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Increasing Productivity with
PRIMERGY x86 HPC from Fujitsu

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From Innovation to HPC Solutions for our Customers

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Fujitsu & preDiCT: *In Silico* Drug Testing

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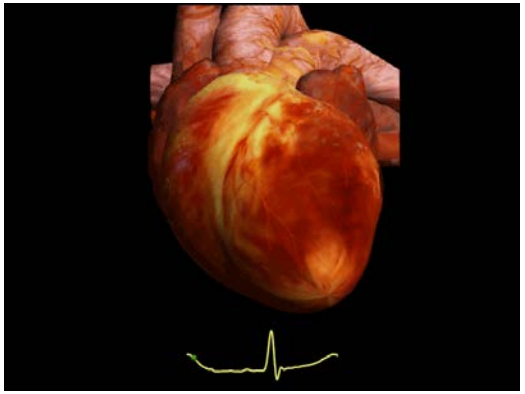
Real time simulation of cardiac electrical activation on a realistic whole human heart mesh

- Half of the drugs that enter clinical testing fail at that stage
  - Often from side-effects in the heart
  - The European project preDiCT was set up to eliminate such unsuitable drugs early in the R&D pipeline to eliminate wasted time and expenditure



NOVARTIS

Roche

UNIVERSITY OF OXFORD

UNIVERSITAS SCIENTIARUM SZEGEDIENSIS · SZEGEDI TUDOMÁNYEGYETEM ·

CR S4

UNIVERSIDAD POLITÉCNICA DE VALENCIA

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gsk GlaxoSmithKline

AUREUS PHARMA

Innovation reduces time to solution

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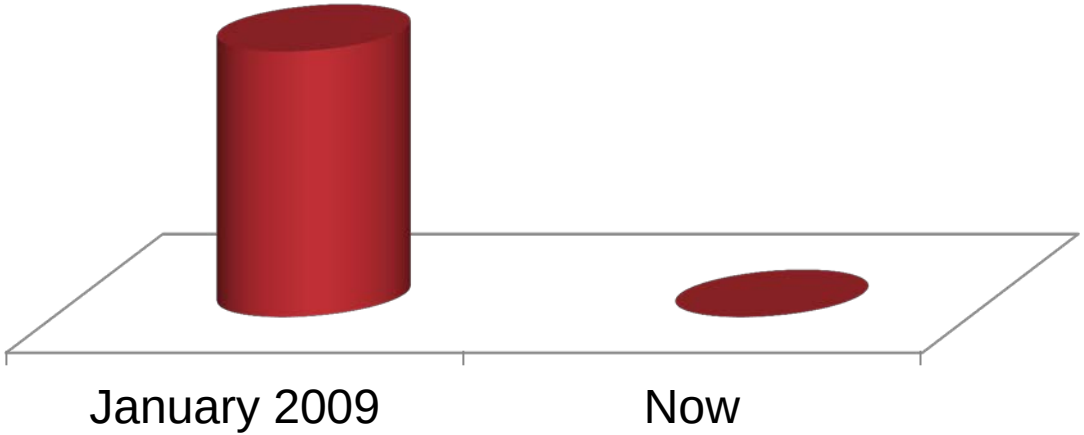

- Application is now 80000x faster
  - One month to calculate 1 s of activity has become just a few seconds

- Simulator now a valuable tool for the pharmaceutical industry
  - Eventually replace *in vivo* testing with *in silico* testing

