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 2014 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 2014 Key Performance	Announced **25** key green technologies

FY 2014 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.

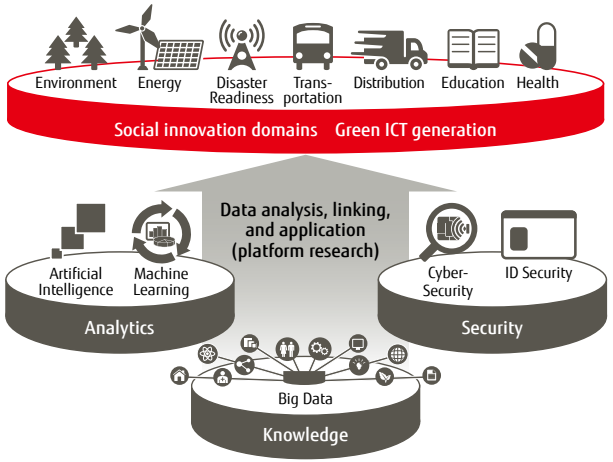
Development Achievements

- Data optimization technology
- Communications data collection and high-speed search technology
- Information service technology among terminals and devices
- Transportation pattern analysis technology
- On demand traffic operation technology
- Patient condition recognition technology
- Wide area SDN management and control technology
- Access re-creation verification technology
- Vehicle lane deviation detection technology
- Cyber attack detection technology
- 56-Gbps receiver circuits for servers
- Cluster supercomputer NW switch reduction technology
- Automatic generation technology for image recognition programs
- WAN speed improvement technology
- CMOS transmission/reception chips for vehicle on-board radars
- New management methods for natural forests
- Sensing middleware for wearable devices
- Bio-derived, water-based paint
- Tools for finding the characteristics of areas in which Linked Open Data technologies are applied
- Ring-type wearable devices
- Technology for detecting early signs of drainage system flooding
- Optical transceiver circuits using silicon photonics
- Technology for recognizing crowd movements
- Flood forecast simulation technology
- Technology for early detection of dyskinesia (irregularities in motor functions)

Announcement of 25 Key Green Technologies

In FY 2014, the Fujitsu Group announced 25 technology development achievements centered on the domains of Green by ICT and the domain of Social Innovation: 18 technological developments (including 13 developments in the domain of Social Innovation), while 7 developments were in Green of ICT.

Social innovation research domains in the laboratory



FY 2015 Targets and Plans

Accelerating the creation of green ICT solutions

While further enhancing the environmental contribution of our advanced technologies, the Fujitsu Group will accelerate the creation of not only individual technologies, but also the creation of related green ICT that connects such technologies. In particular, we will keep strengthening green ICT, as well as the data analysis, linking, and platform research that support it, in the domain of Social Innovation, as we continue to promote and publicize to society our technological achievements.

Research and Development of Advanced Green ICT

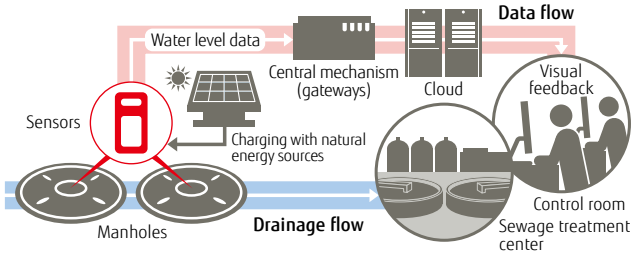
Main Activities in FY 2014

Developing Manhole Sensors as a Low-Cost Technology for Detecting Signs of Drainage System Overflow

Building water measuring sensors into manholes is effective for detecting and controlling urban drainage overflow and damage. Battery replacement, however, means a high cost of operation per manhole.

Fujitsu Laboratories Ltd. addressed this issue by determining the number and location of the manholes that should include sensors. The company used analysis of the time it takes water to flow from upstream to downstream, given variations in topography and the shape and the length of the drainage routes. The overall flow of drainage can be understood and forecast with just one-fifth the previous number of sensors. Furthermore, the company has taken into account fluctuations in water levels and developed control technology that optimizes measurement parameters. The amount of electric power consumed has been cut approximately 70% while still maintaining measurement accuracy. This efficiency makes it possible to run the manholes solely on natural energy, bringing per-unit operating costs down approximately 90%.

Drainage water level monitoring system



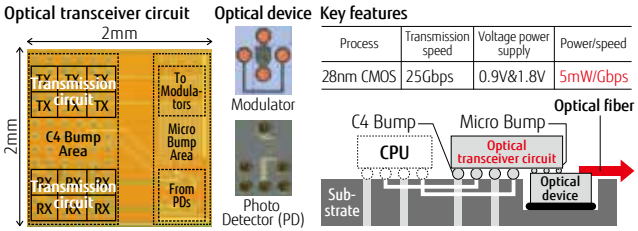
Achieving the World's Most Efficient Inter-Processor Data Transmissions at 5 mW per 1 Gbps*1

Fujitsu, Fujitsu Laboratories Ltd., Fujitsu Laboratories of America, Inc. (FLA), the Photonics Electronics Technology Research Association (PETRA), and the New Energy and Industrial Technology Development Organization (NEDO) announced in February 2015 results of their joint development of an optical transceiver circuit using silicon photonics technology.*2

With this new approach, optical devices are moved at low voltages while adjusting the current amplification at a speed that can track the data fluctuations. This halves normal power consumption but gives high-speed transmission of 25 Gbps. The new technology holds down power consumption and achieves fast transmission in the range of terabits per second, which is expected to lead to great new performance gains for servers and supercomputers.

*1 **1 Gbps:** a rate of transmission where one gigabit of data is transmitted in one second.
*2 **Silicon photonics technology:** technology that patterns optical devices on a silicon substrate.

Illustration of the newly-developed optical transceiver circuit and its key features



Developing Technology for Automatically Determining Parameters for a Flood Forecasting Simulator to Mitigate Water Damage

Currently, flood forecasting simulators are being applied as part of these waterway management efforts. With simulators, it is preferable to use "distributed runoff models" that show land use distribution, including topography, forests, and urban areas. It is difficult, however, to determine optimal parameters for these models.

To address this challenge, the Public Works Research Institute (PWRI) and Fujitsu Laboratories Ltd. developed technology for automatically determining parameters to use in a flood forecasting simulator based on distributed runoff models. A very high degree of reproducibility was achieved after comparing values from 15 previous flood flow measurements with values calculated using flood forecasting simulations.

This approach allows for continually adjusting optimal settings for the flood forecasting simulator in order to allow river managers to determine suitable actions for disaster preparedness and mitigation.

Values from waterway flow level measurements and values calculated from simulations