Information & Communication

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"Modular Data Center" Contributing to Promotion of Green IT by Conserving Power and Space

In recent years, as IT devices have expanded to deal with the explosive increases in data amounts, energy consumption has also skyrocketed. It is predicted that five years from now, domestic data centers will consume twice as much power, requiring the full output of a single power plant in Japan. It is against this background that Hitachi has developed its "modular data center," which optimizes the arrangement of both IT devices and cooling equipment. This type of data center greatly reduces energy consumption while contributing to the promotion of Green IT.

Hideo Sawamoto (left), Senior Staff; Koichi Koyano (right), Senior Engineer, Data Center Energy Saving Facilities Systems Department, Service Business Operation, Enterprise Server Division, Information & Telecommunication Systems Company, Hitachi, Ltd.

Flexible Solutions for Every Data Center Problem

Although in the case of a traditional data center the limit for a single rack of IT (information technology) devices used to be around 4 kW of power consumption, due to the increased levels of performance and integration in IT devices today, now a single rack needs to support devices consuming approximately 10 to 20 kW of power. For this reason, due to the increased power demands of the cooling equipment required to sufficiently cool these IT devices, overall increases in the total power consumed by data centers has become a problem, focusing strong expectations on ways to improve cooling equipment performance.

This is why Hitachi has applied proprietary cooling optimization technology to develop and market racks that optimize cooling efficiency during IT device operation, as well as a "modular data center" with optimal cooling device arrangement. A modular data center enables cooling up to a maximum of 21 kW per rack, while at the same time reducing installation area (floor space) by up to a maximum of approximately 80%,[1] and the air-conditioner power consumed by up to a maximum of approximately 67%,[2] when compared to traditional data center operations. In addition, by creating module patterns, it is possible to reduce construction time by approximately 67%, from the six months required by traditional data centers to two months.

Rack-type Air Conditioners and Simulation Technology are the Key

The basic design of a modular data center features two rows of racks, with floor-installed rack-type air conditioners and IT devices arranged in alternating racks. Based on a box-type data center with boxes 3.6 to 10 m wide and 6.3 m deep, it is possible to construct a data center from module units at minimum approximately 22 m² in volume. In addition, Hitachi has prepared 17 sample arrangement patterns, making it possible to flexibly modify the data center design based on the shape of available space as well as IT device specifications.

Traditional data centers place cooling equipment under double floors to blow cool air with powerful fans, but this method of circulating air requires enormous amounts of energy because the distance air needs to be blown is long, and the need to add cables under the floor makes it difficult to fully implement the required cooling performance. Therefore, the modular data center uses rack-type air conditioners installed on the floor next to the IT devices themselves for focused cooling. This reduces air-conditioner power consumption by approximately 67% while at the same time reducing the amount of space required to store the highly integrated IT devices thanks to improved cooling performance.

The linchpin to this design is an air-conditioning environment consulting service. Hitachi has developed a proprietary air-conditioning environment diagnostic system in order to improve the efficiency of supercomputers by simulating and testing in advance for impediments such as hot spots, thereby optimizing the data center. This makes it possible to maximize cooling efficiency by optimizing the placement of air-conditioners, IT devices, power distribution boards, and other equipment within the module.

Further Energy Conservation is Promoted by Natural Refrigerant Cycling Systems and Monitoring Control Panels

By using the power created when refrigerant is vaporized and rises due to the heat of the servers, as well as the power created when the refrigerant cools, condenses, and falls, Hitachi has developed a proprietary "natural refrigerant cycling system" that does not use compressors or other such engines. The application of this system to a "modular data center" makes it possible to save even more energy at data centers. In addition, a monitoring and control panel is also provided to optimize data center operations. These measures contribute even further to a reduction in facility administrator work and TCO (total cost of ownership).

Collective Efforts of Hitachi are Promoting Green IT

Hitachi has been aggressively working to reduce CO_2 (carbon dioxide) while saving power, and has been strengthening its development of environmentally conscious IT products since 2007, including the implementation of a five-year IT power-saving plan to reduce CO_2 emissions by a total of 330,000 t starting in 2008, as well as an Eco-friendly Datacenter Project that aims to improve overall data center power efficiency with the goal of reducing power consumption by a maximum of up to 50% under 2007 levels by 2012. The development of this modular data center is also a part of this process. Hitachi is uniquely positioned to offer total solutions, from servers to cooling equipment, and consulting services. Every company in Hitachi will continue pooling resources in order to promote Green IT into the future.

[1] When compared with the installation of 320-kW systems and conventional data centers using wall-installed air conditioners.
[2] Hitachi's calculation based on data from Japan Electronics and Information Technology Industries Association (JEITA) in June 2009.

The 3rd Yokohama Data Center
—An Environmentally Conscious Data Center

In recent years, as the business conditions surrounding corporations grow increasingly severe, pressure has increased to cut back on investments in the information systems that are mandatory for conducting business, to reduce costs, and to improve business efficiency and other areas. As these corporate requirements have been growing increasingly acute in the utilization of data centers, so too has the focus been growing ever sharper on environmental problems such as global warming, and there is now a strong demand for environmental consciousness at data centers as well.

It is against this background that the Yokohama Data Center has been expanded, with the establishment of a "3rd Yokohama Data Center" in July 2009. This center brings together the collective efforts of the entire Hitachi Group, fully combining robustness and trustworthiness with cutting-edge green IT (information technology) in an environmentally conscious data center. The internally located Hitachi Control Center provides bene-

fits such as uniform management for rapid problem-solving support and complete operations control. In addition, the Harmonious Cloud Center has also been established in order to provide validation and the other services required for the highly reliable and highly secure cloud computing that is essential when it comes to supporting massive corporate operations.

With the establishment of the 3rd Yokohama Data Center, Hitachi will redouble its contributions to the strengthening of user businesses, by providing maximum support for the increasingly demanding corporate requirements placed on data center services.
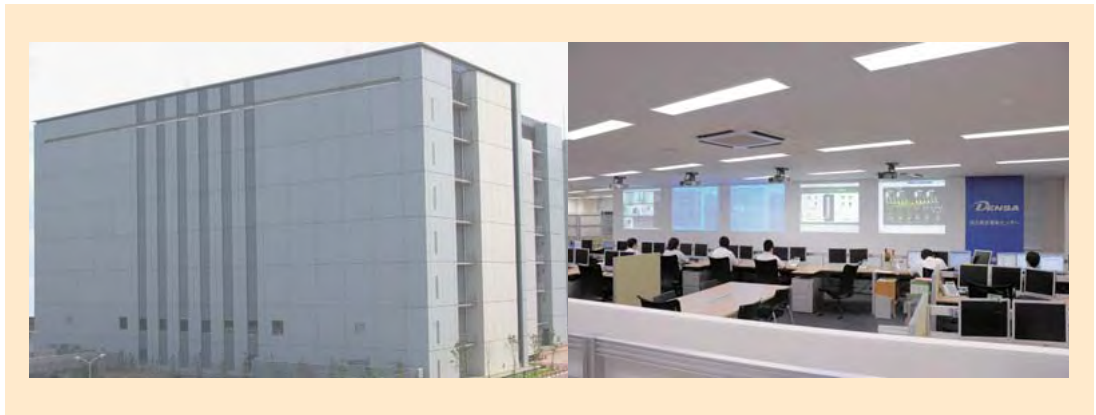
Exterior of the 3rd Yokohama Data Center (left) and Hitachi Control Center (right)

Global Initiatives in Finger Vein Technology

Over the last five years, biometric authentication has been widely introduced by Japanese banks to prevent fraud using ATMs (automated teller machines). Approximately 80% of banks have chosen Hitachi's finger vein technology over other forms of biometrics such as fingerprints, for its superior accuracy, ease of use, and security. Today, the advantages of finger vein technology are becoming even more widely recognized around the world, and Hitachi has been partnering with global security solution providers to deliver finger vein-based solutions for customers worldwide.