Open Innovation: Disaster Mitigation

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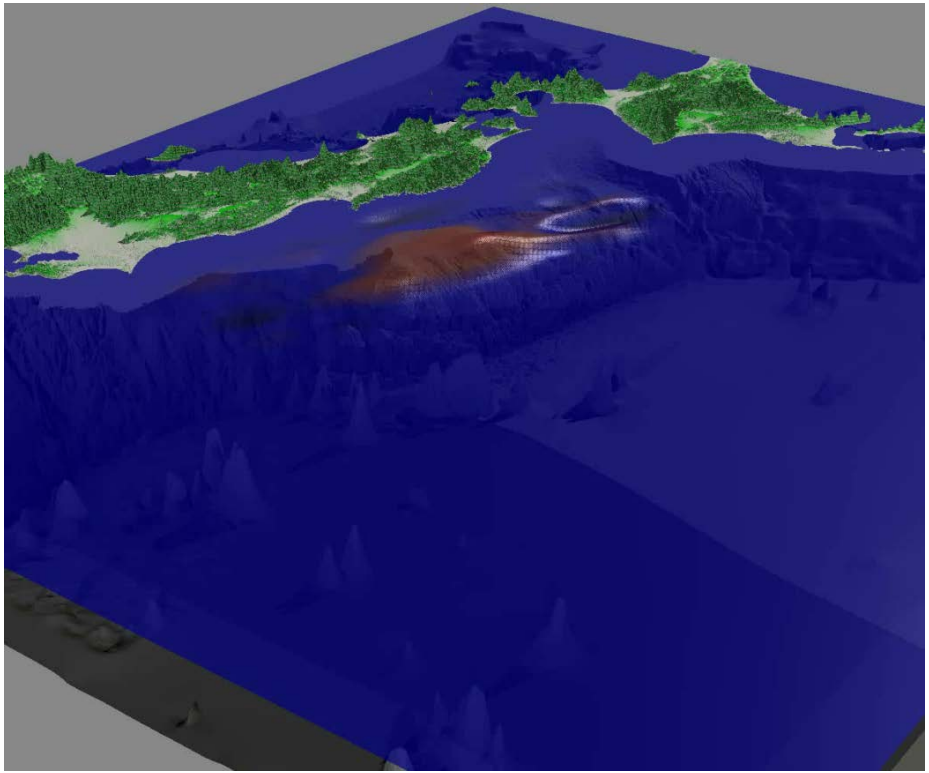
Earthquake/Seabed Data
Tohoku, Tokyo Universities

Ocean Models
Imperial College London, ANU

Open Numerical Libraries
www.openpetascale.org

Multicore Parallel Computer



Fujitsu‘s Approach for the HPC Market

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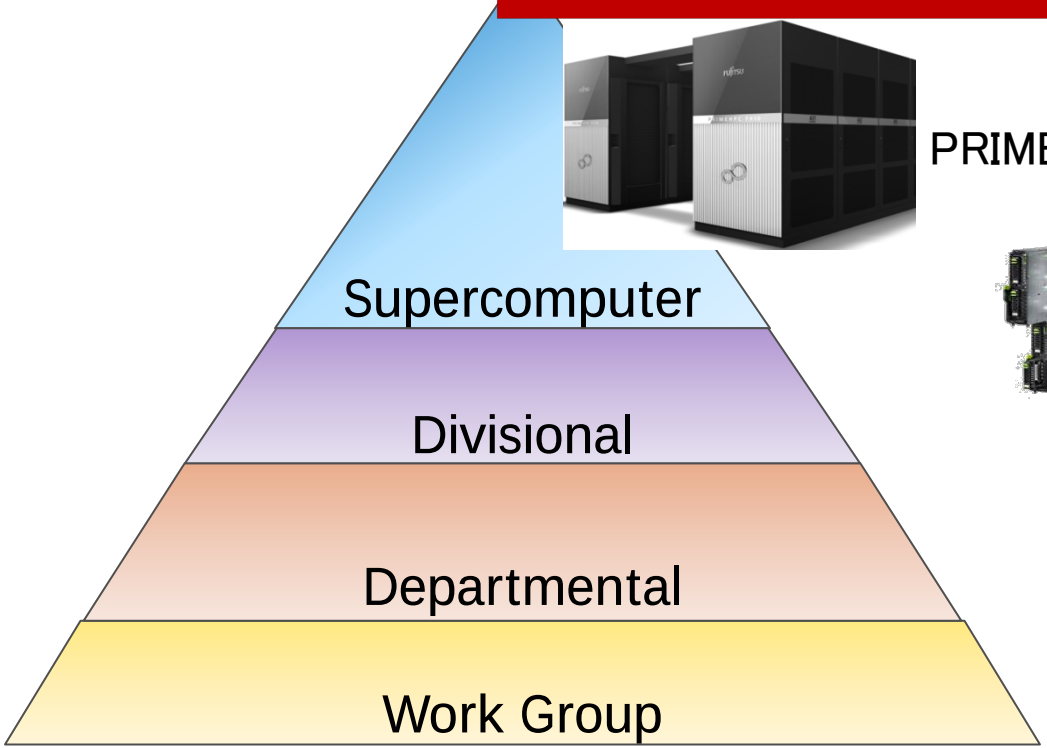
Delivering high performance from technical workstations to supercomputers



