
- Low pressure in rack circuit eliminates leakage risks
- Returning water is warm enough to enable waste heat recycling



Why hot-water On-Chip Liquid Cooling?



Maximum rack density

Less cooling power and costs

Lower investment needed for building new data centers

Lower overall energy consumption

Extreme dense HPC and cluster installations with more than 50 kW per rack are only possible with liquid cooling

Liquid cooling allows for up to **50% less cooling power and costs** through high efficient coolers with low operating costs

A hot water based liquid cooling infrastructure requires a **way lower investment** than traditional air cooled infrastructure

Hot water based liquid cooling enables the easy **usage of waste heat** for heating homes, green houses, or swimming pools



JCAHPC “Many-Core” Fujitsu Supercomputer Project (2016)



PRIMERGY Server-based x86 Cluster System



Outline

Will be the Japan's **highest-performance supercomputer** at 25 PFLOPS.

System will contain over **8,200 Intel® Xeon Phi™ processors** and begin operations starting December, 2016.

About JCAHPC

In 2013, the University of Tokyo's Information Technology Center (ITC) and the University of Tsukuba's Center for Computational Sciences (CCS) founded the Joint Center for Advanced High Performance Computing (JCAHPC) where both universities would collaborate to build and operate a single supercomputer system.

JCAHPC “Many-Core” Fujitsu Supercomputer Breakdown

This supercomputer will contribute to science, technology and academia through the promotion of cutting-edge computational science



#1 Supercomputer in Japan: Performance of **25 PFLOPS**

Compute Nodes

FUJITSU PRIMERGY x86 servers
Intel® Xeon Phi™ processors
(code name: Knights Landing)

8,208 nodes
Peak Performance: 25 PFLOPS



Compute Node Network (Intel® Omni-Path)

Parallel File System

High-speed File Cache System

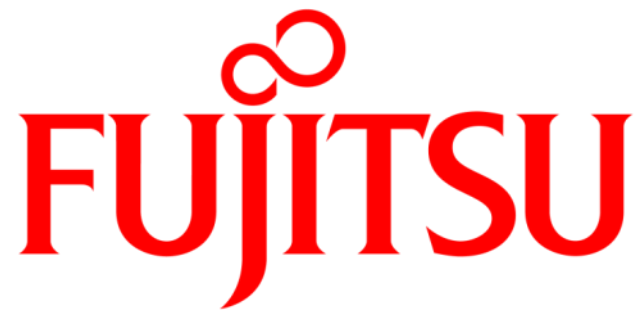
Life/Management Network (Ethernet)

Project | Oakforest-PACS Supercomputer

Client | JCAHPC

Technology & Solution

- x86 Fujitsu PRIMERGY cluster system, combination of 8,208 of the latest PRIMERGY models as computation nodes, additional 51 PRIMERGY units, including 20 PRIMERGY RX2530 M2 models as login nodes
- Eight nodes per 2U rackmount chassis
- Advanced "hot water" cooling technology is used to supply cooling water to all system's components
- Intel® "Omni-Path" interconnect for high performance parallelization
- Fujitsu will also supply an HPC middleware, the FUJITSU Software Technical Computing Suite, to ensure the efficient job scheduling and overall system management.



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