

# **Report of Study Group on Revitalization Policies of Data Centers in the Cloud Computing Age**

Study Group on Revitalization Policies of Data Centers  
in the Cloud Computing Age

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## ● Introduction

Japan has an environment in place that enables extremely smooth distribution of information as the globally most advanced information and communications infrastructure has been developed which, according to an ITU Internet Report of 2006, enables the highest speed broadband services to be provided at the lowest cost in the world, etc. This has resulted in the nominal GDP of the information and communications industry exceeding 95 trillion yen, or approximately 10% of nominal GDP of all industries in Japan. At the same time information and communications play a core role in social and economic activities in Japan as their contribution to actual GDP growth over 2003 to 2007 reached approximately 34%. In addition, internet traffic in Japan reached 1.36 terabits/second, or that an amount of information equivalent to approximately 3.10 million DVDs is being exchanged over the internet every day. Social and economic activities therefore very much depend on use of information and communications.

Because of these circumstances an environment through which data can be stored at extremely low cost without needing to be aware of where it is physically stored is now available for use via the development of cloud computing technologies that enable the provision of effectively combined extremely large-scale information systems via information and communications networks. The cost of processing information via information and communications networks and providing services has also been significantly reduced through a significant reduction in the cost of communications via the development of the abovementioned information and communications infrastructure and a significant reduction in the cost of storing, processing, and using information via the development of cloud computing technologies. This has then resulted in opportunities to further develop the information and communications industry.

In contrast however, data centers, which are used to store and distribute the data, have been the focus of global competition. Data can now be freely and globally handled via use of information and communications networks wherever it is actually stored, with information therefore trending to be amassed at easier to use or low cost data centers. At the same time data centers can easily take advantage of the benefit of scale and thus greater aggregation results in a lower cost or the provision of more diverse services, etc., thereby further strengthening their competitiveness. A small difference in current competitiveness could therefore become significant in the next few years.

However, Japan is not necessarily considered to be ideally located for data centers by global data center users and the provision of services using new technologies such as cloud computing technologies, etc. have been falling behind other leading countries. In actuality cases in which users in Japan are being provided with services using data centers established overseas (hereinafter referred to as “overseas data centers”) are rapidly increasing (increased inflow of data). This has resulted in the inflow traffic from overseas to Japan accounting for over 40% of internet traffic in Japan.

This then results in the issues of: in spite of data traffic originating at overseas data centers it does

not profit telecommunications carriers in Japan as they have to invest in equipment to handle the traffic and the cost can get shifted to domestic communication charges, domestic laws are basically not applicable to data originating from overseas data centers, while information aggregation can be a unifying force in the creation of new economic activities data being stored overseas makes business creation in Japan difficult, and sites for developing engineers capable of establishing/operating large scale systems and analyzing massive amounts of data will be lost, etc. Modern society with its advanced information technologies requires the creation of new industries through aggregating information and analyzing it, in particular with further developments, thus making the data centers that are the aggregation points of information more and more important.

Utilization of domestically established data centers (hereinafter referred to as “domestic data centers”) is therefore necessary in improving the international competitiveness of information and communications industry in Japan and protecting the rights of users of services provided by data centers.

At the same time, and with changes in the ICT environments that are currently taking place mainly at data centers, the realization of balanced development of both data centers and information and communications networks, which are the bases for information and communications industries in Japan, will require clarification of any obstructive technological and systematic factors and the promotion of measures in a timely manner in enabling domestic aggregation of information needed in maintaining the economic competitiveness of Japan.

For these reasons the Study Group has held discussions aimed at strengthening the international competitiveness of domestic data centers and developing environments in which services can be used worry free. The expectation of the Study Group is that information and communications in Japan will further develop with consideration given to these discussions.

# 1. Background of discussions

With services provided via information and communications networks the information requested by users of the services is generated by systems connected to information and communications networks before being sent to the users. The computers that the systems that generate the information are generally known as “servers”, with the services provided thus depending on the information that can be generated by those servers. The servers are aggregated at “data centers”. Data centers comprised of servers, which are the key to service provision, inevitably have been the base for providing diverse services via information and communications networks and for aggregating massive amounts of information, and thus play an extremely important role in both information and communications networks and information and communications industry, which are inseparable.

