Fujitsu’s Business

High Performance Computing (HPC)

The Fujitsu HPC Platform

Fujitsu offers both products and in-house support for all the necessary components of HPC systems, including interconnects, OS, middleware, and compilers. By leveraging the advanced support know-how we have cultivated through our more than 30 years of experience, we are able to harness the full benefits of HPC systems for our customers.

<table>
<thead>
<tr>
<th>Category</th>
<th>HPC Clusters*1</th>
<th>Supercomputer</th>
</tr>
</thead>
<tbody>
<tr>
<td>Product</td>
<td>FUJITSU Server PRIMERGY RX200 PRIMERGY RX300</td>
<td>FUJITSU Supercomputer PRIMEHPC FX10</td>
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<tr>
<td></td>
<td>FUJITSU Server PRIMERGY RX350 PRIMERGY TX300</td>
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<tr>
<td></td>
<td>FUJITSU Server PRIMERGY BX900</td>
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<td></td>
<td>FUJITSU Server PRIMERGY CX400</td>
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<td></td>
<td>FUJITSU HX2560</td>
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</tbody>
</table>

- **Features**
  - Low-profile rack-mount servers (1U/2U) with up to two of the latest Xeon processors.
  - Servers with up to two of the latest Xeon processors, also up to two Xeon Phi coprocessors/GPGPUs for increased performance with low cost, low power consumption.
  - A high-density, large-scale blade server with up to 18 Xeon server blades in a 10U chassis.
  - A high-density, multi-node server that achieves double the density of a 1U rack server. Supports up to four Xeon servers in a 2U chassis.
  - A low-profile rack-mount (2U) server with up to two of the latest Xeon processors, also up to four Xeon Phi coprocessors/GPGPUs for increased performance with low cost, low power consumption.
  - A supercomputer that improves upon technology employed by the K computer. Achieves peak performance from 2.5 TFLOPS to 23.2 PFLOPS.

<table>
<thead>
<tr>
<th>OSs</th>
<th>Linux, Windows Server</th>
<th>Linux</th>
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<tbody>
<tr>
<td>CPUs</td>
<td>Intel Xeon processors, etc.</td>
<td>SPARC64™ IXx</td>
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</tbody>
</table>

- **Development**
  - Fujitsu Limited together with Fujitsu Technology Solutions (Holding) B.V. (Germany)
  - Fujitsu Limited

- **Manufacturing**
  - Fujitsu Technology Solutions (Holding) B.V. (Augsburg, Germany), Fujitsu Isotec Limited (Fukushima, Japan)
  - Fujitsu Isotec Limited (Fukushima, Japan)
  - Fujitsu IT Products Limited (Ishikawa, Japan)

- **Recent Deployments**

<table>
<thead>
<tr>
<th>Customer</th>
<th>System</th>
<th>Peak Performance</th>
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</thead>
<tbody>
<tr>
<td>RIKEN AICS (Advanced Institute for Computational Science)</td>
<td>Supercomputer (K computer)</td>
<td>11.28 PFLOPS</td>
</tr>
<tr>
<td>Australia’s NCI (National Computational Infrastructure)</td>
<td>HPC Cluster (PRIMERGY CX400)</td>
<td>1.22 PFLOPS</td>
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<tr>
<td></td>
<td>Supercomputer (PRIMEHPC FX10)</td>
<td></td>
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<tr>
<td>Information Technology Center, The University of Tokyo</td>
<td>Supercomputer (PRIMEHPC FX10)</td>
<td>1.13 PFLOPS</td>
</tr>
<tr>
<td>Taiwan Central Weather Bureau (CWB)</td>
<td>Supercomputer (PRIMEHPC FX10)</td>
<td>Exceeds 1 PFLOPS²</td>
</tr>
<tr>
<td>Research Institute for Information Technology, Kyushu University</td>
<td>HPC Cluster (PRIMERGY CX400)</td>
<td>993.7 TFLOPS</td>
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<tr>
<td></td>
<td>Supercomputer (PRIMEHPC FX10)</td>
<td></td>
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<tr>
<td>Information Technology Center, Nagoya University</td>
<td>HPC Cluster (PRIMERGY CX400)</td>
<td>561.4 TFLOPS</td>
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<td></td>
<td>Supercomputer (PRIMEHPC FX10)</td>
<td></td>
</tr>
<tr>
<td>High Performance Computing (HPC) Wales</td>
<td>HPC Cluster (PRIMERGY BX900)</td>
<td>Exceeds 300 TFLOPS</td>
</tr>
<tr>
<td>The Institute for Solid State Physics (ISSP), The University of Tokyo</td>
<td>Supercomputer (PRIMEHPC FX10)</td>
<td>90.8 TFLOPS</td>
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<tr>
<td>Canon Inc.</td>
<td>Supercomputer (PRIMEHPC FX10)</td>
<td>20.2 TFLOPS</td>
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<tr>
<td>Kobe University</td>
<td>Supercomputer (PRIMEHPC FX10)</td>
<td>20.2 TFLOPS</td>
</tr>
<tr>
<td>Kinki University</td>
<td>Supercomputer (PRIMEHPC FX10)</td>
<td>2.5 TFLOPS</td>
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</table>

