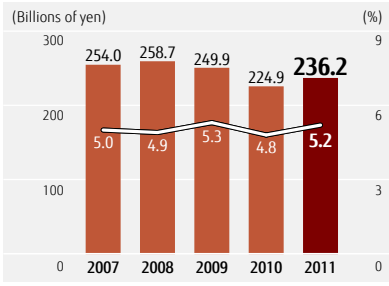
Our Mission in R&D

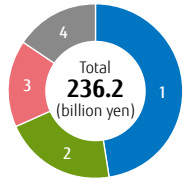
As our fundamental R&D policy, we pursue initiatives to create new value for our customers and to achieve our Corporate Vision of contributing to the creation of a networked society that is fulfilling and secure, bringing about a prosperous and dream-inspiring future. In order to achieve these initiatives, our R&D of advanced technologies includes technologies for next-generation services, computer servers and networks, as well as various electronic devices and advanced materials which serve as building blocks for our products.

- **Foster the creation of new businesses**
- **Create and accumulate advanced technologies**
- **Extend our value chain globally**
- **Fulfill our social responsibilities**

R&D Expenditure, and Ratio to Net Sales

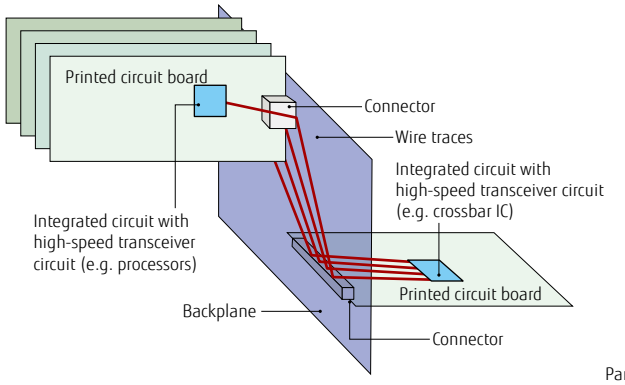


Fiscal 2010 R&D Expenditure by Segment



Major Advanced R&D Achievements for Fiscal 2010

Large-scale multiprocessor server



A high-speed transmission channel for use in a server backplane

(1) Paving the way for Higher Efficiency Datacenters with Development of High-Speed Transceiver Circuit that Extends In-Server Data Transmission Distance by 1.7 Times and Real-time High-speed Storage-Deduplication Technology

Datacenters supporting the modern cloud computing era require large-scale, high-performance servers connected to multiple processors. Extending circuit distance on the printed circuit boards that transfer data within each server is critical to realizing servers that meet these criteria. However, when data transfer speeds exceed 10 gigabits per second (10Gbps), signal distortion is amplified, thereby making proper data transmission difficult.

To resolve this problem, Fujitsu developed a high-speed data transceiver circuit that uses a new signal-processing algorithm to compensate for large signal distortion. This has made it possible to extend in-server transmission distance 1.7 times from approximately 70 cm to 120 cm, opening the way to larger server systems featuring higher performance.

Datacenters also need to utilize storage effectively in order to host large volumes of data. Fujitsu has developed a software technology that stores data while simultaneously eliminating data duplication. This technology can be utilized with any OS, making it an effective tool for virtual systems, where data duplication is frequently found. This advantage, in turn, enables reduction of both storage costs and power consumption at datacenters.

Part of this work is for research commissioned by the New Energy and Industrial Technology Development Organization (NEDO) of Japan, as part of the "Green IT Project: Development of Power-saving Technologies for Storage Systems."

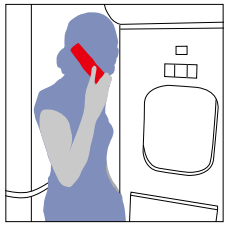
(2) Distributed Data Storage Technology and Inter-Cloud Data Security Technology Utilizing the Strengths of Cloud Computing

In cloud datacenters, for distributed key-value data storage technology capable of efficiently writing large volumes of data, due to the fact that the data is distributed across multiple servers, it had been difficult to aggregate data or maintain its consistency, resulting in longer processing times. To address this issue, Fujitsu has developed technology capable of high-speed data aggregation and processing that is up to 8 times faster than conventional methods. The new technology is expected to open doors for new applications for cloud computing services, such as enabling shorter processing times for analysis of access log data.