Servers initially established at data centers consisted of large-scale expensive computers known as “general purpose computers” or “mainframes”, and require a number of engineers to use/operate them. After going through several changes with trends that have taken place in downsizing and open system utilization resulting in a rapid increase in the speed and performance of computers servers have become of relatively low cost, despite being of high speed and performance, and an environment for providing diverse services at low cost thus developed.

In addition, the development of information and communications networks, including the internet, have enabled extremely large volumes of information to be exchanged via information and communications networks extremely fast and at low cost, thus eliminating obstacles in processing massive amounts of information via information and communications networks. Furthermore, communications charge systems that do not depend on the distance of communication have grown in popularity. This has resulted in the creation of an environment in which servers located at remote sites can be utilized at no cost disadvantage.

This situation has enabled a method of using servers known as “cloud computing” to emerge that enable users to use services without actually being aware of the existence of the servers, while also enabling service providers to more freely select locations to establish servers. However, data centers therefore are being subjected to greater global competition.

The physical location of the servers, or where the data centers are actually located, can have a significant impact on not only the development of the information and communications industry but also the competitiveness of domestic industries utilizing information and communications technologies, thus resulting in improving the competitiveness of data centers in Japan being necessary. Measures for its revitalization will therefore be discussed.

## 1.1 Data centers

“Data centers” is used to collectively refer to the “facilities” they are comprised of, including the buildings and rooms, etc., used to accommodate the servers, etc. (refers to servers and accompanying

communication devices, power supply equipment, etc.; hereinafter the same) and the actual servers, etc. accommodated therein. Conventionally special facilities with the power supply, air conditioning equipment, and conduits for communications networks required in operating special devices such as “general purpose computers” and “mainframes” have been called data centers. At present, however, servers have decreased in size and can thus be operated from general offices, although the typical practice involves accommodating them in data centers where multiple servers can be established. The facilities and servers, etc. are occasionally established by different parties, in which case the facilities alone can be called data centers (data centers in the narrowest sense).

In addition, various services are provided using data centers.

For example, a service that involves facilities used to accommodate servers, etc. being rented out is called “housing” or “collocation”, and are one of the basic services provided using data centers. In addition, a service that involves servers, etc. accommodated in data centers called “hosting” being rented out is also very common. Conventionally large-scale computers accommodated in data centers were extremely expensive, thus making it very difficult for anyone wishing to utilize one to buy. Time sharing in which a computer is used by multiple users allotted different times was therefore common, with “hosting” being regarded as a service that is an extension of that. “Hosting” services can be directly provided by owners of facilities or parties who have established servers, etc. at facilities rented via housing services, etc. In the latter case the said parties are called “users of housing services” but at the same time “providers of hosting services”, thus playing the roles of being both the user and provider of data centers.

With “hosting” services, in addition to renting servers, etc. per device, services for renting out part of the functions of servers, etc. called “virtual hosting” or “HaaS (Hardware as a Service)” are also available.

Furthermore, the development of information and communications technologies in recent years has resulted in services being available that provide the information processing functions of software running on servers alone called “ASP (Application Service Provider)” and “SaaS (Software as a Service)” growing in popularity. Users of ASP and SaaS can utilize services via information and communications networks without any concern about setting/operating servers, etc. This is the most common service provided to end users, including general consumers. ASP and SaaS can also be made directly available by facility owners or parties that have established servers, etc. via facilities rented through housing services, etc. In the latter case it should be noted that the parties have an extremely high degree of freedom in providing services because they do not own the facilities themselves.

The Study Group involves discussion of measures for use in disseminating the revitalization of “data centers” in the narrowest sense and measures for revitalizing “data centers” in a broader sense (provision of services through “data centers” in the narrowest sense being their domestic establishment).

In this report “data centers” is used to refer to “data centers” in the narrowest sense, or facilities,

“data center businesses” to businesses that provide a variety of services via “data centers” in the narrowest sense, “data center business operators” to anyone engaged in the said businesses, and “data center users” to anyone using the services provided by data center business operators.

## 1.2 Cloud computing

A common understanding was reached through discussions held by the Study Group that at present no general definition for “cloud computing” exists. Or, that is, it would be appropriate to consider “cloud computing” as an overall computing trend rather than as any specific method used to provide services via information and communications networks.

