Hitachi Cloud Computing Solutions for Enterprise Information Systems

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OVERVIEW: Use of cloud computing for enterprise information systems is spreading, driven by considerations such as management rationalization and responding promptly to changes in the business environment. Based on this background, Hitachi has been supplying Hitachi Cloud Computing Solutions since 2009 to support the adoption of cloud computing for enterprise information systems. In addition to strengthening Hitachi Cloud Computing Solutions for both private and public cloud systems, Hitachi is also working on hybrid cloud systems that combine a number of different clouds, as required, to suit the characteristics of a particular system.

INTRODUCTION

THE adoption of cloud computing for enterprise information systems is growing due to demand for capabilities such as management rationalization and the ability to respond promptly to changes in the business environment. In response, Hitachi announced its Hitachi Cloud Computing Solutions in June 2009. The primary features required of a cloud are speed and flexibility. In addition, Hitachi also seeks to draw on its experience in social infrastructure to supply systems on which its customers can rely, and work with them on generating new business value (see Fig. 1).

Cloud systems can be divided into public clouds in which IT (information technology) services are supplied via a network by a third-party provider and private clouds in which a company establishes its own cloud platform, which can be used by different departments. Hitachi is working to strengthen Hitachi Cloud Computing Solutions for both these types of cloud.

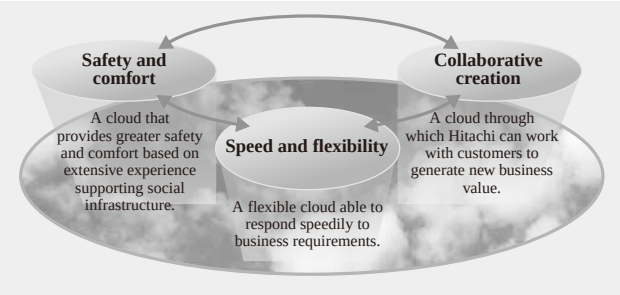


Fig. 1—Concepts behind Hitachi Cloud Computing Solutions. The primary features of a cloud are speed and flexibility. In addition, Hitachi also intends to work with customers to generate new business value and provide safety and comfort based on its experience in social infrastructure.

One of the requirements of a public cloud solution is an extensive range of business applications supplied in the form of SaaS (software as a service). Hitachi's menu of SaaS applications numbers more than 100, with new applications being added all the time. Hitachi is also making ongoing enhancements to its PaaS (platform as a service) platform services, which feature the high reliability needed for corporate use.

For private clouds, Hitachi can supply efficient cloud platforms that provide safety and comfort by using highly reliable servers, storage, and networks, together with middleware for operating and administering them efficiently.

This article describes solutions that encourage the evolution of enterprise information systems into hybrid clouds. It also gives examples of hybrid cloud installations and introduces Hitachi Cloud Data Center.

ADOPTION OF HYBRID CLOUDS FOR ENTERPRISE INFORMATION SYSTEMS

When introducing a cloud into an enterprise information system, it is important that it be done in a way that takes account of the nature of the activities handled by each business system. A public cloud is suitable for routine activities that are not part of the company's core business, whereas a private cloud is suitable for non-routine core activities.

Rather than migrating the enterprise information system to the cloud all at once, installing a cloud involves progressively shifting to the cloud-based model over a period of time. Similarly, all business systems are not migrated to the cloud in their

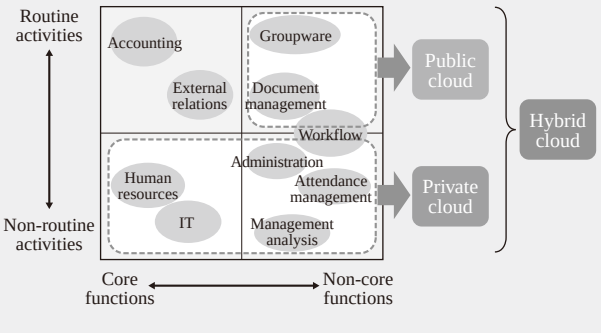


Fig. 2—Adoption of Hybrid Cloud Model for Enterprise Information Systems (Financial System Example).
It is anticipated that enterprise information systems will migrate to a hybrid cloud that combines existing systems with public and private clouds.

entirety, and some parts continue to use the existing systems. Accordingly, it is anticipated that enterprise information systems will shift to hybrid clouds that combine existing systems with public and private clouds (see Fig. 2).