Elsewhere, as a security technology for utilizing confidential data in external clouds, Fujitsu has developed cloud information gateway technology capable of controlling data exchange, by checking the security clearance level of the data and even the content of confidential information. The technology masks and adapts confidential data to enable the use of cloud services without the need to transmit actual data to external clouds, thus leading to new ways of leveraging cloud computing, including cross-industry business collaboration and task allocation.

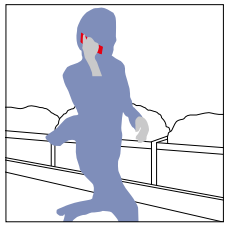
(3) Mobile Phone Technology that Improves Voice-Call Quality—PITTARI VOICE Technology

Fujitsu has developed practical applications for "Super HAKKIRI VOICE (Extra-clear voice) 3," a technology that adjusts the sound quality of voice calls, to compensate for background noise. As a next step, Fujitsu developed "PITTARI VOICE (Exact voice)," a voice enhancement technology that improves voice quality even further. The technology optimally adjusts sound quality and volume by detecting the caller's movement (e.g. walking or running) and the surrounding environment (e.g. onboard a high-speed bullet train). "PITTARI VOICE (Exact voice)" was incorporated into several models of Fujitsu's mobile phones, including the docomo PRIME series™ F-01C mobile phone released in Japan in November 2010.



While onboard a high-speed bullet train

While walking



While running

(4) Successful 40Gbps Optical-Fiber Transmission Using Directly-Modulated Semiconductor Laser Without Cooling

With the emergence of cloud computing and high-definition video distribution services, data traffic over networks is rapidly growing. Conventionally, optical transmission systems used for high-speed transfer of large volumes of data employed laser light sources that required cooling, which consumed a significant amount of power. Fujitsu has developed and successfully tested a directly-modulated semiconductor laser that does not require cooling and is capable of optical fiber transmissions at the speed of 40 gigabits per second (40Gbps). By eliminating the need for cooling, the new technology cuts power consumption by more than half compared to conventional technologies, taking Fujitsu a significant step ahead to realizing the next generation in energy-efficient, high-speed data transfer.

(5) Release of Sixth-Generation Milbeaut Imaging Processor for Beautiful Still and Video Images

The shift in recent years toward high-definition technology in digital cameras and other audio-visual devices has been accompanied by growing demand for higher image quality. In response, Fujitsu has developed the MB91696AM, an imaging processor of Fujitsu's Milbeaut advanced imaging processor series that enables both high-speed continuous shooting at 8 frames per second and high-resolution, Full Hi-Vision video. By enhancing its proprietary Milbeaut image processing technology and fully optimizing its H.264 Full HD codec engine, Fujitsu has taken image quality and processing performance to new heights for both still images and video.

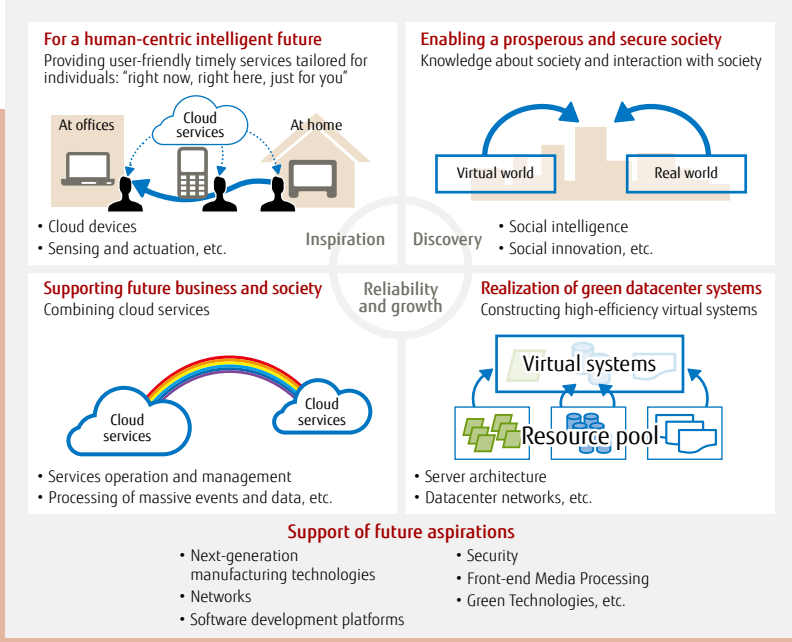
(6) Technology for High-Speed Detection of Toxic Proteins Using DNA Aptamers

Fujitsu has developed a proprietary technology that uses DNA material in a sensor to measure the amount of protein present, by employing newly developed artificial antibodies called DNA aptamers. In the fiscal year under review, with Nagoya University of Japan, we jointly developed technology capable of detecting proteins 100 times faster than previous methods, by applying our newly developed artificial antibody technology to toxic proteins from *Staphylococcus aureus*, a common source of food poisoning. Furthermore, Fujitsu and the Technical University of Munich have jointly developed the world's first technology that optically measures with high speed and precision the changes in volume or size of protein. These technologies will lead to advancements in food safety by enabling more accurate and faster measurements during food shipment inspections.