Discussions at the Study Group therefore took place on defining, as a matter of convenience, cloud computing as a “form of providing services” to be as follows:

- [1] a method of providing some form of services using data centers, and
- [2] service providers providing information processing devices and information processing functions to third parties (users) but
- [3] with users not needing to be aware of where the facilities the services are being provided from are or which devices the services are provided by.

Services via information and communications networks are conventionally provided in such a way that end users explicitly access “devices” known as “servers” via networks. In contrast to this cloud computing involves the characteristic that end users are only aware of the actual “services” provided via networks but not the devices that are actually used to provide the services.

In this case users may “not be able to identify which devices services are being provided from” or “not able to identify which facilities services are being provided from”, depending on the method used to provide the pertinent service. Furthermore, as described in Chapter 2, service providers also may “not be able to identify which devices services are being provided from” or “not able to identify which facilities services are being provided from” with regard to the services that they provide to end users.

In addition, cloud computing has the characteristic of being a “service that can be provided to end users globally from a single system via use of the internet”. This then results in the enablement of the “provision of services in a flexible manner with a high level of scalability at low cost through large-scale facilities and devices being shared by an extremely large number of end users”. Even greater advantages of scale can be achieved with even more aggregation, and hence larger scale data centers can provide more flexible services at lower cost. This has become a factor in the facilitation of more aggregated large-scale data centers. In addition, transferring large scale data centers requires the establishment of new data centers of the same or larger scale, but once large-scale data centers have been established the scale of them tends to grow even larger, thus making transfer to other regions difficult.

The progress of globalization in social and economic activities and international division of labor,

however, have resulted in distributed data centers being available when selecting appropriate data centers whenever necessary from data centers established in multiple regions via utilization of the characteristic that no specific devices are necessary in the provision of services. This then enables the users of data centers providing global services to continue using the services even if data centers in specific regions have become unavailable due to disasters, etc.

It should be noted that large-scale business operators providing global services from overseas using cloud computing technologies are of very high competitiveness through having acquired the necessary skills to establish/operate systems that provide flexible and highly scalable services at low cost, and have secured high business continuity by constructing large scale data centers in multiple locations worldwide.

### **1.3 Importance of data centers**

As described above the services provided via information and communications networks are implemented via the distribution of information generated by servers, etc. established at data centers to end users through use of information and communications networks. Data centers are therefore an extremely important part of the infrastructure that is essential in implementing the provision of services to an information and communications based society.

In addition, data centers are the base from which the services are implemented, thus making the active provision of various services using data centers and development of information and communications industry extremely difficult without sufficient revitalization of domestic data centers. At the same time modern society has access to advanced information technologies but creating new industries through aggregating information and analyzing it is essential in enabling further developments, thus making data centers that are aggregation points of information more and more important not only within the information and communications industry but also to overall social and economic activities.

Because of these circumstances an environment in which services via information and communications networks can be provided from anywhere in the world to anywhere else in the world have been realized with the development of information and communications networks and the emergence of cloud computing. This means that more flexible business environments have also been developed for providers of services via information and communications networks. In contrast, however, services intended for end users in Japan can be provided not only from domestic data centers but also overseas data centers, thus meaning that data centers are being subjected to global competition.

Ignoring the need to revitalize domestic data centers in strengthening their competitiveness against stiff international competition could therefore have a significant impact on the development of the information and communications industry as well as the development of all industries within Japan. Issues with cases of data being provided from overseas data centers are as follows.



## **(1) Issues concerning development of service providers**

- In addition to information provided to users the collection/analysis of data pertaining to the service provision, including analysis of the status of use of information by users, etc., is a core business for providers of services via information and communications networks. Greater accumulation of data can be used to improve the services provided while analysing the data can lead to the development of services that meet the needs of users more aptly.
- Storing data at overseas data centers can result in the following issues.
  - [1] Japanese legislation only applies within Japan. In accordance with the legislation of the country where the data centers are established, therefore, the stored data may be subject to being requested to be disclosed or impossible to access from Japan.
  - [2] Extremely complex data analysis requires a very large number of communications, thus requiring a certain amount of time for the communications involved. The data analysis therefore needs to take place as near the location the data is stored as possible. Complex data analysis, involving the development of new services and discussion of new businesses, etc., therefore tends to take place at locations near data centers, which could result in the core business of data collection/analysis, etc. being capable of only taking place conducted overseas.
  - [3] Data collection and the establishment/operation of information systems could take place overseas and thus bases for acquiring skills and development of new technologies pertaining to them will no longer exist domestically, thus making domestic development of engineers involved in operating/developing them difficult. This could result in the domestic development of new experimental services also being difficult.
- The creation of domestic data centers that can then be used as bases for business environments which can also be used easily as overseas data centers is therefore extremely important in enabling service providers to autonomously develop services