PRIMEHPC FX10

x86 HPC Cluster

Modular growth potential towards …

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Workgroup / departmental

BX400

RX200

CX400

Data Center

…capacity

Scalability
Density
Energy Costs
Co-processor support

Data Center

BX900

Scalability
Density
Availability

…capability

Flexibility to address all kinds of customer requirements

- Latest generation Intel® Xeon® Processor E5-2600 series supporting high frequency CPUs and co-processor support
- Highest memory performance plus high reliability features
- Industry leading Blade Server density
- Industry leading IO Bandwidth
- Low latency/high bandwidth Infiniband infrastructure

PRIMERGY CX400 - HPC Design

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CX400 combines high performance computing with high density at lower overall investment

High Density / Scalability in 2U Chassis

- HPC requirements optimally fulfilled
  - Up to 4 nodes CX250 S1 (1U) or 2 nodes CX270 S1 (2U) per 2U chassis
  - 2x Intel® Xeon® **E5-2600** processors / node
  - Intel® Xeon® processor E5-2400 node coming soon
  - 16 DIMMs, up to **1600MHz**
  - Redundant, hot-plug PSUs for enhanced availability / lower servicing effort
  - Up to 24x HDD
  - **FDR Infiniband** interconnect option for highest, most efficient bandwidth and lowest latency
  - **GPGPU** Option (2U node)
  - Support of Intel Phi planned

Main usage scenario

Cloud

HPC

Intel's Many Core and Multi-core Engines

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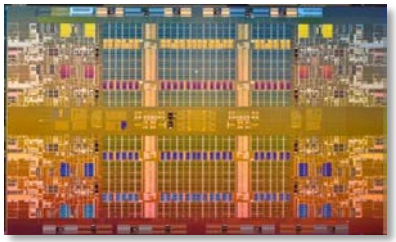
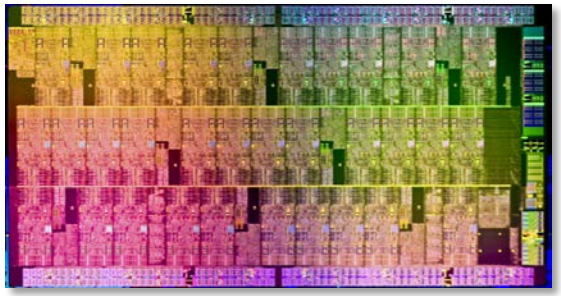


Multi-core Intel® Xeon® processor at 2.0-3.5 GHz

Intel® Xeon® processor:

- Intel's Foundation of HPC Performance
- Suited for full scope of workloads
- Industry leading performance/watt for serial & highly parallel workloads.