Although the hybrid clouds used in current enterprise information systems are still comparatively loosely coordinated, it is anticipated that in the future they will evolve into integrated forms that combine public, private, and existing systems, as and where required, and link them together.

SOLUTIONS THAT SUPPORT MIGRATION OF ENTERPRISE INFORMATION SYSTEMS TO CLOUD

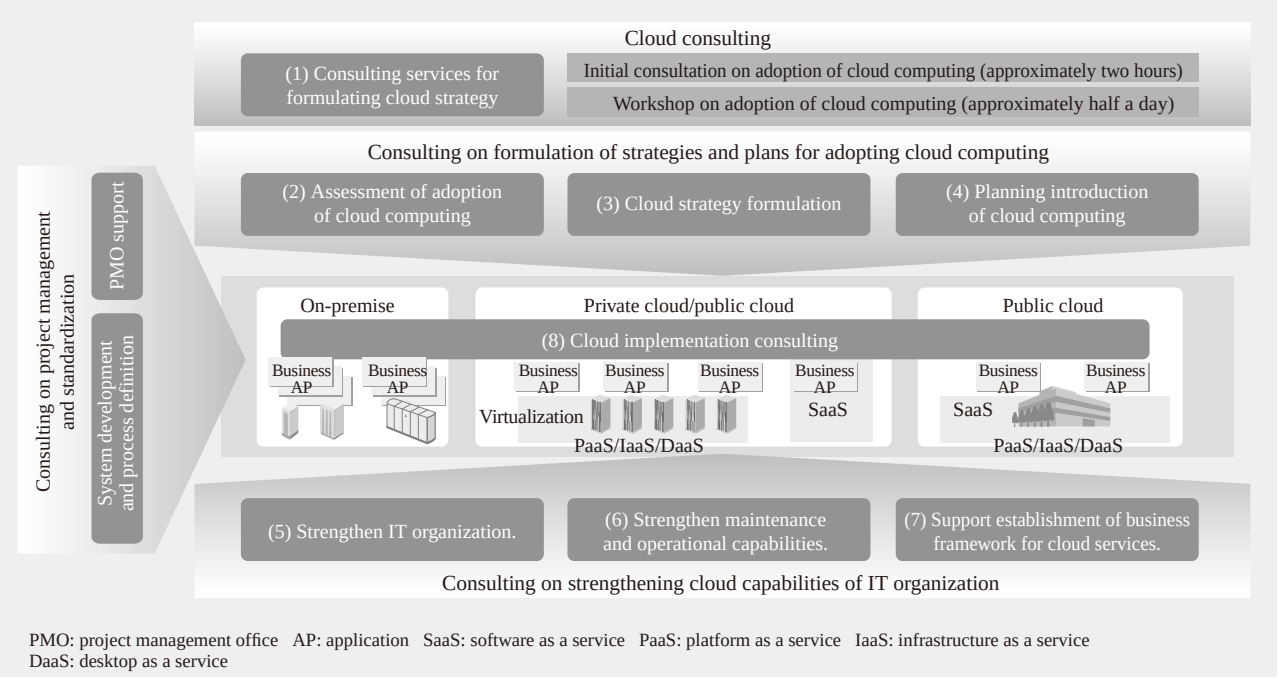
Hitachi supplies a wide range of solutions that assist with migrating corporate systems to the cloud. This section describes two of these that Hitachi has sought to strengthen in recent times, namely consulting services and storage services.