## **(2) Issues concerning protection of rights of domestic end users**

- End users can receive services via information and communications networks without being aware of the physical location of data centers in which the servers providing the services are accommodated.
- Because of this use of services provided from servers accommodated in overseas data centers is considered to involve the following issues.
  - [1] End users expect to have their rights (rights in accordance with consumer protection laws and industry guidelines) secured to the same degree as in the real world against the various risks involved in receiving services via information and communications networks. However, Japanese legislation, etc. does not apply to services provided from overseas data centers, which could thus result in the revocation of the rights of end users.

[2] In addition, the time required for communications is proportional to the distance they have to travel. If services are provided using exactly the same methods those provided from locations closest to end users would be of the highest quality.

- Similar to original social and economic activities that are in place services used by end users being provided from domestic data centers is considered more desirable for end users in ensuring they receive the services without any undue worry.

### **(3) Issues concerning overall information and communications industry, including communications business operators**

- Providers of services via information and communications networks involve communication charges being directly paid to telecommunications carriers located where the data centers were established. However, the communication charges do not get distributed among all the telecommunications carriers involved in the traffic with these services.
- Inflow traffic from overseas to Japan therefore does not basically lead to any increased revenue for telecommunications carriers within Japan. In addition, an increase in inflow traffic from overseas over domestic networks will require domestic telecommunications carriers to invest in equipment in dealing with that increased traffic, despite it not leading to any increased revenue. The cost of that could therefore be passed onto to charges for domestically originating traffic, thus resulting in increased communication costs within Japan.
- In addition, new services via information and communications technologies are consistently emerging and enabling those with new service ideas to readily commence providing those services in an experimental manner is considered desirable. Enabling equipment for implementing service provision via information and communications networks, or domestic data centers, to be readily used is thus considered desirable in revitalizing the information and communications industry.
- Furthermore, the data centers in which systems required for implementing services via information and communications networks to be created can then be used as bases for developing information and communications engineers. A lack of such bases could make the development of information and communications engineers difficult, thus increasing the risk of those technologies being hollowed out.
- As indicated above it is desirable for the overall information and communications industries involved in traffic to Japan originate from domestic data centers.

### **(4) Issues concerning overall social and economic activities in Japan**

- Collecting and analyzing information on overall social and economic activities in identifying current demands and appropriately responding to needs is of the utmost importance to the creation of new industries. With modern society that has access to advanced information technologies data centers are the bases where information for analysis gets accumulated. Using

overseas data centers for social and economic activities within Japan therefore means that data which could be analyzed for use in creating new industries would be accumulated overseas, which could result in new industries being created overseas rather than in Japan.

- In addition, information and communications technologies are used not only in the information and communications industry but also in most social and economic activities, thus making further utilization of them essential in improving productivity. As described in (3), if the development of information and communications engineers were to prove difficult, the realization of improved productivity within Japan could also be difficult.
- Furthermore, Japanese legislation may not be applicable or it may not be clear whether it applicable or not to services provided using overseas data centers.
- The actual location where economic activities take place will therefore be unclear, with the countries in which the taxation rights of revenue from these services belong therefore also being unclear.
- At the same time services considered inappropriate within Japanese legislation and life styles may be provided from overseas data centers, thus making requesting termination of any such services, etc. difficult.
- As indicated above it would be desirable for overall social and economic activities involving services provided to Japan originate from domestic data centers.