Many Core Intel® Xeon® Phi™ coprocessor at 1-1.5 GHz

Intel® Xeon Phi™ coprocessor:

- Optimized for highly parallelized compute intensive workloads
- Common programming model & S/W tools with Xeon processors, enabling efficient app readiness and performance tuning
- Launching on 22nm with >50 cores and required b/w to provide outstanding performance for highly parallel HPC uses

XEON PHI Cornerstones

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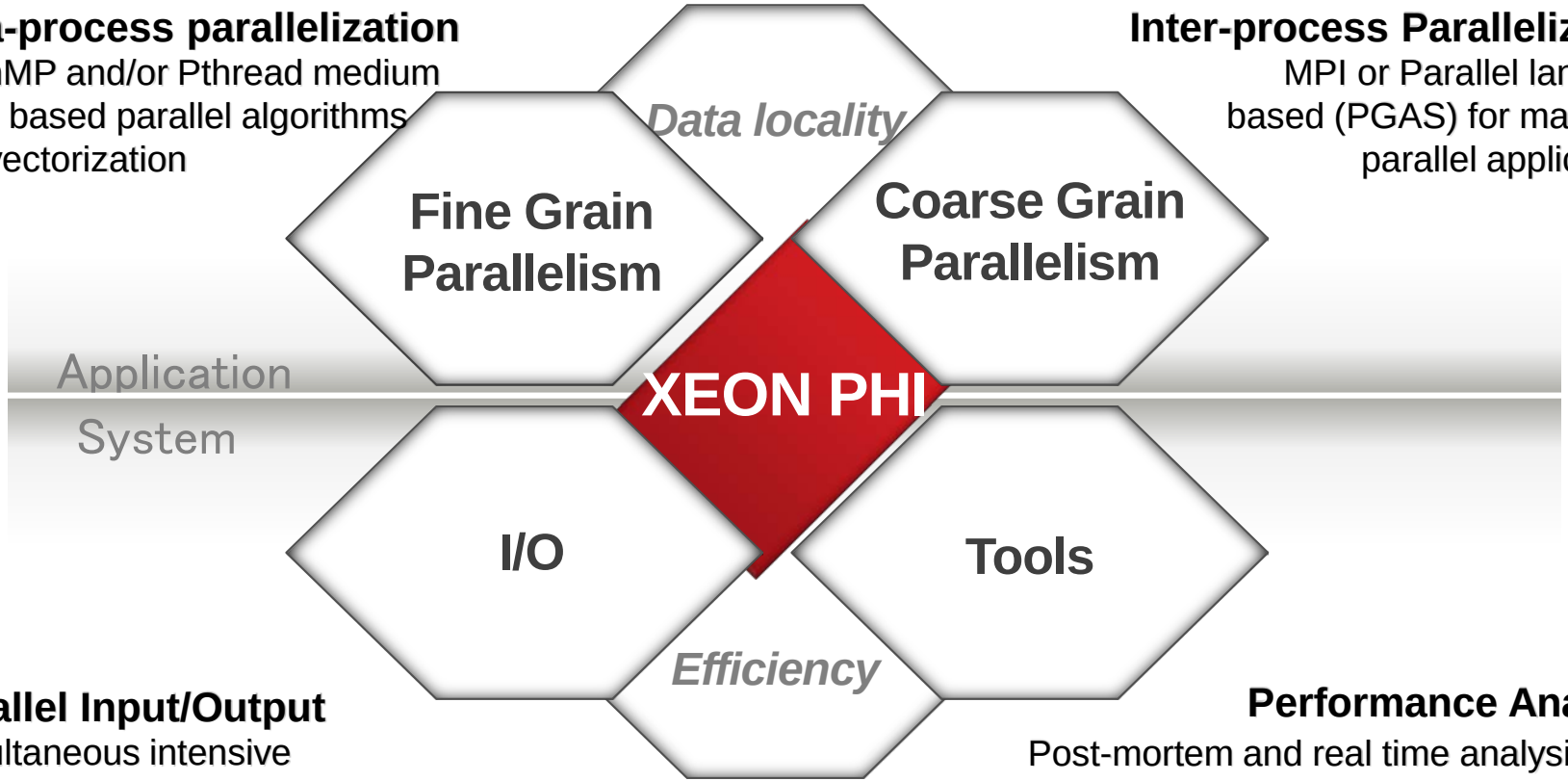
Intra-process parallelization
OpenMP and/or Pthread medium scale based parallel algorithms and vectorization