Consulting Services

The issues to be considered when adopting a cloud-based model for enterprise information systems extend beyond deciding which business systems to migrate to the cloud and how this migration process should proceed. The wide range of other factors to be taken into account include clarifying the business aims and objectives for introducing cloud computing and reviewing the role of the information systems department. Hitachi Cloud Computing Solutions offer a diverse range of consulting services that approach these issues from a variety of perspectives to support decisionmaking by the customer's senior management and its information systems department (see Fig. 3).

Consulting services for formulating cloud strategy

These services consist of two free services that offer an initial consultation service and workshop respectively for answering customer inquiries about the use of cloud computing. The initial consultation



PMO: project management office AP: application SaaS: software as a service PaaS: platform as a service IaaS: infrastructure as a service
DaaS: desktop as a service

Fig. 3—Overview of Consulting Services Included in Hitachi Cloud Computing Solutions.
Hitachi offers a diverse range of consulting services that approach the issues from a variety of perspectives to support decision making by the customer's senior management and its information systems department.

service (approximately two hours) asks customers about their specific circumstances and answers their concerns about what is required to proceed with adopting cloud computing, drawing on case studies involving the use of cloud services. Important issues when adopting cloud computing include management of IT assets, operations, and rethinking the role of the IT department. The cloud workshop (approximately half a day) puts these in context together with policies for dealing with them while inquiring into the problems perceived by the customer.

Consulting on formulation of strategies and plans for adopting cloud computing

This consulting process is broken down into three services: assessing the adoption of cloud computing, formulating a cloud strategy, and planning the introduction of cloud computing. The assessment service includes the use of analytical methods and tools based on past projects to simulate the adoption of cloud computing and estimate the likely operational benefits. The cloud strategy formulation service helps the customer formulate a cloud strategy by clarifying the business aims and objectives of introducing cloud computing. The cloud planning service identifies the organizational, operational, and system requirements for introducing cloud computing and helps the customer formulate an action plan.

Consulting on strengthening cloud capabilities of IT organization

This consulting process is broken down into three services: strengthening the IT organization, strengthening maintenance and operational capabilities, and supporting the establishment of a business framework for cloud services. Strengthening the IT organization means helping the IT organization rethink its approach to cloud computing (such as turning the IT department into a service organization). Strengthening maintenance and operational capabilities means establishing governance measures [such as SLAs (service level agreements)] for operation, maintenance, and other tasks associated with cloud computing. Supporting the establishment of a business framework for cloud services means providing assistance with activities associated with cloud operation, such as lifecycle definitions and the establishment of schemes both with service providers and within the customer's own business (corporate group).

In response to growing interest in saving electric power and other environmental concerns, Hitachi can also provide estimates of the savings on power consumption, CO_2 (carbon dioxide) emissions, and similar factors that will result from migrating to the cloud (see Fig. 4).

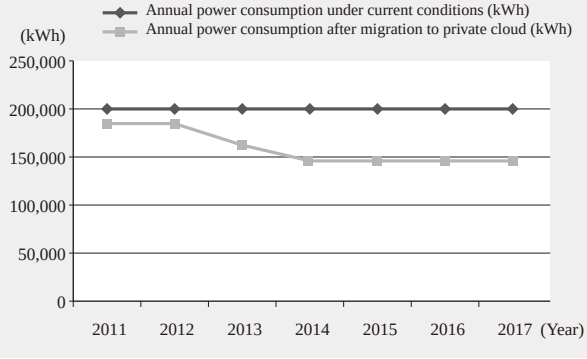


Fig. 4—Example of Power Savings Estimation by Consulting Service.
The consulting service provides year-by-year estimates of the change in annual power consumption of the current system and the system after migration to a private cloud.

Hitachi can also provide consulting remotely by connecting to customers via a videoconferencing system, which is installed at a number of sites including Hitachi Cloud Square, which opened in 2010 (and which combines a showroom for Hitachi Cloud Computing Solutions with testing facilities).