Sagem Sécurité (Safran Group), one of the world's leading suppliers of identity systems, which is headquartered in France, is partnering with Hitachi to jointly develop a multi-modal biometric module. By combining the best of Sagem Sécurité's fingerprint identification technology and Hitachi's vein imaging technology, the new module is designed to achieve unrivalled levels of accuracy and security. This development is being geared for mass roll-out in 2010.
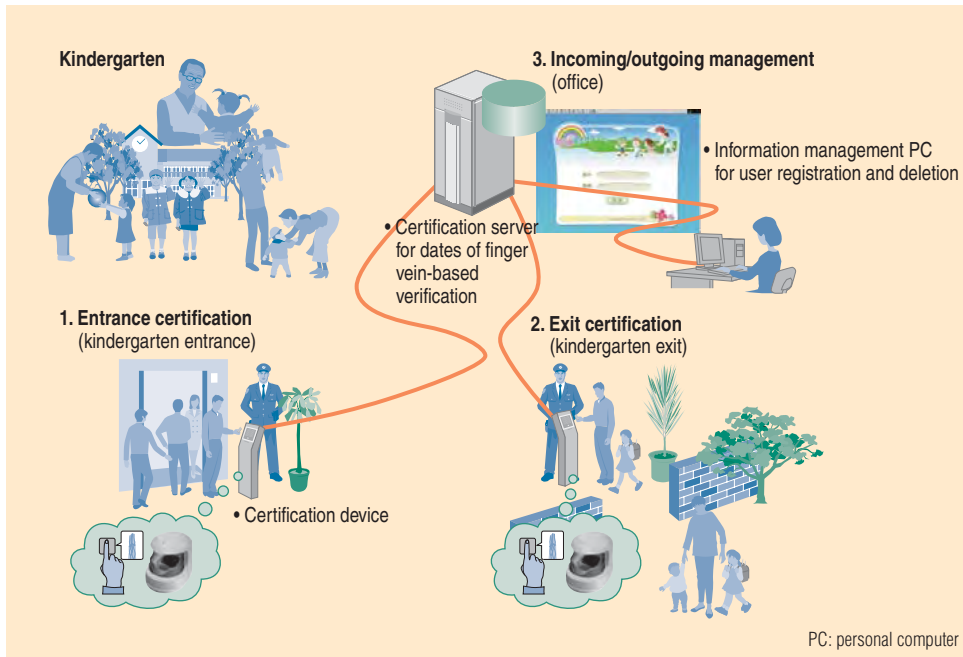
Easydentic Group, a major European player in innovative corporate security technologies, is using Hitachi's finger vein module in their physical access control systems. Easydentic Group chose finger vein technology because it is easy to incorporate into their solutions, is user-friendly, and offers a high level of security.

L-1 Identity Solutions, one of the largest identity management solution providers in the USA and Canada, is developing a physical access control product based on Hitachi's finger vein module. The characteristics of finger vein technology are expected to enhance the convenience and security of their new product, which is planned for release in 2010.

Hitachi will continue to take initiatives worldwide while expanding its finger vein-based solutions in the global market.

First multi-modal device (fingerprint and finger vein) (left) and finger vein-based physical access control system (right)

Promotion of Finger Vein-based Solutions in the Chinese Market

Kindergarten

3. Incoming/outgoing management (office)

• Information management PC for user registration and deletion

• Certification server for dates of finger vein-based verification

1. Entrance certification (kindergarten entrance)

2. Exit certification (kindergarten exit)

• Certification device

PC: personal computer

Kindergarten student pick-up and drop-off system

In China, Hitachi (China) Ltd. and Hitachi Beijing Tech Information Systems Co., Ltd. began selling finger vein-based solutions starting in 2008. For instance, developed finger vein-based solutions include personal information confirmation systems, timecard management systems, and kindergarten student pick-up and drop-off systems that connect with the SMS (short message service) functions of mobile phones. These solutions are sold to local companies and kindergartens.

The Chinese government promoted the fusion of industrialization and information technology as a key measure in 2009, along with the enhancement of information security. Therefore, the interest level regarding high-security IT (information technology) solutions such as finger vein-based solutions is increasing.

Hitachi is now reinforcing its sales network with local distributors in China and taking actions to bolster its presence in both public and private sectors, while aiming to become the de facto standard solution for biometric authentication security solutions in China.

Financial Applications of Finger Vein Technology

Hitachi-Omron Terminal Solutions, Corporation produces ATMs (automated teller machines) that have finger vein readers.

Since 2005, finger vein biometrics has always been the best choice for quality financial institutions in Japan.

The number of criminal cases has been dramatically decreasing since 2005.

[Features of finger vein biometrics]

(1) High availability

Accepts a very wide range of the user population, regardless of occupation, living habit, environmental conditions, and so on.

(2) High accuracy

The chance of false acceptance is considerably low.

If T-FMR (transactional false match rate) is between 0.01% and 0.1%, T-FNMR (transactional false non-match rate) is less than 1% according to evaluation by International Biometric Group (IBG).

(3) Ideal for:

User populations with a large variety of ages, occupations, living habits, ethnic backgrounds, and so on

Applications in the public sector, financial services, and so on

[Finger vein application products]

Hitachi-Omron Terminal Solutions produces finger vein modules for a variety of terminals. These biometric modules are supplied not only for Hitachi-Omron Terminal Solutions ATMs but also for its partners' security products.

With the high availability and high security of finger vein biometrics, applications are expanding to an even wider range of fields. (Hitachi-Omron Terminal Solutions, Corporation)


ATM with finger vein reader

Enterprise Grid Solution for the Core Systems of Financial Institutions

Ever since the financial crisis of 2008, enterprise grids have been attracting attention as a means of effectively utilizing IT (information technology) resources. The Enterprise Grid Solution announced in September 2009 specializes in batch processes that can handle a wide range of grid-based application needs, by supporting the construction of a grid infrastructure that can execute multiple differing business applications under a single environment.

Component technologies include process control for the parallel execution of computational processes, and data control that achieves high-speed access by manipulating data in memory. By offering core systems a mechanism for maintaining the trustworthiness they demand, an environment is provided based on these technologies that enables the efficient use of IT resources within the corporation.
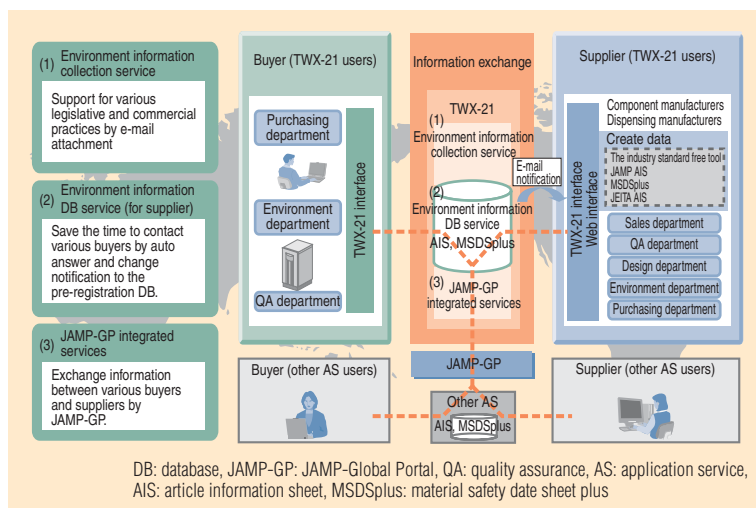
Also, when it comes to the construction of a grid infrastructure, everything from consulting to construction, operation, and maintenance is provided in a consistent manner.