Inter-process Parallelization
MPI or Parallel language based (PGAS) for massively parallel applications



Parallel Input/Output
Simultaneous intensive data access to/from multiple running processes

Performance Analysis
Post-mortem and real time analysis tools to understand application behaviour

The Ecosystem for HPC turn-key solutions

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PRIMERGY Hardware

Cluster Operation

PCM
FUJITSU
Edition

redhat

Windows HPC Server 2008

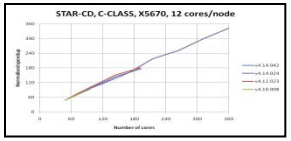
ISV and Research Partnerships

ANSYS
SIMULIA
MSC Software
ESI GROUP
CD-adapco
LSTC
Altair
Exa
MAGMA

PreDiCT Initiative

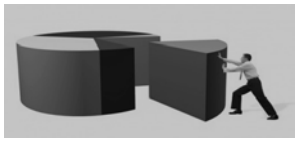
Open Petascale Libraries Network

Consulting and Integration Services



Sizing, design

Proof of concept



Integration into customer environment

intel Cluster Ready

Certified system and production environment

Complete assembly, pre-installation and quality assurance

"Ready to Operate" delivery

Ready to Go

Reduce Complexity - Increase Productivity

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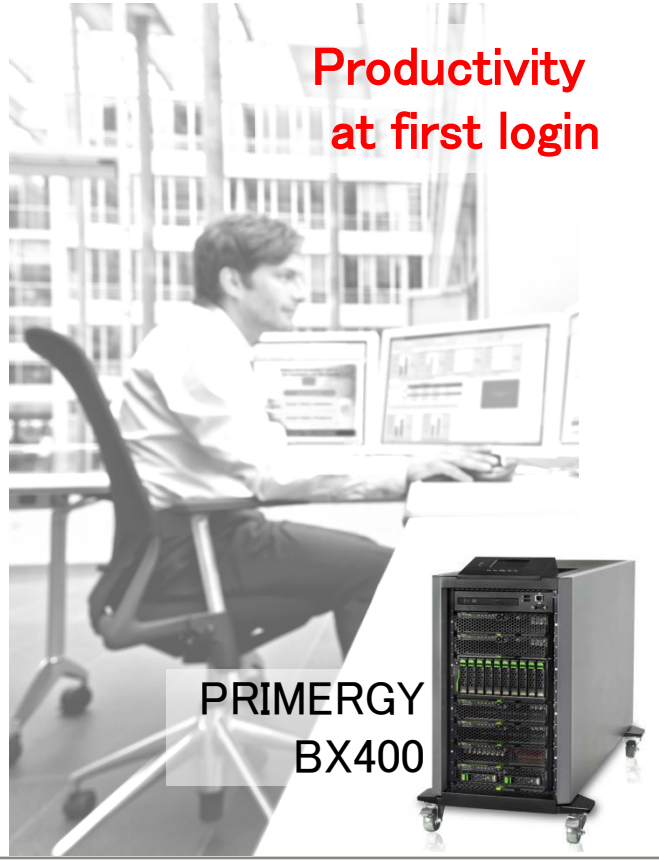
Preconfigured (Ready2Go)