Storage Services

Hitachi offers a hybrid storage service that links storage located at the customer's site with storage at Hitachi Cloud Data Center (data center used to provide Hitachi Cloud Computing Solutions) to perform automatic archiving and system backups of the customer's data assets in the Hitachi cloud. This service is implemented using Hitachi File Migrator, the file virtualization function of Hitachi Virtual File Platform (VFP), and has the following features:

(1) Provides comfort in the event of data loss at the customer's site due to a disaster or other incident as the data is backed up in the Hitachi cloud, which is provided from a robust data center.

(2) Provides the infrastructure for archiving and backing up data on the cloud using functions built into the storage systems, which eliminates the need to administer software, servers, and other resources used for archiving and backing up.

(3) Can connect via the Internet.

This solution includes services that provide respectively an archive function designed to minimize the quantity of data held on the VFP and a system backup function designed to protect the data on the VFP.

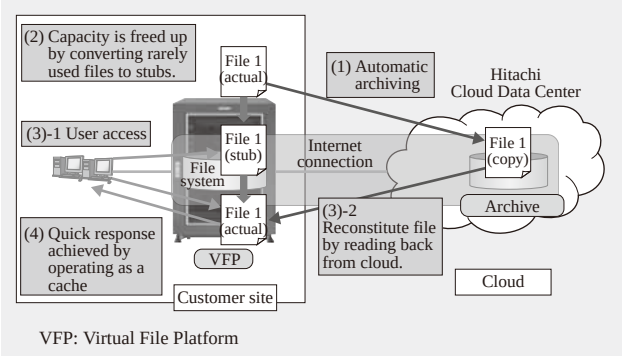


Fig. 5—Overview of Managed Service for Archiving of File Storage.
Rarely used files on the storage system (VFP) at the customer's site are automatically archived at Hitachi Cloud Data Center to minimize the increase in the amount of data on the VFP.

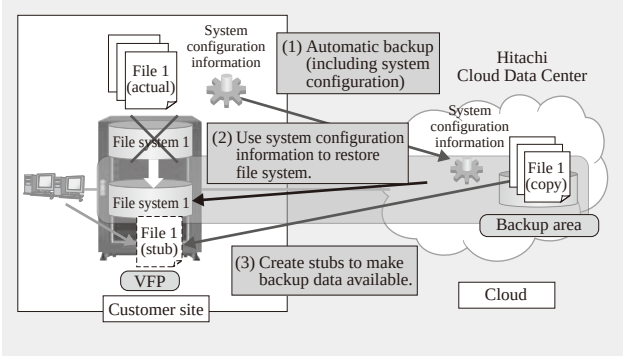


Fig. 6—Overview of Managed Service for Backing up File Storage System.
The service automatically backs up the files and system files on the storage system (VFP) at the customer's site to Hitachi Cloud Data Center in case of a fault or disaster.

Managed service for archiving of file storage

Archiving large quantities of rarely used data in the cloud can minimize growth in the amount of data stored in the VFP at the customer's site, and save the customer from time-consuming capacity monitoring and upgrading work. This cloud-based archive is provided as a service for a monthly fee (see Fig. 5).
(1) Files on the VFP are automatically moved to the cloud archive during the night or other times when system traffic is low.
(2) The storage space on the VFP devoted to rarely used files is freed up by converting them to stubs (proxies used to stand in for the actual file).
(3) When the user accesses a stub file, the file is reconstituted from the copy of the actual file stored in the cloud. Users do not need to be aware of where the data is located and can continue to use files in the same way as before.
(4) As commonly used files remain in the VFP and are not converted to stubs, response times for these are the same as for local file storage. As the VFP acts as a cache, the system can operate comfortably via an Internet connection.

Managed service for backing up file storage system

This service provides users with an easy way to make remote backups via the cloud for a monthly fee, without needing to configure and operate their own remote site. The service also significantly reduces downtime by using stub files to restore faulty systems (see Fig. 6).
(1) Automatic backup of all data on the VFP to a backup area in the cloud during the night or other times when system traffic is low.
(2) If the file system fails, it can be recovered using the system configuration data on the cloud.
(3) Utilizes the Hitachi File Migrator virtualization function and makes the backup data on the cloud available by creating stub files using the data.