As the demand for faster processing and lower IT costs grows even
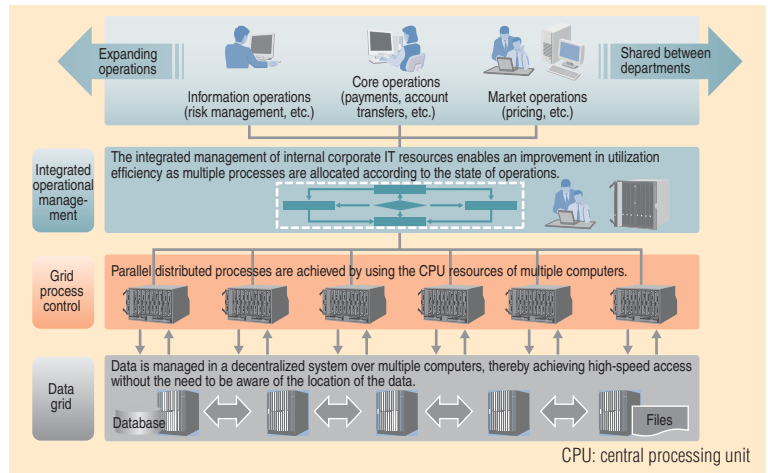
Enterprise grid configuration overview

further in the future, the Enterprise Grid Solution will be ready to serve as a trump card solution for applications in a variety of different corporate sectors.

Environment Information Exchange Services Supporting Compliance with the REACH Regulation
—The Latest SaaS Business Application Services of TWX-21

DB: database, JAMP-GP: JAMP-Global Portal, QA: quality assurance, AS: application service, AIS: article information sheet, MSDSplus: material safety date sheet plus

The environment information exchange service of TWX-21

Hitachi has developed the SaaS (software as a service) business application services, which support compliance with the REACH (Registration, Evaluation, Authorization and Restriction of Chemicals) regulation and other global chemical substance management regulations.

These services offer efficient environmental information format creation, seamless information exchange, and management and collection between companies, and were introduced in July 2009 as the latest part of TWX-21.

TWX-21 (enterprises business media services) is the umbrella

term referring to B2B EC (business to business e-commerce) services in manufacturing by Hitachi, which provides various SaaS business application services to 40,000 customer companies worldwide.

First, Hitachi has worked with its suppliers in order to develop the services' features for environment information exchange and collection, by applying market-leading experience and know-how as a manufacturer.

Second, these services enable the creation and exchange of Joint Article Management Promotion-consortium (JAMP) and other industry-standard formats. The services are also available using the same registered ID (identification data), screen image and operational environment as other services of TWX-21, such as the Japan Electronics and Information Technology Industries Association (JEITA) industry standard EDI (electronic data interchange) service and the specifications exchange service.

Finally, customers can reduce initial costs by using industry-standard free tools for creating or collecting data themselves. Customers can also add the format creation, collection and management functions of TWX-21 after initial implementation. Moreover, these services will become available in English and Chinese in 2010.

Hitachi continues to enhance these services by applying user requirements through help desks, user forums, and activities as a member of several organizations within the industry, while supporting customers in adapting to changing global chemical substance management regulations.

Sumitomo Chemical Co., Ltd.'s Next-generation Chemical Safety Information Management Database System Based on the SAP EHS Management Platform
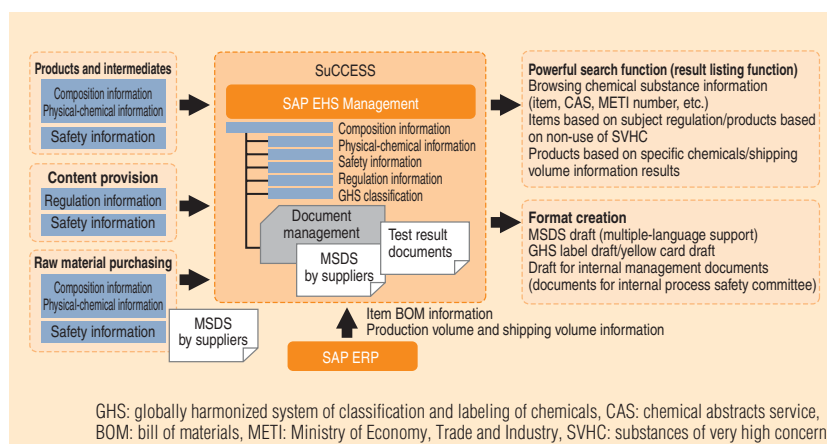
Sumitomo Chemical Co., Ltd. had been conducting risk assessment and taking management measures in order to ensure safety throughout the entire lifecycle, by using custom-built systems with multiple databases.

However, Sumitomo Chemical has also created and implemented an internal database system for the integration and management of chemical safety information [SuCCESS (Sumitomo Chemical Comprehensive Environmental, Health & Safety Management System)].

Using a wealth of data accumulated over many years, SuCCESS enables the unification of management information about safety and applicable regulations, as well as MSDS (material safety data sheet) for all the chemical substances Sumitomo Chemical handles, thus allowing all employees to access necessary information through the company intranet and utilize it for chemical risk management.

As an implementation partner, Hitachi developed this system by applying its accumulated know-how for environmental and safety management, expertise in various systems in the chemical industry, and vast experience in deploying SAP ERP (enterprise resource planning) solutions.

This system is based on the SAP EHS (environment, health, and safety) Management platform, which has been installed by many major chemical companies in the USA and Europe that are expanding their business globally. Sumitomo Chemical is the first Japanese chemical company to adopt and operate the SAP EHS Management platform, which allows it to use a system that is able to accommodate the laws and languages of all regions in which the company conducts business.

Hitachi will continue making contributions to its customers by offering various solutions for environmental and safety management.

Outline of the next-generation chemical safety information management database system of Sumitomo Chemical Co., Ltd.

Job Management Partner 1: Flexibility and Scalability for IT Strategy in this Age of Change
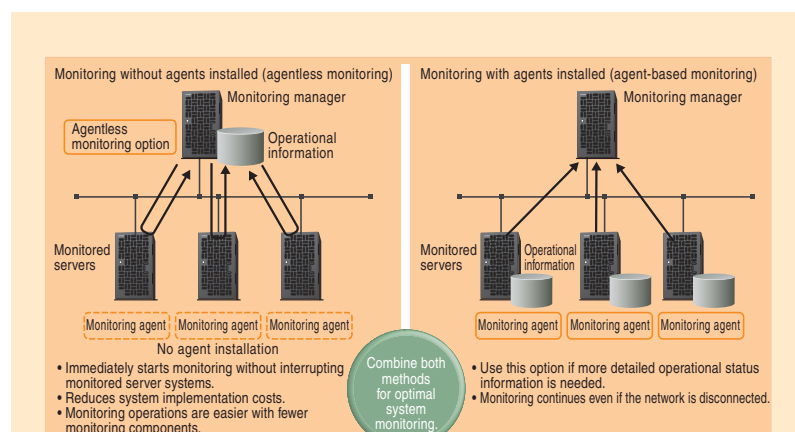
Utilizing the self-monitoring capabilities increasingly built into server components, JP1's new agentless monitoring feature can be combined with the detailed data that is available with an installed JP1 monitoring agent to provide greatly improved server monitoring of an IT infrastructure.

Utilizing agentless and agent-based monitoring

result, companies must vigorously engage in a review of their IT (information technology) infrastructures in order to address ongoing changes.

To help companies build IT infrastructures that can cope with this age of change, JP1 (job management partner 1), an integrated system management suite, has added agentless* monitoring capabilities to version 9 in order to comprehensively support the system operations of our customers.

JP1 V9 implements agentless monitoring to provide customers with immediate access to the operational status of remote servers. Agentless monitoring and conventional agent-based monitoring can be flexibly combined according to the needs of the server, for instance by having agentless monitoring check basic performance while the agent captures detailed information, thereby helping our customers optimize their business.

In this age of change, companies need to continuously evolve their strategies in response to the demands of business. As a

* The agentless tool does not require additional software on clients to operate properly.