Topics

Realization of the "Human Centric Intelligent Society"—Creating New Value in the Real World Through Human Centric ICT

We will connect people, objects and information to generate value. We will leverage this value to provide inspiration, discovery, reliability and growth through development of advanced technologies to realize a "Human Centric Intelligent Society."



Awards and Prizes

Commendations for Science and Technology in 2 categories from the Minister of Education, Culture, Sports, Science and Technology of Japan

5 members of the Fujitsu Group were honored by Japan's Minister of Education, Culture, Sports, Science and Technology in fiscal 2010 with Commendations for Science and Technology: Development Category for the "development of palm vein authentication technology for financial institutions." 3 other members received Commendations for Science and Technology: Research Category for their research on new technology based on DNA material for the detection of proteins.

SPARC64™ VIIIfx Ultra-high-performance CPU for Japan's Next-generation Supercomputer "K Computer"* Wins the "Japan Industrial Technology Grand Prize" from the Minister of Education, Culture, Sports, Science and Technology of Japan

Fujitsu Limited and Japan's Institute of Physical and Chemical Research (RIKEN) jointly developed SPARC64™ VIIIfx, an ultra-high-performance CPU for Japan's next-generation supercomputer, the "K computer," the world's fastest highest-performance supercomputer as of June 2011. Their accomplishment was honored in fiscal 2010 with the "Japan Industrial Technology Grand Prize" from the Minister of Education, Culture, Sports, Science and Technology of Japan, hosted by Nikkan Kogyo Shimbun, Ltd.

* K computer: The name given to the new Japanese supercomputer system by RIKEN in July 2010. The English is the transliteration of the Japanese kanji letter used for the system name.

On-Demand Virtual System Service* Honored with "Best 10 New Products Awards" from a Major Japanese Industrial Newspaper and "Superior Products and Services Awards" from Japan's Foremost Financial Newspaper

Fujitsu Limited received 2 accolades in fiscal 2010 for its On-Demand Virtual System Service cloud computing service, as the "Best 10 New Products Awards" from the major Japanese industrial newspaper the *Nikkan Kogyo Shimbun*, and "Nikkei Superior Products and Services Awards—Top Award and Online-version Award" from Japan's foremost financial newspaper, the *Nihon Keizai Shimbun*.

* On-Demand Virtual System Service is now known as Fujitsu's Global Cloud Platform.

Advanced R&D Strategic Direction in Fiscal 2011

Fujitsu has classified its framework for advanced research into the three categories below, with a view to achieving group-wide optimization from a global standpoint. Through this framework Fujitsu will carry out strategic R&D for the future of the Fujitsu Group, align business segment strategies with research strategies, and enhance resource shifts in response to changes in Fujitsu's business portfolio. Fujitsu will employ a top-down approach to setting research themes, and will conduct strategic research investment.

1. **Core Strategic Themes: Technologies essential to the medium- to long-term future of the Fujitsu Group**
2. **Business Strategic Themes: Short- to medium-term technologies that business segments have committed to commercializing**
3. **Seeds-oriented Themes: Budding technologies not specific to current businesses, and medium- to long-term technologies targeting unknown domains**

In particular, Fujitsu is promoting the following four themes as Core Strategic Themes.

(1) Human Centric Computing
Fujitsu will correlate, combine and analyze data from real-world applications with data from specific industry applications, to realize convergence services that generate value.

(2) Intelligent Society
Fujitsu will help create social infrastructure that solves increasingly complex social problems and transcends individual corporate and industry barriers, to contribute new value and knowledge to societies and corporations.

(3) Cloud Fusion
Through effortless connections between clouds, and with existing systems, Fujitsu will link and share information to expand the fields for applying ICT, thereby creating new markets.

(4) Green Datacenters
By optimizing power supply and cooling technologies, and employing optical networks, Fujitsu will build power-saving datacenters that realize high cost-performance as well.