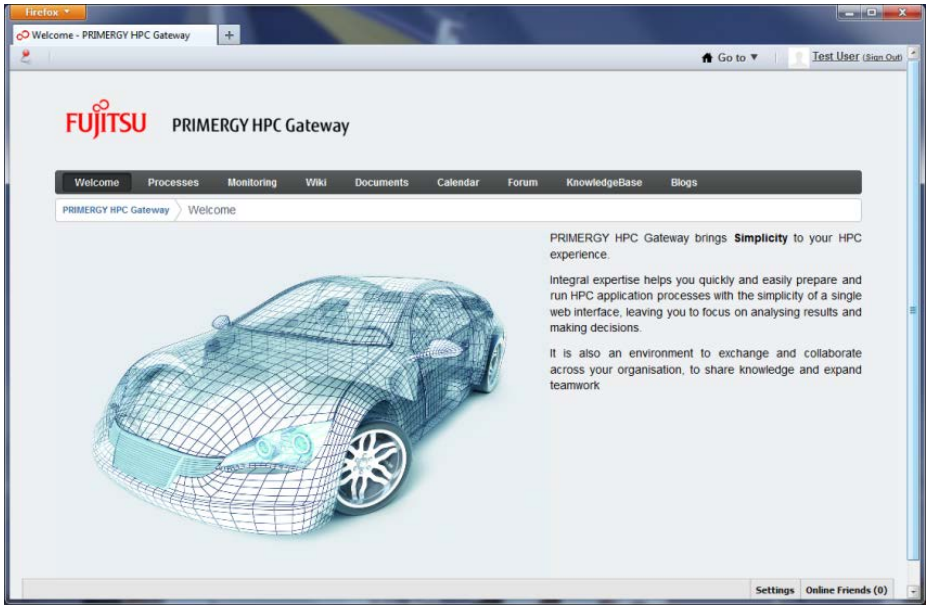
- 4, 8, 16, 32 node configurations
- Intel Cluster Ready certified
- Application affine
- Completely assembled and tested in the factory

Customized

- Individually sized and configured
- Small to large to ultra large configuration
- Intel Cluster Ready certified components
- Benchmarking, Sizing and Integration Services



Introducing PRIMERGY HPC Gateway



Constant visibility on experiments and projects

Traceability for assured and secure operations

Scalable and Agile resources usable from single view

Access Global processes and data

Foundation of PRIMERGY HPC Solutions

PRIMERGY HPC Gateway

- Integral application expertise
- Application on-boarding
- Collaboration and teamwork

Ready-to-go HPC System

- Optimal configuration
- Certified operation
- HPC software stack

HPC Clusters with delivering user-centric business outcomes

- Tailored to vertical domain
- HPC jump-start
- Application process aware
- Dynamic infrastructure readiness

Summary: why Fujitsu ?

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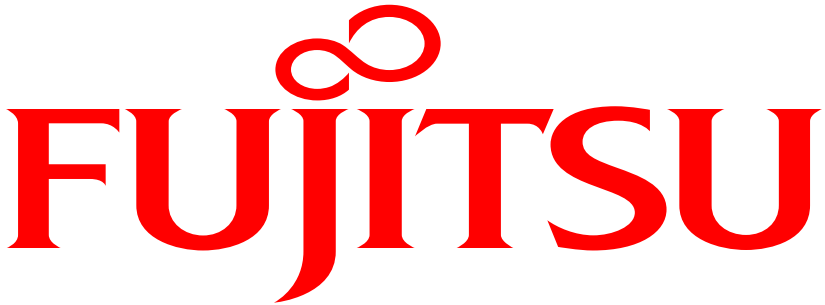
- Fujitsu has strong **competence** in HPC (Global HPC Center, research projects, solutions, applications, algorithms, hardware, software, HPC solutions, benchmarking)
- Long-term experience in **collaborating** in international projects with partners and customers, e.g. HPC Wales, A*STAR, Riken, Australian National Computational Infrastructure (NCI), many universities…
- 30 years building the fastest HPC systems. **Value proposition** based on high performance, ‘green innovation’, silent reliability, user-friendly ‘ HPC Simplicity, and ISV certification
- Fujitsu offers the **widest spectrum** of solutions, from powerful Celsius workstations to competitive x86 server line to the fastest supercomputers in the world



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