SOA (service-oriented architecture) Platform
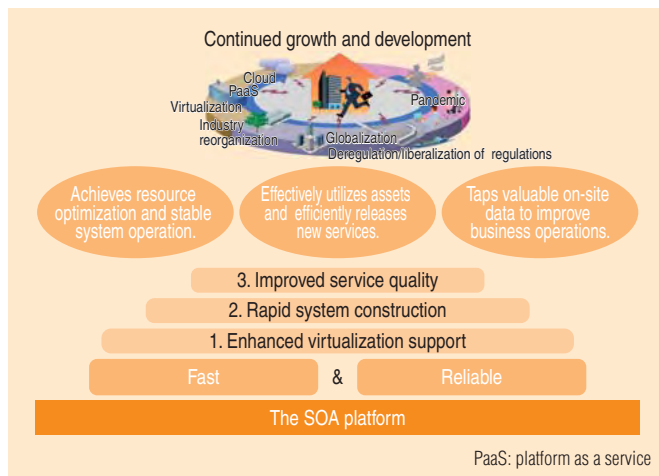
Conceptual diagram of the SOA platform

In order to deal with the rapidly changing business conditions of recent years, corporations have been raising expectations for information systems that can enable rapid transitioning from business strategy to execution. The SOA platform is a family of middleware products for constructing information systems, and the latest version (announced in January 2010 in Japan) offers even more powerful functions to build highly reliable corporate information systems quickly.

[Key features]

(1) Enhanced virtualization support

Our SOA platform provides functions to support the design, construction, and operation of increasingly complex systems by applying virtualization technology. These functions make it possible to secure the flexibility that is a benefit of virtualization while simultaneously increasing system reliability.

(2) Rapid system construction

Functions are provided to offer benefits such as an increase in connectivity between existing systems and new systems, thereby maximizing the utility of the existing systems. These functions make it possible to improve the user's productivity in developing systems.

(3) Improved service quality

A variety of different functions are provided that help improve the quality of services, such as real-time analysis functions that can handle tremendous amounts of data, NGN (next-generation network) linkage functions, and others.

The SOA platform will continue to enhance its functions into the future, as a system infrastructure for the cloud era.

Modular Data Center

A modular data center improves the cooling efficiency of air conditioning systems in order to reduce energy consumption. Data centers designed in this way can save both electricity and space, thereby making it possible to implement servers, storage, and other IT (information technology) devices with a high density level.

Racks of IT equipment and rack-type air conditioners are arranged based on a numerical analysis simulator for airflow and temperature conducted by an air conditioning environment consulting service that utilizes Hitachi's proprietary cooling technology. This makes it possible to conserve electricity for cooling up to a maximum improvement of approximately 67% over previous cooling facilities,[*1] while reducing the floor space required by up to a maximum of approximately 80% through the concentration of IT devices in racks.[*2] Modules can be installed starting with a minimum of approximately 22 m^2,[*3] and flexible expansion according to user needs is possible. The optimization and packaging of data center facilities can also reduce construction time from the previous six months to two months, for a reduction of approximately 67%.

In addition, Hitachi has developed a proprietary "refrigerant natural circulation system" that does not use compressors or pumps by using the power created when refrigerant is vaporized and rises due to the heat of the servers, as well as the power created when the refrigerant cools, condenses, and falls. This system makes it possible to save even more energy at data centers. In addition, a monitoring and control panel is also provided to optimize data
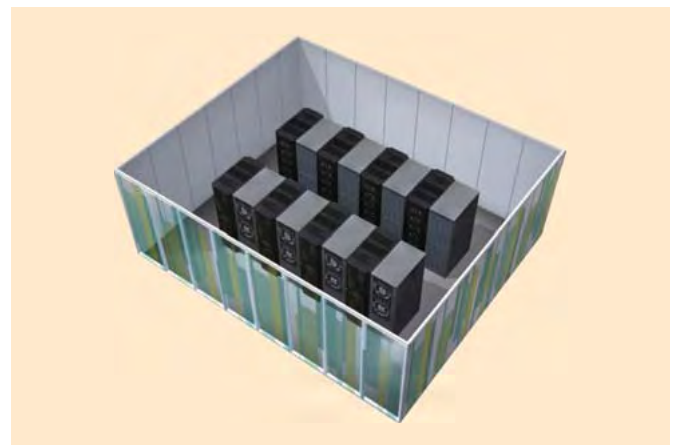
Modular data center

center operations. These measures contribute to a reduction in facility administrator work and TCO (total cost of ownership).

Hitachi is a one-stop modular data center solution provider, offering everything from consultation to construction and maintenance support.

*1 Hitachi's calculation based on data from Japan Electronics and Information Technology Industries Association (JEITA) in June 2009.
*2 When compared with the installation of 320-kW systems and conventional data centers using wall-installed air conditioners.
*3 The size of a module is 6.3 m × 3.6 m (approximately 22 m^2).

Server Platform Overview

Hitachi offers a variety of computer products ranging from client system and PC (personal computer) servers to mainframes and supercomputers and environmentally conscious modular data center systems, using the experience gained over more than 40 years in computer manufacturing.

BladeSymphony is a highly scalable, performance-oriented blade server platform that supports multiple operating systems on Intel Xeon* processors to address the needs of the modern data center. In addition, BladeSymphony is also adopted as a highly reliable cloud infrastructure system due to its high-end UNIX*-level performance, trustworthiness, and flexible expandability.

Hitachi develops its own proprietary mainframes from hardware to middleware as a platform supporting the mission-critical systems used by society and corporations, with the high performance necessary to rapidly process large-scale batches and online services, and the high reliability and availability required to support stable operations.

Enterprise server customers who use the AIX* OS (operating system) can run their mission-critical applications on enterprise UNIX server series machines. The advanced server product line based on Intel Itanium* processors runs HP-UX*. These products offer high performance and virtualization mechanisms for the flexibility needed to support mission-critical services in an open platform environment.

The PC server series uses Xeon or Pentium processors and runs Windows* or Linux*. PC servers with excellent cost performance are used as a front-end layer to small and medium-sized systems, as well as core systems.

Entry-level blade servers provide high performance for large-scale data centers through high density, power conservation, and superior cost performance.

The secure client solution consists of thin clients connected to PC hardware in the data center.

In addition, Hitachi offers modular data center, which provides power and space saving in data center environments.

Overall, whatever the user requires, Hitachi has the appropriate server platform solution.

* See "Trademarks" on page 87.
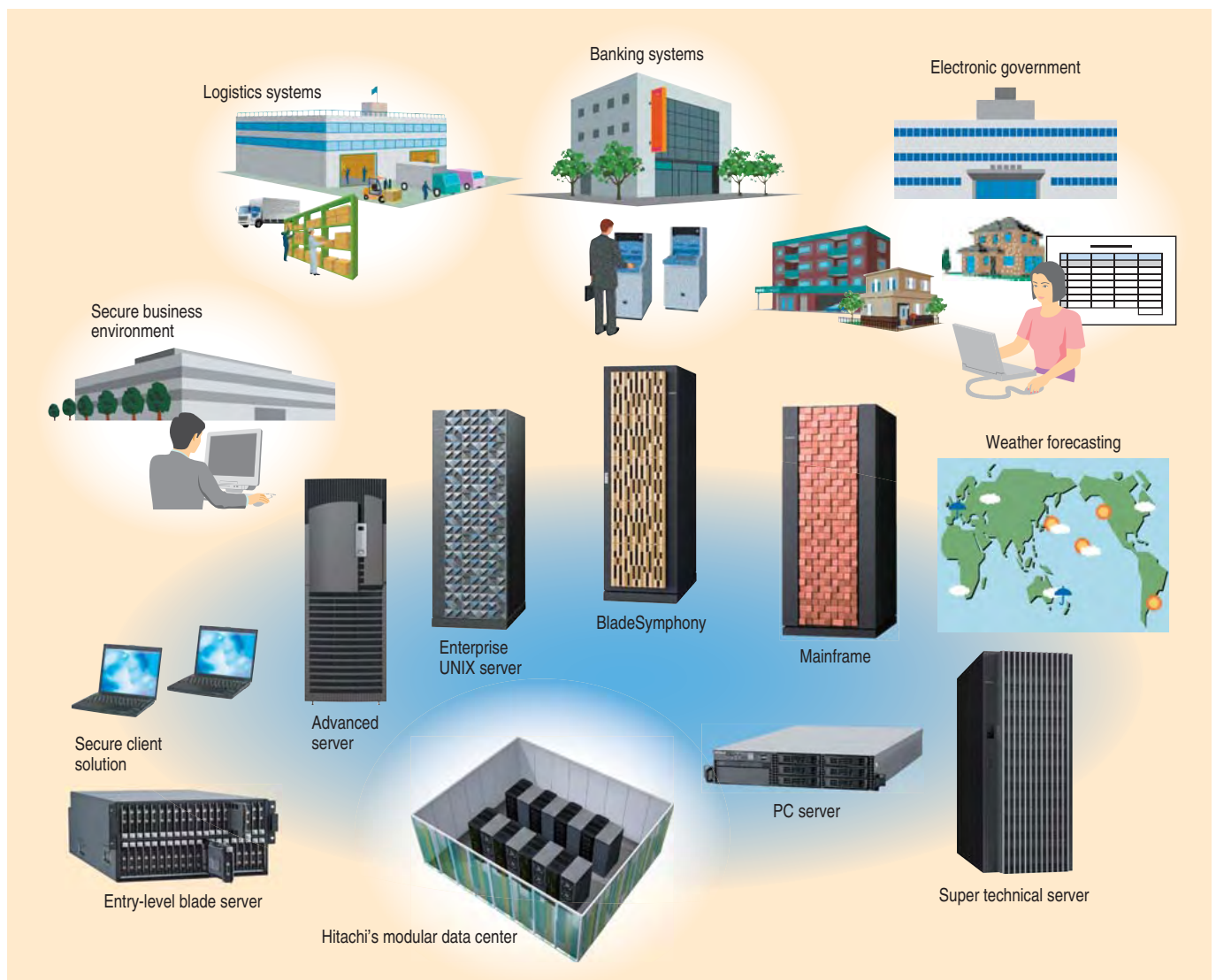
Hitachi server platform for IT (information technology) infrastructures