#### **1.4 Identification of issues and direction of solutions**

While data centers are being subjected to global competition the importance of domestic data centers has been growing. Analysing internet traffic within Japan revealed that it had increased by a multiple of 4.3 over the five years of November 2004 through to November 2009. This is considered to be due to a consistent increase in the use of services provided via the internet. However, the percentage of inflow traffic from overseas to total internet traffic doubled from less than 20% in November 2004 to over 40% in November 2009, thus indicating that the use of services provided from overseas data centers has increased to be significantly more than those provided from domestic data centers.

At the same time large-scale business operators providing global services from overseas are starting to distribute their data centers internationally. Businesses originating in North American region, for example, can improve their continuity of service provision and reduce the time required for communications by establishing data centers in the three globally divided regions of North America, Europe, and Asia. Despite this, however, the percentage of inflow traffic from overseas has been increasing.

Because of these circumstances not just increasing use of domestic data centers but also increasing the percentage of services provided to Japan via information and communications networks from domestic data centers is considered necessary in improving the international competitiveness of the information and communications industry in Japan through providing

services intended for both overseas and domestic use from domestic data centers and protecting the rights of domestic end users.

The following two measures for use in revitalizing domestic data centers are therefore being considered:

- [1] Revitalizing domestic data centers through increasing the volume of data center usage by facilitating outsourcing of enterprise information systems
- [2] Improving competitiveness of domestic data centers with the aim of raising the percentage of domestic data centers to match the existing volume of data center usage

It was the most appropriate for the Study Group to discuss the measure of [2], or method of raising the percentage of domestic data centers.

## 2. Trends with major overseas data center business operators

Business operators providing services via information and communications networks through utilizing cloud computing or the services of “data centers” in a broader sense already exist overseas that are globally developing a broad range of businesses.

In a discussion on data center revitalization methods by the Study Group services provided using domestic data centers and services provided by global data center business operators from overseas data centers were compared from the point of view of the users of data centers within Japan with the aim of raising the percentage of services provided using domestic data centers and the percentage of global data center business operators providing services to Japan from domestic data centers.

The trends with and characteristics of major overseas business operators were therefore identified to be the following.

### (1) Google Inc.

- Google is engaged in businesses of collectively providing edited/processed information created by third parties mainly through information retrieval and with the aim of “being a total service provider over information and communications networks”.
- Google owns a very large number of servers, etc. that are used to collect a massive amount of information from the internet and provide end users with large amounts of data storage. It also owns its own data centers for use in accommodating them.
- In order to smoothly process massive amounts of information the load is distributed over a large number of servers and data centers. A very large number of servers, etc. therefore act in unison in responses to requests from end users.
- The availability of the system is secured by distributing massive amounts of information over a very large number of servers while also concurrently storing each piece of information on multiple servers. Services are not implemented using records that indicate the information individual servers store and instead by retrieving the required information from all the servers via search engine technologies. No one is actually therefore aware which piece of information is stored on which server and thus identifying in advance which servers will be used to implement services is difficult.
- Especially developed/manufactured servers are used to establish/operate such systems as they consist of an extremely large number of servers. Operating technologies for use in the thousands of servers being managed by a relatively small number of engineers have also been established. Efforts are being made to lower the cost of establishing/operating systems, including the introduction of “container-type data centers” that utilize containers used for export to instead accommodate servers, etc.
- Google is therefore providing various services via information and communications networks at an extremely low cost (free advertisement model) via use of search technologies and technologies that establish/operate systems as the core technologies.

- In contrast however, strict quality assurance is difficult due to the scale of the system when compared to methods of providing services using a smaller number of services. In particular, ensuring enough recovery time in advance in the case of a system failure is difficult.
- Efficient use of power and utilization of green electricity is being strongly promoted and at present the PUE<sup>1</sup> is believed to be less than 1.2.

## **(2) Microsoft Corporation**

- Microsoft was originally a software vendor but the progress of the internet has resulted in it now also providing various services via information and communications networks.
- With Office Suites (word processors and spread sheet software, etc.) in particular, Microsoft intends to provide them in two forms: those used as services via information and communications networks and those used after installing them on PCs.
- There can be a significant difference in the stability and speed of software and the secrecy of information between the cases in which they are provided as services via information and communications networks and cases in which they are executed on PCs at hand. Microsoft therefore plans to provide information processing environments by combining the advantages of both forms.
- Operating technologies for managing a large number of servers using a small number of engineers have been established in providing services via information and communications network via a free advertisement model, similar to Google. Efforts are also being made to lower the cost of establishing/operating systems, including the introduction of “container-type data centers” that utilize containers used for export to accommodate servers, etc.
- In addition, data centers are selected according to the quality required for services via information and communications networks. Services for Japan are partially being provided from domestic data centers in enabling the smooth provision of services that meet the legislation of regions in which the services are provided.
- Efficient use of power and utilization of green electricity is being strongly promoted and at present the PUE is believed to be less than 1.2.