EXAMPLES OF ADOPTING CLOUD SYSTEMS

Cloud System for Mission-critical Fluid Analysis

Kajima Corporation had been using time on a grid computer made up of Hitachi's high performance computing servers and other computers to perform fluid analysis tasks, such as analyzing wind flow around buildings or predicting the dispersion of contaminants. However, changing economic circumstances made IT cost reductions an urgent priority.

Because large and complex numerical simulations like those used for fluid analysis are run for each construction project, the intensity with which IT resources are used varies widely between busy times and normal times. Consequently, they became interested in the cloud as a method of cost optimization and started using a Hitachi Cloud Computing Solutions PaaS system in January 2011.

Introduction of the system involved connecting Hitachi Cloud Computing Solutions PaaS to Kajima Corporation's large in-house KI Net network via a VPN (virtual private network). While fluid analyses are run on the cloud, the programs and other data are kept on a server connected to KI Net (see Fig. 7). The method used to access the cloud via this server uses the same interface as direct access.

This succeeded in significantly reducing the workload associated with the efficient use, maintenance, and operation of IT resources without creating any extra work or other dissatisfaction for users in terms of the system operation. The total

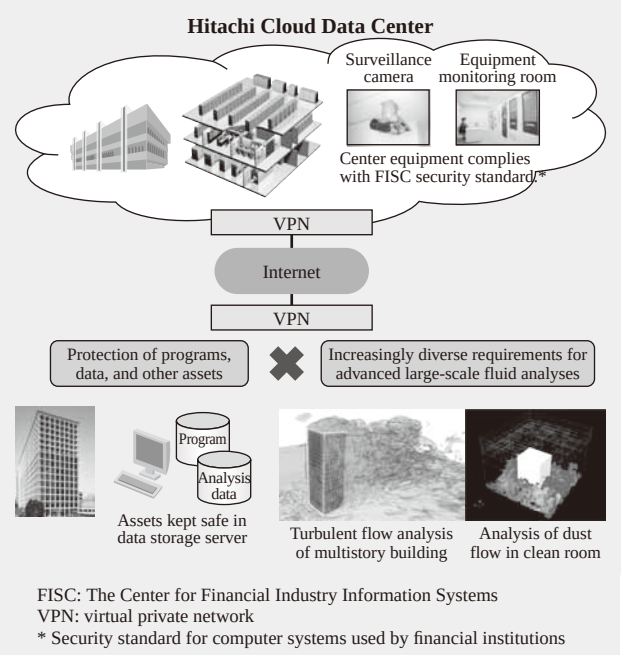


Fig. 7—Overview of Fluid Analysis System of Kajima Corporation.
Hitachi Cloud Computing Solutions are used in conjunction with an in-house data storage server to protect assets and allow previous practices to continue unchanged.

cost was reduced by about 40% compared to using Hitachi's high performance computing servers.

Use of Cloud to Provide Information during Disaster or Power Outage

Chiba University has its own data center where it operates web servers for distributing information and was investigating how to ensure that this function could continue during a power outage. After considering factors such as positioning the server at a location where power outages were unlikely, the ability to keep the server running using a private backup generator in the event that a power outage did occur, and minimizing the size of the initial investment, they decided to use a PaaS supplied from Hitachi Cloud Data Center to construct an environment able to handle disasters or power outages.

The system configuration was in the form of a hybrid cloud that linked the university data center and Hitachi Cloud Data Center (see Fig. 8). The web server at the university data center was designated the primary, and the server in Hitachi Cloud Data Center the secondary. Also, a content synchronization server was used to periodically synchronize the data on the primary and secondary servers. Information distribution operates from both servers under normal conditions, but if a power outage or other disaster