Hitachi's BladeSymphony Integrated Service Platform

Designed for maximum performance and scalability, BladeSymphony is a highly integrated next-generation IT (information technology) platform for managing not only servers but also storage and network resources. The BladeSymphony Management Suite allows central management of system configurations that include multiple chassis and racks of blade servers. It also allows the various system resources to be managed through a unified dashboard. This provides customers with reduced complexity through integrated management, lower total cost of ownership, and an improved return on investment.

Customers can select the appropriate model according to their specific business needs. For enterprise-class capabilities in mission-critical applications, Hitachi provides the 10-U (about 444.5-mm) high-end blade server (with Intel Xeon processors). For remote office or branch office workloads, Hitachi provides the 6-U (about 266.7-mm) high-density blade server (with Intel Xeon processors). Hitachi also offers many features to help customers meet the challenge of Green IT. These include Hitachi's unique server virtualization feature for efficient server consolidation and Hitachi's world-class 80 PLUS* GOLD certified power supply for lower energy costs.

* See "Trademarks" on page 87.

BladeSymphony integrated service platform

Entry-level Blade Servers and Blade PCs

High-density blade PCs

blades are power units, LAN (local area network) switch modules, control boxes for monitoring operations, and other modules, enabling the construction of a flexible and space-saving system. Management software is also provided in order to support efficient management and operations.

Client consolidation can be achieved by using blade PCs (personal computers), which are also available in the same form factor of 40 blades in 5U* height. By using blade PCs, it becomes possible to apply thin client systems to areas of operation that require high-performance PCs for software development and analysis as well, and this enables the con-

Entry-level blade servers are servers that can be consolidated with a high level of density as front-end servers and distributed process servers, and are suited for use by data center businesses and providers. Entry level blade servers can be arranged such that a single rack has up to a maximum of 320 server blades, thereby reducing installation floor area and power consumption at data centers and other such sites. Inside each base unit used for storing solidation of a wide range of PCs within the corporation. By consolidating the PCs that are spread throughout the corporation into a data center, it becomes possible to provide a high-security client environment while reducing operating costs through highly integrated management with a smaller management burden.

* 1U: 44.45 mm

Hitachi Universal Storage Platform V and Hitachi Universal Storage Platform VM

The Hitachi Universal Storage Platform V and Hitachi Universal Storage Platform VM disk array subsystems for enterprises provide storage virtualization functions using storage controllers.

The Hitachi Universal Volume Manager storage device virtualization function virtually integrates different models of multiple storage devices, thereby simplifying the management and operation of storage. The Hitachi Dynamic Provisioning volume capacity virtualization function makes it possible to define large-sized volumes without depending on the physical storage capacity, thereby removing the necessity for complicated volume capacity designs and greatly reducing the time and effort required for storage capacity planning. In addition, when capacity is added to a disk array, since the operational application data is automatically rearranged, it is possible to prevent the problem whereby data access from a server or other source tends to be biased towards specific drives.

Hitachi Universal Storage Platform V and Hitachi Universal Storage Platform VM disk array subsystems

This makes it possible to further optimize the timing of the addition or reduction of storage capacity during storage installation, and improves the customer's return on storage investment while reducing running costs.

Hitachi Adaptable Modular Storage 2000 Series with Enhanced Support for Data Center Streamlining
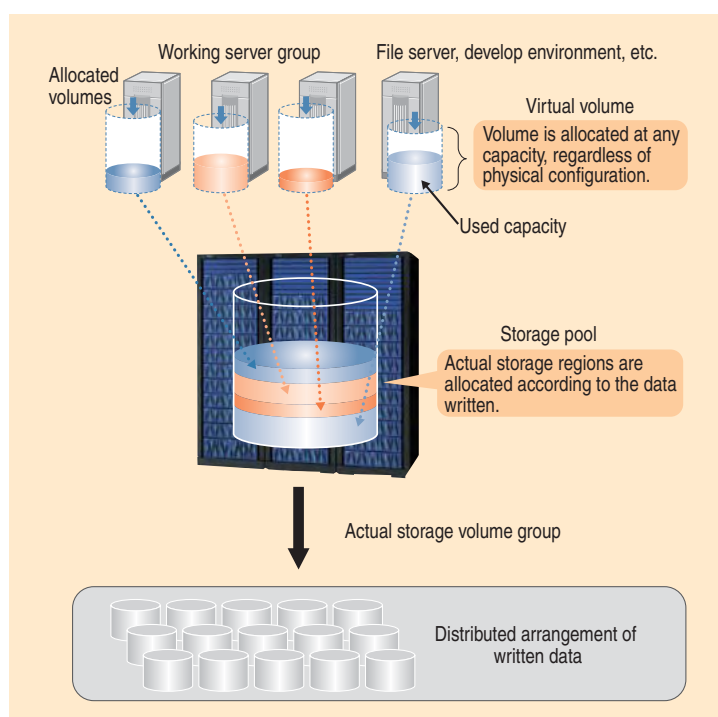
Reduced storage management burden through capacity virtualization

Hitachi Adaptable Modular Storage (AMS) 2000 series of mid-range disk arrays is a product line enhanced with the addition of volume capacity virtualization functions, high-density expansion options, and other features.

The Hitachi Dynamic Provisioning volume capacity virtualization function reduces the complicated design work necessary for volumes and performance, improves disk array capacity usage efficiency, and enables reductions in power consumption. The "high-density expandable housing" achieves a density level that is more than twice as high as previous models, thereby reducing the installation area required for data center equipment.

Through the addition of direct-current power supply models that are mainly required for the systems used by communications businesses, as well as the addition of 8-Gbit/s fibre channel host interface support and AMS2000 series-specific tape replication and other functions, Hitachi will continue strengthening its support for operations that improve data center usage efficiency.

Hitachi Content Platform

Hitachi Content Platform: enabling organizations to adopt cloud services at their own pace

The Hitachi Content Platform is an intelligent and multipurpose content storage solution for rapidly growing amounts of unstructured data. IT (information technology) professionals can use the Hitachi Content Platform to evolve their cloud implementation at their own pace, without adding any other storage islands. It is also possible to segregate data securely within different namespaces.

