

Top Message	Message from the Head of Corporate Environmental and CSR Strategy Unit	Special Feature 1: The Fujitsu Group Medium/Long-term Environmental Vision	Special Feature 2: Digital Co-creation	Fujitsu Group Environmental Action Plan Stage VIII	Chapter I Contribution to Society	Chapter II Our Business	Environmental Management	Data Overview
Contribute to Sustainable Development of Society through Provision of ICT Services		Developing Innovative Technologies for Solving Environmental Issues		Development of Top-Level Energy Efficient Products	Improving the Resource Efficiency and Resource Circulation of Products	Product Recycling		

Developing Innovative Technologies for Solving Environmental Issues

Our Approach

Fujitsu Laboratories, the core research and development (R&D) organization in the Fujitsu Group, works on a diverse mix of emerging ICT-related technologies—ranging from advanced materials, next-generation devices, networks, and cloud systems to the creation of next-generation solutions and services—with the environment always in mind.

Drawing on these efforts to develop innovative technologies and embracing its mission to create technologies that can help solve social and environmental problems, Fujitsu Laboratories promotes environmental activities ranging from CO₂ emission reductions through energy-conserving practices and work task-efficiency improvements to resource-saving initiatives, countermeasures for natural disasters, the preservation of biodiversity, and efforts to combat global warming.

Summary of FY 2016 Achievements

Targets under the Fujitsu Group Environmental Action Plan (Stage VII) (toward FY 2018)	Develop innovative technologies that address environmental issues.
FY 2016 Targets	Announce 35 key green technologies* (event)
FY 2016 Key Performance	Announced 58 key green technologies (Press announcements: 25; Academic society presentations + exhibitions: 33)

* **Key green technologies:** Technologies for reducing power/energy consumption, improving work-hour efficiency, conserving resources, and tackling social issues

FY 2016 Performance and Results

Showcasing Developed Technologies to the World

Fujitsu's Environmental Action Plan (Stage VIII) includes the objective of enhancing the company's ability to showcase the green-oriented technologies in its development portfolio to the public. In FY 2016, we expanded on our normal mass-media initiatives by giving presentations at a new selection of events (academic society meetings and exhibitions).

In terms of the SDGs, the technologies that Fujitsu announced in FY 2016 contribute primarily to two goals: "Make cities and human settlements inclusive, safe, resilient and sustainable" (Goal 11) and "Take urgent action to combat climate change and its impact" (Goal 13).

FY 2016 Development Performance (items appearing in the media)

- (1) Technology for quickly tracking changes in open-source software
- (2) High-accuracy fuel-efficiency estimates using ship operation data
- (3) Mathematical AI technology for quickly solving urban security positioning problems
- (4) High-speed forensic technology for grasping the entirety of a cyber-attack at a glance
- (5) Technology for capturing human movements at high-speed, high-precision levels via 3D sensing and determining the corresponding techniques in real time
- (6) Technology for building optimal networks for media-based services
- (7) Semiconductor packaging substrate that enables thin film capacitor embedding
- (8) Field engineering technology for providing IoT services rapidly
- (9) Technology for automatically generating image recognition algorithms on an AI-enabled platform
- (10) Energy-saving technology for cooling data centers

- (11) Technology for automatically assessing personal data privacy risks
- (12) System for detecting sewer flooding, aimed at reducing damage from torrential rain and flash floods
- (13) Technology that allows 5G mobile wireless base stations and access points to achieve high-speed transmissions (over 10 Gbps) at low power-consumption levels on par with Wi-Fi
- (14) LED-watermarking technology for automating and optimizing manual-labor tasks
- (15) Technology for automatically extracting business specifications in programs
- (16) Millimeter-wave CMOS circuitry for automotive radar, enabling the world's fastest frequency modulation
- (17) Technology for using conversational speech to automatically identify customer satisfaction/dissatisfaction
- (18) Analysis technology for improving the communications performance of virtual networks
- (19) In-memory deduplication technology for accelerating the response times of large-scale storage
- (20) Flexible, battery-less beacon that uses analog power circuit control to create a compact, slim configuration
- (21) Technology for measuring magnetic properties under stress with a piezoelectric device
- (22) Mobile-app control technology for revolutionizing home healthcare
- (23) Technology for the centralized management of data distributed in the cloud and on edge servers
- (24) Technology for enabling the secure use of cloud services via IoT devices using smartphone-based biometric authentication
- (25) One of the world's smallest DC-DC power modules