The Story Behind the Shipment of the Next-Generation Supercomputer System

No. 1 on TOP500 Supercomputer List!

Combining the best of Fujitsu Group technology, the "K computer"*1 will support the creation of a "Human Centric Intelligent Society"

The K computer, being jointly developed by RIKEN and Fujitsu under the auspices of the Ministry of Education, Culture, Sports, Science and Technology (MEXT), has achieved the No. 1 ranking on the TOP500 list of most powerful supercomputers. In September 2010, Fujitsu began shipping computing units to RIKEN Advanced Institute for Computational Science in Kobe, Japan. The entire system will be comprised of more than 800 computing racks after its planned completion in 2012. The K computer is expected to be used in a wide range of scientific and engineering fields.

Aiming for 10-Petaflops Performance

A supercomputer possesses the enormous processing power used to conduct virtual simulations which require sophisticated calculations. Fujitsu, with technological expertise and more than 30 years of supercomputer development experience, is jointly developing the K computer with RIKEN, aiming to achieve a new performance record of 10 petaflops*2.

SPARC64™ VIIIfx: High-performance, Energy-efficient CPU

The K computer comprises more than 80,000 SPARC64™ VIIIfx processors manufactured by Fujitsu Semiconductor. Each SPARC64™ VIIIfx CPU has a processing speed of 128 gigaflops, and together the processors will have the combined capability of ten quadrillion operations per second (10 petaflops) when the system is complete. The system also employs innovative technologies to reduce power consumption, including a water-based cooling system and a configuration which shuts down circuits not in use. With these technologies, the system has a processing power of 2.2 gigaflops per watt, placing it among the most power-efficient supercomputers in the world.

First Shipment of Computing Racks for the K Computer

On September 28, 2010 at its plant in Kahoku, Ishikawa Prefecture, Fujitsu IT Products loaded the first eight computing racks of the K computer into a truck bound for the RIKEN Advanced Institute for Computational Science in Kobe. At the RIKEN facility, the computing racks were set up in a computer room measuring 60 meters long by 50 meters wide. Regular shipments and configuration activities have continued since then, with completion scheduled for 2012.

Realizing a Prosperous, Secure Society

Fujitsu has a vision of a "Human Centric Intelligent Society" in which sophisticated ICT solutions are used to solve a variety of social issues and help create a prosperous and secure society. Supercomputers are being used in a wide range of fields, from the prediction and prevention of global warming and natural disasters, to the development of new industrial materials and astronomical analysis. Through the development and manufacture of supercomputers, Fujitsu is helping to contribute to the creation of a "Human Centric Intelligent Society".

*1 K computer: The name given to the new Japanese supercomputer system by RIKEN in July 2010. The English is the transliteration of the Japanese kanji letter used for the system name.

*2 10 petaflops: Peta stands for one thousand trillion, or one quadrillion. FLOPS stands for floating point operations per second, or the number of calculations the machine is capable of in one second.

No. 1 on TOP500 Supercomputer List!

The 37th TOP500 supercomputer list was announced on June 20, 2011 at the 26th International Supercomputer Conference (ISC) in Hamburg, Germany. The K computer posted a world-record processing speed of 8.162 petaflops, an interim performance level as of June 2011, to take the No. 1 position. This is the first time since June 2004 that a system developed in Japan has garnered the top spot on the list.

Tadao Amada
Development Dept. I, System Development Div.,
Next Generation Technical Computing Unit

Combining Fujitsu Group Capabilities to Achieve World-Record Performance

I joined the K computer project in 2007 as a project leader in charge of system assembly and testing. We've come a long way to achieve the No. 1 ranking on the definitive TOP500 supercomputer list. It started with combining the capabilities of the entire team and conducting initial tests in an environment where we were building prototypes by hand. This was the first system of its kind in the world, and to prepare for it we needed to reinforce the testing room floor, increase the number of cooling water circulators, air conditioners, and other equipment. We had other special requirements to work out, including procurement, as we had to choose materials with both cost and the environment in mind. In addition, there were upgrades to the semiconductor parts and resolving problems between each of the constituent components. After all the hard work and innovation, the results are immensely gratifying. There was a tremendous amount of collaboration between various teams at each phase of the project, from initial development to manufacture, testing, logistics, and configuration. We will continue to bring together all the capabilities of the Fujitsu Group to complete the manufacture, shipment and deployment of the world's fastest supercomputer system.