The Hitachi Content Platform offers many capabilities, including multitenant architecture, object versioning, retention and disposition services, encryption, immutability, a high degree of availability, and search capabilities. These capabilities prevent unauthorized access and support different service level agreements and features for different datasets. The Hitachi Content Platform consolidates archive, cloud and backup functions in one platform. IT professionals can deploy multiple tiers of storage within a single cluster to support a variety of different workloads.

[Key features]

(1) Multiple tenants and namespaces enable different attributes at the tenant and namespace levels to segregate management.

(2) Object versioning allows multiple versions of an object to be stored and accessed.

(3) Multiple storage array support enables the use of multiple different storage arrays as the underlying storage.

(4) An enterprise retention mode allows for the privileged deletion of content and the reduction of retention classes.

(5) A privileged deletion feature allows authorized users to delete content still under retention in enterprise retention mode.

(6) Automatic disposition enables the deletion of content whose retention time has expired at the namespace level.

(7) Single instancing and compression reduce the amount of storage consumed.

Hitachi Storage Command Suite Storage Management Software

The Hitachi Storage Command Suite is a family of products that simplify the operations of storage administrators in a SAN (storage area network) environment. The Hitachi Storage Command Suite features a GUI (graphical user interface) that enables unified and user-friendly operations for the integrated management of storage, even in an environment with multiple storage devices. It also features the ability to manage a heterogeneous environment including virtualized servers, applications, and switches from an operational perspective.

[Key features]

(1) Storage consolidation (reduces operations management costs)

The Hitachi Storage Command Suite simplifies storage management and supports stable storage operation by consolidating the management of storage systems through a unified interface.

(2) Tiered storage (reduces storage costs)

The Hitachi Storage Command Suite supports optimized storage utilization based on the value of data.
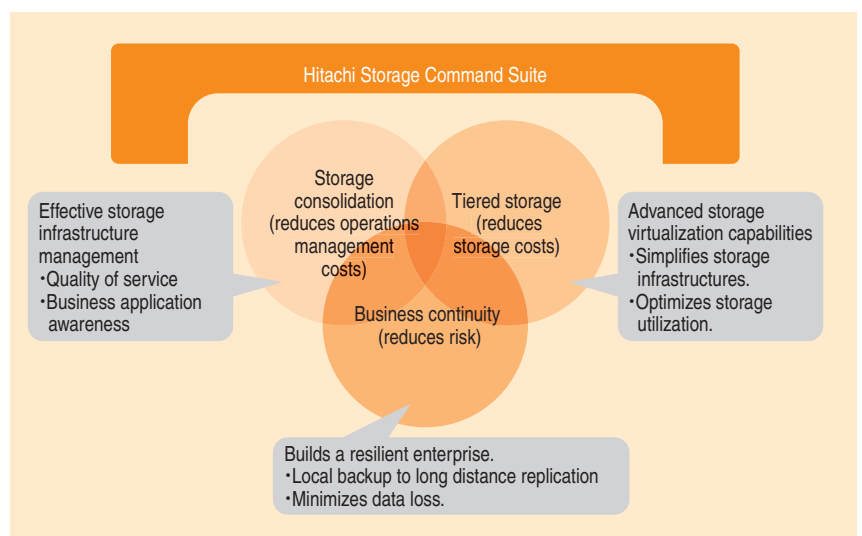
Hitachi Storage Command Suite delivering three key building blocks

(3) Business continuity (reduces risk)

The Hitachi Storage Command Suite supports assured data protection for backup and disaster recovery system solutions.

[Carrier, Access/Transport] Next-generation Mobile Standard LTE-related Products

BBU

RRH
(wireless remote unit)

Gateway unit

ER5000 series base station units

The standardization group The 3rd Generation Partnership Project (3GPP) has developed the next-generation LTE (long term evolution) mobile phone communications standard in order to achieve high-speed data transmission on mobile phones. LTE offers the features described below.

This is why Hitachi has developed the LTE-related ER5000 series of products, which includes network devices such as gateways that connect networks and MME (mobility management entity) devices that manage the movement of gateways and terminals, and base station units such as BBU (base band unit) devices that take care of base band signal processing and RRH (remote radio head: wireless remote unit) devices that handle wireless signals.
[Key features]
(1) High-speed data streams are divided into low-speed data streams that feature a high degree of tolerance to propagation delay, and the data streams are sent over different frequencies using OFDMA (orthogonal frequency division multiple access) technology.
(2) In order to improve communication efficiency, multiple antennas are used to simultaneously send multiple data streams by multiplexing, and the receiver solves simultaneous equations to decode the multiple data streams using MIMO (multi input multi output) technology.
(3) By combining OFDMA and MIMO technologies, the ER5000 series of products achieves high-speed data communications with an upstream maximum of 37 Mbit/s and a downstream maximum of 73 Mbit/s, through the use of 2×2 10-MHz-band MIMO.
Hitachi plans to gradually expand this product family into other fields in the future, while also contributing to the formulation of the "LTE Advanced" next-next-generation standard.

[Carrier, Access/Transport] Next-generation Mobile Standard Mobile WiMAX-related Products

Mobile WiMAX* (worldwide interoperability for microwave access) was developed based on the IEEE 802.16e standard of The Institute of Electrical and Electronics Engineers, Inc. (IEEE) in the USA, and is drawing attention as a means of providing a constant and high-speed environment for accessing networks such as the Internet, even while in motion.
Hitachi is developing products for the entire system based on this standard, including base stations offering the features described below.
[Key features]
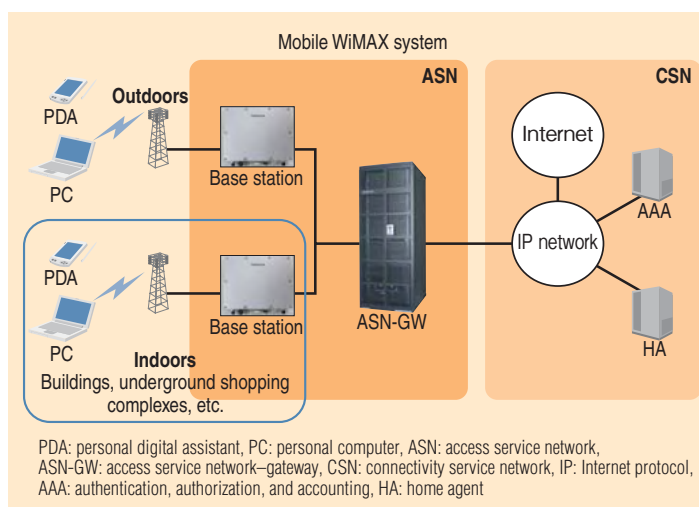(1) Miniaturized outdoor specifications
Miniaturization is achieved in a device designed for outdoor installation (approximately 7 L), while reducing the cost of installation work.
(2) Can be installed either outdoors or indoors.
Even in indoor environments and other places where GPS (global positioning system) antennas cannot be installed, IEEE 1588 is supported in order to allow for the reception of synchronized signals via a LAN (local area network), thereby enabling installation both outdoors and indoors.
(3) Supports a high degree of functionality.
In spite of their miniature size, these base stations have implemented advanced functions such as FFR (fractional frequency reuse), which can reduce interference between adjacent base stations, and CSM (collaborative spatial multiplexing), which

PDA: personal digital assistant, PC: personal computer, ASN: access service network,
ASN-GW: access service network–gateway, CSN: connectivity service network, IP: Internet protocol,
AAA: authentication, authorization, and accounting, HA: home agent

Ultra miniature mobile WiMAX base stations for outdoor use

expands the capacity of the upstream circuit.
Hitachi plans to continue expanding its product line with products supporting the enhanced IEEE 802.16m standard as well, while building on its accomplishments in the Japanese market.

* See "Trademarks" on page 87.