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Main Development Initiatives in FY 2016

High-Speed Forensic Technology for Grasping the Entirety of a Cyber-Attack at a Glance



Assessing the damaging effects of malware, which infect organizations to trigger problems, used to involve bringing experts in for time-consuming analyses of network and device logs.

By compressing, storing, and automatically analyzing massive volumes of network communications data, Fujitsu Laboratories has now developed technology that lets users analyze the status of a targeted cyber-attack in a short period of time and shows the whole picture at a glance. The technology collects communications data flowing through the network and then, using the data to infer the commands executed on the PC, connects command operations with specific user information to identify who executed what type of remote control and collect trace information about command operations. Upon detecting a targeted cyber-attack in its home system, the technology extracts affected PCs one after the other and automatically draws the attack status from a comprehensive perspective.

As a result, users can conduct analyses quickly without needing to be an expert, and can implement prompt, far-reaching countermeasures before the damage of an attack can spread.



Screenshot of the analysis system for the status of targeted attacks

The Industry's First Technology for Automatically Assessing Personal Data Privacy Risks



Japan's Amended Act on the Protection of Personal Information, which goes into effect in 2017, will make it possible to provide third parties with de-identified personal data—even without the individual's consent. Before providing de-identified data, providers must first ensure it complies with guidelines and evaluate the risk of specific individuals being recognized.

Based on data distribution, Fujitsu Laboratories developed the industry's first technology to automatically search for combinations of attributes that make it easiest to identify individuals—as well as quantifying that ease of identification—in a realistic timeframe. This makes it possible to quickly see which attributes to prioritize for de-identification. Fujitsu Laboratories also developed a technology for calculating potential damage from data leaks and determining compliance with various de-identification guidelines. Users can evaluate risks and implement appropriate de-identification processes quickly and easily.

Technology for quantifying the ease of personal data identification

Age	Occupation	Permanent address	Age	Occupation	Permanent address	
50	Artist	Downtown	50	Artist	Downtown	Possible to identify based on age and occupation Difficulty level: 1.8
50	Public servant	Downtown	50	Public servant	Downtown	
60	Artist	Downtown	60	Artist	Downtown	
60	Public servant	Downtown	60	Public servant	Downtown	
60	Public servant	Suburbs	60	Public servant	Suburbs	Difficulty level: 0.5
						Difficulty level: 0.6

5 records can be identified	5 records can be identified
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Before the new technology: Difficult to establish countermeasures	With the developed technology: Easy to see items to de-identify
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Energy-Saving Technology for Cooling Data Centers



Currently, reports indicate that data center energy consumption constitutes 1–2% of all electricity use, so better energy conservation is needed, particularly in air-conditioning.

To respond to the dynamic status changes unique to data centers, such as moving information equipment in and out and modifying rack arrangements, Fujitsu Laboratories has developed a highly accurate prediction technology. The innovation sequentially predicts air-conditioning effects, making it possible to reduce the amount of energy that air conditioning consumes. The technology creates a database that incorporates the status of air-conditioning equipment and operates under conditions requiring the system to gather information from two sources: not only choosing measurement data for addressing prediction targets but also automatically selecting at least one variable from the air-conditioning equipment status. By creating a predictive model using the selected variables, the technology successfully improves predictive accuracy.

High-precision temperature-prediction technology

