Research and Development of Advanced Green ICT

Our Approach

The Fujitsu Group pursues its business activities with an aim to solving social and environmental problems by driving forward research and development (R&D) in a multitude of domains. Working from the standpoints of environmentalism and sustainability, we use leading-edge technologies as our foundation and expand outward into materials and devices used in products, as well as facilities and system solutions.

At Fujitsu Laboratories Ltd., the core company shouldering R&D in the Fujitsu Group, two key approaches are being undertaken: "Green of ICT," which seeks to reduce energy and resources consumed by ICT equipment and infrastructure, and "Green by ICT," which seeks to reduce environmental burdens through the use of ICT. Within these approaches, Green by ICT has a significant ripple effect in society and we are aiming to drive green ICT in the domain of Social Innovation, the core of the Fujitsu Group's growth strategy.

Summary of FY 2015 Achievements

Targets under the Fujitsu Group Environmental Action Plan (Stage VII) (toward FY 2015)	**Develop innovative technologies** that enable solutions and products to reduce the environmental loads
FY 2015 Key Performance	Announced **25** key green technologies

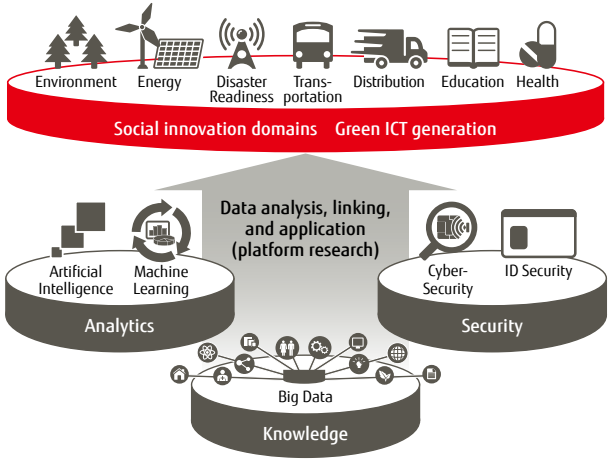
FY 2015 Performance and Results

Positioning and Highlighting Fujitsu Laboratories' Key Green Technologies

To disseminate the Fujitsu Group's advanced green ICT throughout society, and to support its early deployment in businesses, we positioned as our key green technologies "best-in-class" and "world-first" technologies, as well as technologies with notably high environmental contribution. We are also highlighting our technological capabilities by advancing our R&D for these key green technologies and assertively promoting them through press announcements.

In addition, in the domain of creating social innovation, which connects and leverages heterogeneous information such as that generated by corporations, governments, individuals, and sensors, we strengthened our generation of green ICT and communicated its contributions to the environment.

Social innovation research domains in the laboratory



Announcement of 25 Key Green Technologies

In FY 2015, the Fujitsu Group announced 25 technology development achievements, including 18 in the domain of Green by ICT and 7 in the domain of Green of ICT, with the former category comprising 5 achievements in the domain of Social Innovation.

Research Achievements

- Software that analyzes service quality while monitoring transmission at a world-record 200 Gbps
- Web OS technology for easy connections between smartphones and peripheral devices
- Technology that visualizes the complexity of business logic
- Development of virtualization technology that brings security and operability to Web applications
- Development of millimeter-wave wireless devices for 5G networks
- Platform services utilizing IoT data
- Technology for high-speed data transmission from remote sites
- Using supercomputers for real-time disaster-recovery scheduling
- Dispersed device connection technology
- Technology to visualize the energy required to execute software
- Technology for fast, automated setup of virtual networks
- Wireless transmission technology for 5G networks
- Technology to accelerate comprehensive analysis of data
- Ultra high frequency transmission and sensing technologies
- Development of non-insolated 100A DC-DC power modules
- Technology for automatically generating image inspection programs
- Development of the world's smallest and most efficient AC adapter
- Development of touch sensors to capture touch data during Kampo doctor exams
- Technology for predicting potential sewer system overflow from torrential rains
- Development of the world's largest-scale magnetic-reversal simulator for (dysprosium-free) neodymium magnets
- Technology trial to predict the population of Japanese sika deer
- Development of technology to detect "back-and-forth-type" targeted e-mail attacks in real time
- Development of gallium nitride transmitter power amplifiers
- Development of technology for instantaneous searches of a target image from a massive volume of images
- Commencement of a trial to test an output control system for photovoltaic power generation

FY 2016 Targets and Plans

Accelerating Development of Innovative Technologies for Solving Environmental Issues

Fujitsu is accelerating the development of innovative technologies for solving various environmental issues such as energy and work task efficiency improvements for reducing CO_2 emissions, countermeasures for natural disasters, and preservation of biodiversity.