*1: An HPC cluster connects many standard PC servers—which individually offer outstanding cost/performance—over a high-speed network, resulting in a system with excellent cost/performance and high-speed parallel processing.

*2: Peak performance in final configuration, due to be completed in December 2014.
Computer-based Simulations

Computer simulations, which compute and reproduce various phenomena, have come to be regarded as the “third pillar of science” alongside theory and experimentation. Computer simulation has become an indispensable R&D tool across all fields, from basic research to manufacturing.

High performance computing (HPC) was developed to process the large-scale computations required for running these simulations at high speeds, and is largely represented by the utilization of supercomputing technology.

HPC has widespread applications in various fields such as manufacturing technology, nanotechnology/material sciences, disaster mitigation, life sciences, aerospace, information technology, the environment, and energy. By offering advanced HPC solutions, Fujitsu is helping to address a range of challenges facing humanity.

Examples of Computer-based Simulations

- Magnetic-field simulator
- Heart simulator
- Tsunami modeling/simulator

Using the K computer, Fujitsu developed large-scale magnetization reversal simulation technology. This technology paves the way toward R&D advances in new magnetic materials, including strong magnets free from heavy rare earth elements.

The heart simulator reproduces all of the heart’s functional components, from the behavior of proteins in myocardial cells to heartbeats and blood ejection. This new technology is hoped to innovate conventional medical care by, for example, shedding light on the mechanisms and explanations of heart diseases.

This modeling can simulate the impact of tsunamis resulting from several earthquake scenarios, which should be essential information for building disaster-ready cities when factored in urban-infrastructure plans, and for planning detailed evacuation.

The K computer, among the World’s Most Powerful Supercomputers

Working together under Japan’s Ministry of Education, Culture, Sports, Science and Technology (MEXT) high performance computing infrastructure (HPCI) initiative, Fujitsu developed the K computer in collaboration with RIKEN. In both June and November of 2011, the K computer ranked first in the TOP 500 supercomputer rankings, having been recognized for two consecutive periods as the world’s fastest supercomputer.

It was opened to general use in September 2012, and today is being used to perform a wide range of simulations for universities, research institutions, and private companies.
Fujitsu's Business

The History of Fujitsu's HPC Solutions
Consistently leading the industry with over 30 years' experience in the HPC field

Fujitsu developed Japan’s first supercomputer in 1977. Since then, the company has been committed to continuing R&D, as well as the delivery of new products, for over 30 years.

Toward Exascale Supercomputers

As a foundation for science and technology, and for industrial competitiveness, the development of supercomputers has become an area of intense competition among countries around the world, and Japan is no exception: by around 2020, the country aims to produce an exascale-class (1,000 times petascale) supercomputer – roughly 100 times more powerful than the K computer.

Fujitsu is working to develop and offer supercomputers with world-class performance using the latest technology available. It is now developing a 100-petaflop-class system as a step toward exascale technology, and is taking part in MEXT’s “Feasibility Study on Future HPCI Infrastructures.”

TC Cloud: Cloud Services for Analytic Simulations

For manufacturers buffeted by international competition, analytic simulation has become increasingly important as a tool in design, development, and research that makes it possible to create high-quality products more quickly and inexpensively.

Fujitsu is helping to strengthen the competitiveness of manufacturers by providing support when the need arises to perform analyses that are massive or unexpected, and which surpass the capabilities of their own computing resources.

- More than 40 applications available to meet a wide range of analytic needs.
- Individual customers can configure their own private cloud environments inside Fujitsu’s datacenters to ensure robust security.
- Smooth execution in the cloud of everything from pre/post to solver processing through a high-speed remote desktop.

*1: Vector Supercomputers: Since multiple data sets can be processed in an “assembly-line” fashion, vector supercomputers demonstrate considerable processing power in performing similar calculations on huge amounts of data.

*2: Scalar Supercomputers: Scalar supercomputers are equipped with general purpose microprocessors, and are able to use those used in servers.

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