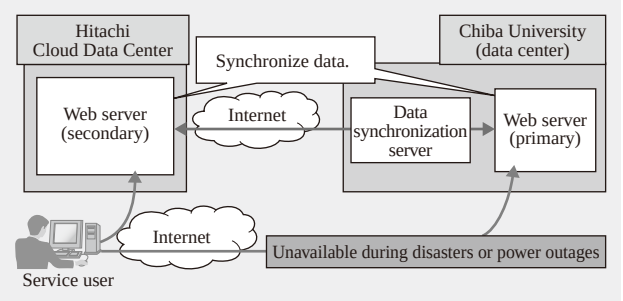


Fig. 8—Example Use of Cloud for Information Distribution at University during Disaster or Power Outage (Chiba University). Chiba University uses a hybrid cloud that links the web servers at its own data center to servers at Hitachi Cloud Data Center to cope with disasters or power outages.

occurs, the secondary server in Hitachi Cloud Data Center can operate on its own.

By using the cloud, it took Chiba University only about two weeks to implement this disaster and power outage preparedness scheme.

HITACHI CLOUD DATA CENTER

There has been a reacknowledgement of the importance of data centers for ensuring business continuity since the Great East Japan Earthquake. The data centers used to provide cloud services are not excluded from the need to provide these services reliably.

This section describes Hitachi Cloud Data Center, which is used as the base for providing Hitachi Cloud Computing Solutions.

Hitachi Cloud Data Center Features

Ensuring that cloud services operate reliably during a disaster is an important factor in maintaining business continuity for customers. Also, ways of minimizing CO_2 emissions to help prevent global warming are in demand around the world.

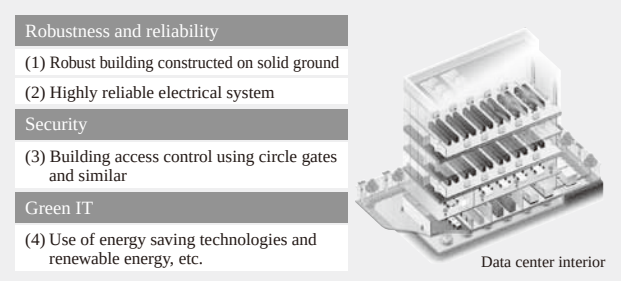


Fig. 9—Hitachi Cloud Data Center Features.
The features of Hitachi Cloud Data Center are "robustness and reliability," "security," and "green IT."

Hitachi Cloud Data Center is designed to have three specific features aimed at reliable operation of cloud services and minimizing CO_2 emissions. These are: "robustness and reliability," "security," and "green IT" (see Fig. 9).

Infrastructure for Reliable Provision of Cloud Services

To ensure that cloud services are supplied reliably, it is important to consider measures for dealing with the risk of system shutdowns due to disasters, human intervention, or other causes.

To deliver cloud services reliably, Hitachi Cloud Data Center adopted the following technologies and products to achieve robustness and reliability as well as a high level of security (see Fig. 10):

(1) Use of seismic isolation mechanisms combined with foundations built directly onto bedrock so that the building's structure is able to withstand the largest earthquake likely to strike the data center site

(2) A highly reliable electrical system based on measures such as using power supplies with a fully redundant configuration

(3) Use of circle gates for building access control with rigorous vein-based authentication and 24-hour monitoring by Hitachi Integrated Control Center

Environmental Considerations

The density of IT equipment installations has risen in recent years, and this has resulted in rising power consumption by the air conditioning required to keep this equipment operating reliably. This has created a demand for more energy-efficient data centers to minimize CO_2 emissions.

Based on the concept of "green IT," Hitachi Cloud Data Center has adopted the following technologies and products to help reduce CO_2 emissions.

(1) Use of efficient air conditioners and optimization of server room air conditioning by using simulations to help decide where to place IT equipment

(2) Use of energy-efficient UPSs (uninterruptible power supplies)

(3) Energy saving measures that utilize the natural environment such as rooftop gardens

Upgrade Plan

Recent years have seen growing demand for reductions in the TCO (total cost of ownership) associated with the operation and administration of information systems. Meanwhile, the arrival of cloud technology is placing steadily increasing demands on data centers, which have become part of the social infrastructure. In particular, the demands being placed on data centers in western Japan have continued to grow since the Great East Japan Earthquake based on concerns such as establishing BCPs (business continuity plans) or putting in place the infrastructure for backups.