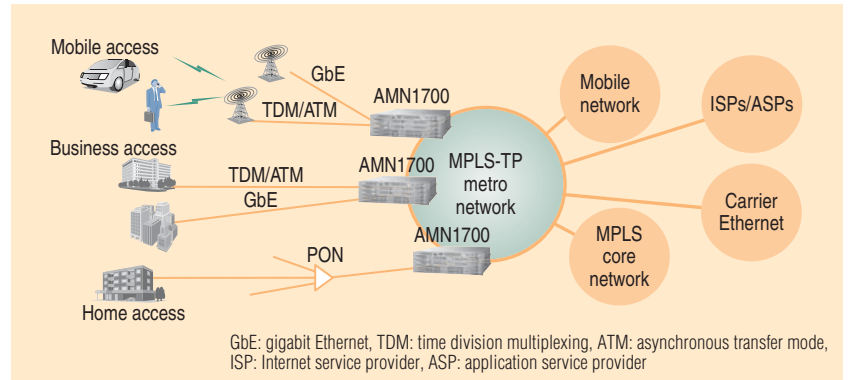# [Carrier, Access/Transport] MPLS Cross-connect Unit AMN1700 Series

This product utilizes the MPLS-TP (multi-protocol label switching—transport profile) standard to achieve a highly reliable transport network that supports various communications services over the Internet, over dedicated lines, and in other networking environments.

[Key features]

(1) A highly reliable IP (Internet protocol) network is made possible by an architecture that separates route control functions from packet transfer functions, and by OAM (operation, administration, and maintenance) functions that achieve high-speed switching.

(2) Functions that emulate the services of previous networks enable efficient integration with the capacities of previously constructed networks by each communications service.
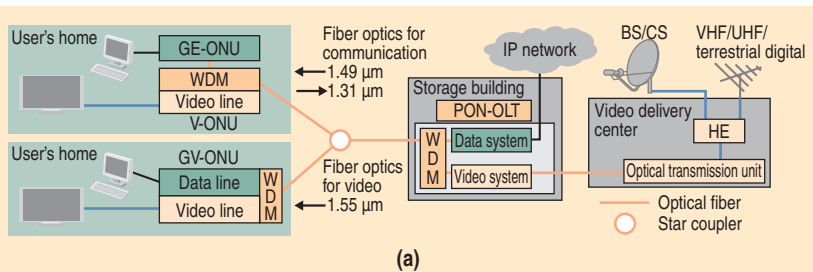
Hitachi plans to add various interfaces such as PON (passive opti-

GbE: gigabit Ethernet, TDM: time division multiplexing, ATM: asynchronous transfer mode, ISP: Internet service provider, ASP: application service provider

Sample configuration of a transport network using the AMN1700 series

cal network), which makes it possible for multiple users to share a single bifurcated optical fiber, while expanding the series product line with increased capacities.

[Carrier, Access/Transport] GV-ONU Optical Network Termination Unit

(a)

Item	Details			
Classification	Dedicated video ONU		Integrated video & data ONU	
Type (installation location and operating temperatures)	Indoor V-ONU (indoors, 0 to 50°C)	Outdoor V-ONU (outdoors, -20 to 50°C)	GV-ONU type 1 (indoors, 0 to 40°C)	GV-ONU type 2 (home gateway installable) (indoors, 0 to 40°C)
Video transmission	ITU-T J.185-compliant FM conversion method			
Data transmission	—	—	Ethernet	
External appearance				
Volume	Approx. 700 cm³	Approx. 1,300 cm³	Approx. 700 cm³	Approx. 1,700 cm³

(b)

GE-ONU: gigabit Ethernet—ONU, WDM: wavelength division multiplexing, V-ONU: video–ONU, PON-OLT: passive optical network—optical line terminal, HE: head end, VHF: very high frequency, UHF: ultra high frequency

Configuration of a video delivery system using the FM conversion method (a) and V-ONU and GV-ONU product deployment and key features (b)

Hitachi commercialized the GV-ONU (GV-optical network unit) optical network termination unit and began delivering the product to Nippon Telegraph and Telephone East Corporation in February 2009. The GV-ONU makes it possible to use a single optical fiber for both video delivery and data communications.

[Key features]

(1) The FM (frequency modulation) conversion method offers a

reduction in the signal degradation that can result from reflection and distortion in the optical transmission path used for video transmission.

(2) The pass-through method's multichannel video output signals can be received directly by the television's internal terrestrial digital/BS (broadcasting satellite) digital/110° CS (communications satellite) tuner.

(3) The four-model lineup includes two previously commercialized dedicated video models (an indoor type and an outdoor type), as well as two GV-ONU models that integrate both video reception and data communication functions. The appropriate model can be selected based on the installation location in the subscriber's house and the use to which the device will be applied.

(4) The GV-ONU, with its remote video reception monitoring and service halt control, can use data communication functions to remotely detect loss of video input signal, to remotely monitor problems in the video reception, and to remotely halt video services, thereby improving the convenience of maintenance tasks.

Further development in FTTH (fiber to the home) services will be the key to the spread of "triple play" services, including high-speed Internet, IP (Internet protocol) telephone, and video delivery, and expectations are high for the usefulness of this device in making this expansion possible.

Storage Devices for the Enterprise

Hitachi began shipping the Ultrastar A7K2000 3.5″ HDD (hard disk drive) storage device for the enterprise in August 2009. In addition, Hitachi is also developing SSD (solid-state drive) products.

(1) 2-Tbyte 3.5″ hard disks

In August 2009, Hitachi began shipping the Ultrastar A7K2000 3.5″ 7,200-RPM (revolutions per minute) hard disk for the enterprise, with an industry-maximum capacity (as of August 2009) of 2 Tbyte.

At 2 Tbyte, this product offers twice the storage capacity of previous products, combining high capacity, high reliability, 7,200 RPM, and a MTBF (mean time between failures) of 1,200,000 hours, all while achieving a balance between product performance and low power consumption. This is the newest product to fully satisfy the exponentially growing demands for capacity in the enterprise data storage market, including cloud computing and large-scale data centers.

In addition, enterprise customers are provided with the option of adding "bulk data encryption," which encrypts user data in the hardware for a level of data security higher than the use of system passwords. Furthermore, the product is environmentally conscious, complying with the RoHS (Restriction of the Use of Certain Hazardous Substances in Electrical and Electronic Equipment) directive and using a halogen-free design.

(2) Solid state drives

Hitachi is also working with Intel Corporation on a joint development project to achieve SSD products for the enterprise that offer extremely high input/output performance, high reliability, and low power consumption.

These SSD products offer either a SAS [serial attached SCSI (small computer system interface)] or FC (fibre channel) interface, and provide I/O (input/output) performance that is 100 times as good as that of a regular hard disk. These products are ideal for applications that demand high-speed response performance, such as financial transaction servers, web servers, cloud computing servers, and others.

In addition, the use of SLC (single level cell) NAND flash memory makes it possible to achieve high reliability, durability, and performance while consuming 60% to 90% less power than that required by a traditional 3.5″ hard disk.

The excellent features of these SSD products greatly improve the performance of data centers, while saving energy and achieving the best possible efficiency in space utilization. These cutting-edge products are opening up a new world for enterprise storage devices.

Hitachi will continue providing product families that support the backbone of storage in this age of cloud computing, by striving to improve performance while increasing the capacity of storage devices for all types of enterprises.