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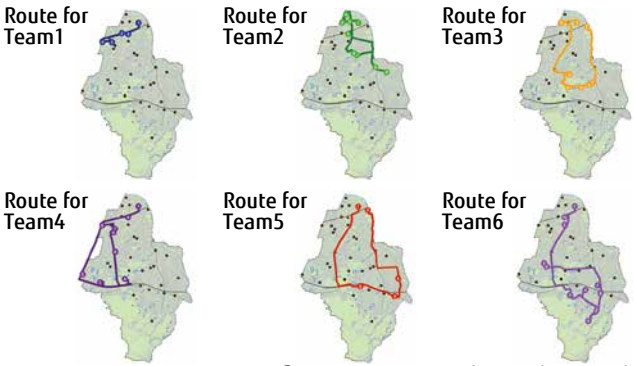
Main Activities in FY 2015

Scheduling Disaster-Recovery with Supercomputers

During a large-scale natural disaster, recovery schedules for essential services, etc. must be formulated quickly. However, since conditions can change even as plans are being formulated, it is difficult to perform the calculations based on massive volumes of data in real time needed to propose an ideal plan that reflects those changing conditions.

Fujitsu Laboratories and the Institute of Mathematics for Industry at Kyushu University have developed a numerical-optimization technology that runs on a supercomputer to efficiently formulate large-scale recovery plans while taking into account complex conditions on the ground, creating real-time scheduling for recovery work. When used with 506 recovery sites and 64 work teams, this technology was able to formulate an appropriate recovery-work schedule in roughly three minutes.

Output result for a case with 37 recovery sites and 6 work teams

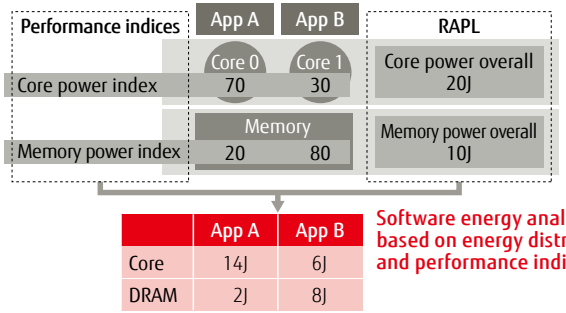


Technology to Visualize the Energy Required to Execute Software

Fujitsu Laboratories Ltd. has developed technology that precisely calculates the energy consumed by software. Servers equipped with Intel-made CPUs can measure power consumption for the CPU as a whole. Until now, however, it was not possible to calculate the energy required to execute software on a core-by-core basis, so it has been difficult to take a software-based approach to reducing power consumption.

Now, Fujitsu Laboratories has developed technology that uses information that can be tracked at the individual core level, such as clock cycles and cache-hit percentages, to estimate energy consumption in detail, down to the program module level. This technology can be used in energy-efficient programming reducing overall server energy usage and, by using spare power and increasing parallelism, boosting software performance.

Software energy analysis based on energy distribution and performance indices



	App A	App B
Core	14J	6J
DRAM	2J	8J

Software energy analysis based on energy distribution and performance indices

Technology Predicting the Population of Japanese Sika Deer

In recent years, the rapid increase in the population of sika deer has led to forest damage from the deer's feeding habits and there are concerns about a loss of biodiversity. Developing countermeasures requires forecasts on the growth of animal distribution. However, it is difficult for researchers to investigate broad and hard-to-reach areas, which has made surveys challenging.

Fujitsu Laboratories has developed a software technology to predict maximum possible mammal populations without a field survey, using publicly available information, such as vegetation maps that display the types and distribution of plants, topographical maps, and climate information, as well as information about the animal's basic biology. In this trial to apply the technology to sika deer, the habitable areas that are suitable for deer to live are calculated. By applying the relationship between sika deer population density and their weight, the maximum possible population number for each square kilometer area is estimated.

Predictions of maximum Japanese sika deer populations (Koshu region, Yamanashi prefecture)

57,000 m² of habitat are needed for each 60-kg sika deer