Hitachi decided, in June 2011, to build a new dedicated data center building in Okayama Prefecture,

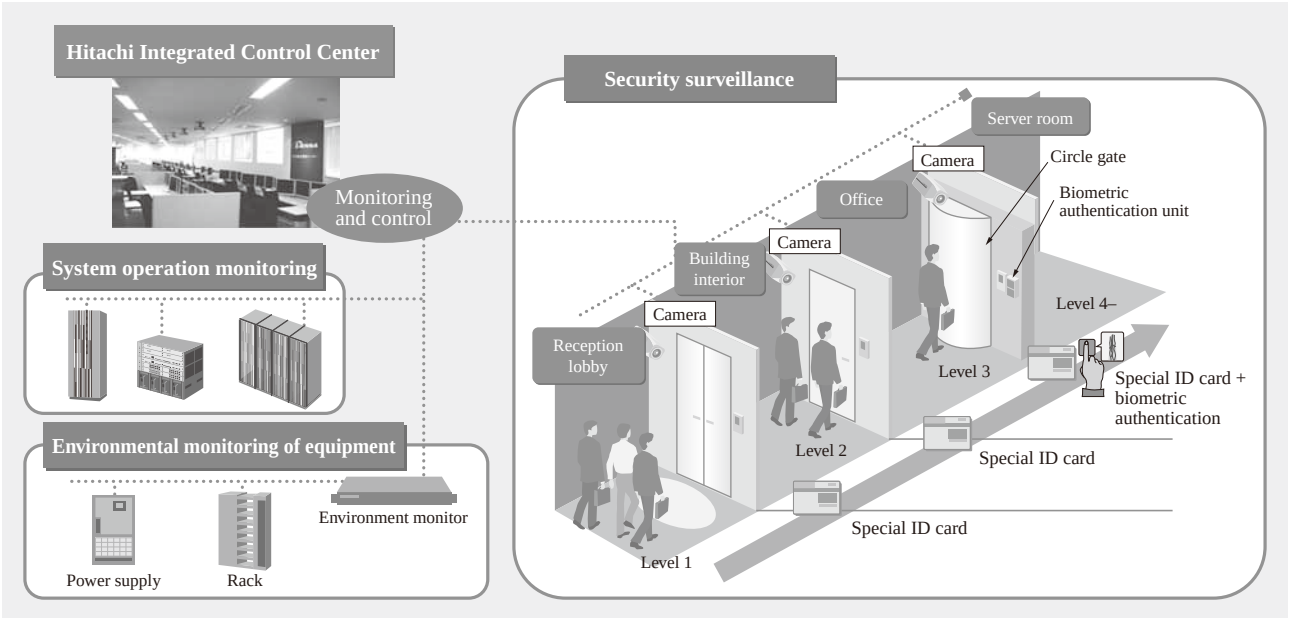


Fig. 10—Technologies and Products for Achieving High Level of Security.
A high level of security is achieved using measures such as centralized monitoring, circle gates, and biometric authentication.

called Hitachi Okayama Center No. 3, in order to provide cloud services with greater security. It has also improved the quality of its cloud services by making its data backup, disaster recovery, and other services more comprehensive and equipping them to deal with disasters, power shortages, and other risks of concern by linking together its data centers around Japan to strengthen their operational framework. For the future, Hitachi intends to expand its services further by linking its data centers (including satellite centers) together and will continue equipping them to be part of the infrastructure of society that supports cloud services.

CONCLUSIONS

This article has described solutions that encourage the evolution of enterprise information systems into hybrid clouds. It has also given examples of hybrid cloud installations and introduced Hitachi Cloud Data Center.

Hitachi intends to continue enhancing its cloud solutions and delivering new value to customers by taking note of the future directions of change, and by applying not only servers, storage, and software, but also the latest technologies, such as networks, for linking data centers together.

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