(Hitachi Global Storage Technologies)
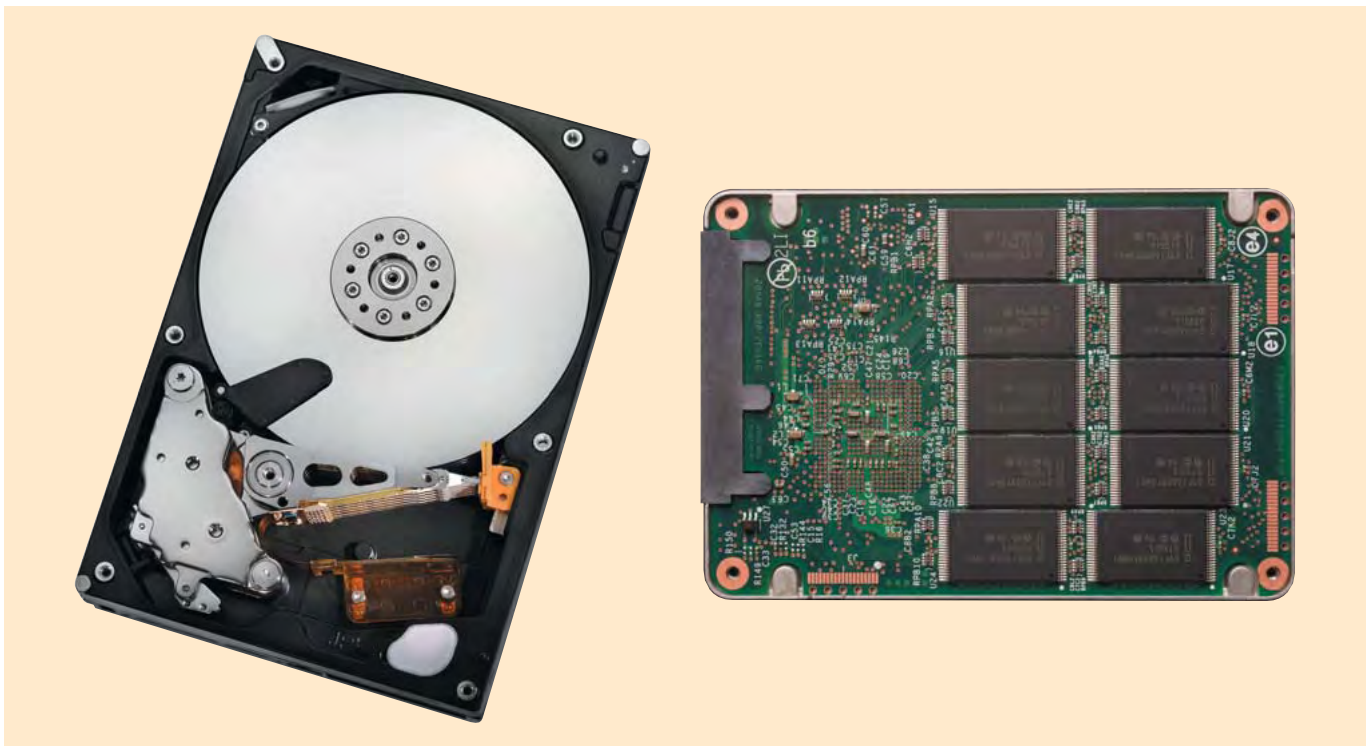
Ultrastar A7K2000 2-Tbyte 3.5" hard disk (left) and internal structure of an SSD product under development (right)

T/R Switch-integrated High-voltage High-speed Pulser IC for Compact Medical Ultrasound Imaging Applications
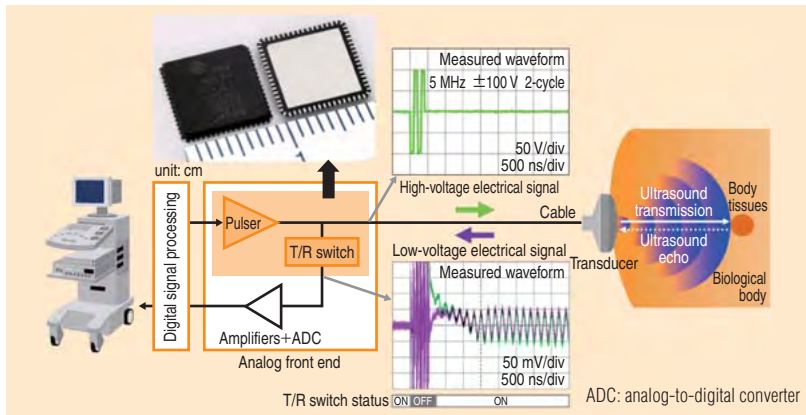
Chip photo and example output waveforms of the pulser IC

A recent trend in front-end circuits for medical ultrasound imaging applications has been to replace numerous discrete components with ICs (integrated circuits). The maturity of mixed-signal IC design techniques and fabrication capabilities has accelerated this trend, particularly in the transmission circuit, and has made it possible to integrate both low-voltage and high-voltage devices onto a single chip.

Hitachi offers a wide selection of integrated high-voltage and high-speed ultrasound pulser ICs, including active T/R (transmit/receive) switch-embedded ICs, for extremely compact and sophisticated systems.

[Key features]

(1) Compact design: Octal/quad channel integration using 250-V SOI (silicon on insulator) MOSFET (metal-oxide semiconductor field-effect transistor) technology is available in a 9 mm×9 mm 64-lead QFN (quad flat non-leaded) package. Each channel consists of a logic interface, level translators, gate drive buffers with selectable embedded/external floating voltage supplies, high-voltage high-current P-channel and N-channel MOSFETs, output blocking high-voltage diodes, noise-cut low-voltage diodes, and an active 10-Ω T/R switch. The ICs also feature four-mode drive current control to reduce power dissipation while facilitating their use in portable applications.

(2) High-performance:±100-V, 2-A pulsing and active 1-A ground clamping for symmetrical bipolar three-level/five-level output waveforms results in low HD2 (second harmonic distortion). Synchronizing input data with a clock signal also improves HD2, delay mismatch, and delay jitter performance.

(3) Suitable for fail-safe systems: The embedded high-voltage slew rate protection, over-voltage protection, and thermal protection prevent IC damage.

(4) Environmentally friendly: RoHS (Restriction of the Use of Certain Hazardous Substances in Electrical and Electronic Equipment) directive-compliant.

High-speed Optical Communication IC with High-speed Low-cost SiGe Bipolar Technology

The demand for faster communications is climbing, as streaming video and other forms of communication over the Internet increase levels of information traffic over fiber-optic networks. This increase is especially marked in the fiber-optics used for local area networks, where a data transmission rate of 100 Gbit/s is demanded on a single fiber, rather than the 40 Gbit/s or 10 Gbit/s now available.

To achieve this 100-Gbit/s transmission rate, four light wave signals each with a different wavelength are used to convey 25 Gbit/s of data per signal. In the 100-Gbit/s optical receiver module that receives these lights, it is necessary to convert the light signal into an electric current with a photodiode, and to convert the current signal into voltage signal output in the semiconductor integrated circuit.

Hitachi has developed a transimpedance amplifier IC (integrated circuit) with SiGe (silicon germanium) bipolar technology for 25-Gbit/s transmission in the 100-Gbit/s optical receiver module. By introducing SiGe epitaxial growth technology into the thin-base formation in the bipolar transistor, ultra high-speed and low noise performance comparable to GaAs (gallium arsenide) com-
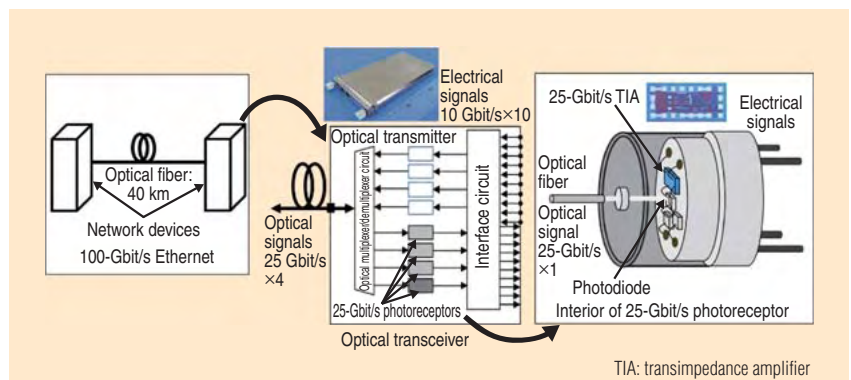

Photo of 25-Gbit/s SiGe bipolar transimpedance amplifier IC (upper right) and configuration

pound devices are achieved at a low cost.

A circuit design technique that suppresses the influence of noise inside or outside the IC makes the best use of the characteristics of this bipolar transistor. The IC size is miniaturized and optimized for the optical receiver module.

Hitachi will continue working to improve these circuit and device technologies while increasing transmission speeds and lowering system costs even further.