## **(3) Amazon.com, Inc.**

- Amazon originally was an online shopping business operator selling books but now handles a diverse range of products and has become an integrated online shopping business operator. In addition, its sales system is also open to third parties and end users can freely compare and select products sold by Amazon or those sold by third parties. Amazon therefore also plays the role of

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<sup>1</sup> Power Usage Effectiveness: A value calculated by dividing the overall power consumption of data centers by the power consumption of servers, etc. A value close to 1 indicates less power is being consumed by equipment other than servers, etc., thus meaning that the data center is using the power in the most effective manner.

being a platform business operator for online shopping.

- In addition, based on information on products that users have purchased or viewed in the past Amazon also functions in automatically recommending products purchased by other users with similar behavior. Highly advanced systems have been established to match up the massive amount of behavior records of users.
- Furthermore, Amazon has started making a broad range of HaaS businesses available in flexibly renting out their information system processing capacity through utilizing their long-term experience as an online shopping platform with significant seasonal variations taken into account with the required information processing capacity, etc. and is already providing a large volume of information processing capacity at extremely low cost.

#### **(4) salesforce.com, Inc.**

- salesforce.com is a SaaS business operator whose core business is customer relations management and sales support software for enterprises. It is known as the first company in the world to be providing a SaaS business via cloud computing.
- At present it provides not only a variety of software in support of the core businesses of enterprises as a service but also platforms on which the software can be executed, including software provided by third parties or developed itself, as services (Platform as a Service).
- Not specifying the services to be used in providing the services enables information processing capacity to be flexibly increased or decreased according to the business peaks of the individual users, etc. In contrast to this the data centers and services can also be set in ensuring the provision of high quality and highly reliable services. Services that combine the advantages of cloud computing and conventional data center services can therefore also be provided.

### 3. Issues in revitalization of domestic data centers and direction of solutions

The result of analyzing the current situation surrounding domestic data centers toward revitalizing them clarified that issues to be solved exist, such as that domestic data centers have disadvantages in the business environment with regard to international competition, domestic data centers have not been able to produce the competitiveness that they inherently have, and the use of domestic data centers being limited by factors, .etc. The current situation with these issues and direction of solutions are as follows.

#### 3.1 Difference in business environments with regard to international competition

When compared to establishing data centers overseas the cost represented by the price of the land is generally higher with establishing data centers in Japan and constructing domestic data centers and providing services via them difficult due to systematic reasons, thus resulting in a disadvantage with regard to international competition. Solving these disadvantages is therefore expected to be a major issue.

##### (1) High cost

###### a) Current status

- Eligible locations for data centers over a wide area to a certain degree where stable electricity and communication networks can be secured at a low price are scarce and the price of land also high in Japan.
- Buildings need to be strongly-built to withstand natural disasters, including earthquakes and typhoons, and thus construction costs are relatively higher when compared to the cost of constructing data centers of the same scale overseas.
- Many of the servers and communication devices, etc. required in the providing services of data centers are manufactured in foreign countries. The cost of purchasing them, therefore, tends to be higher than the cost of purchasing them at locations where their vendors are located<sup>2</sup>.
- Statutory service life for servers and communication devices, etc. (nine years for communication equipment, five years for other servers, and 10 years for other communication devices<sup>3</sup>) is longer than the actual service life. Annual increases in the performance of these

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<sup>2</sup> According to information possessed by the members of the Study Group the price is at most twice as much as that as for procuring them in the U.S.A.

<sup>3</sup> Ministerial Ordinance concerning Durability of Depreciable Assets (Ordinance of the Ministry of Finance No. 15 of 1965)

Appended Table I Table of Durability of Depreciable Tangible Assets other than Machines and Devices  
Appliances and fixtures

(2) Office equipment and communication equipment                      computers (others) 5 years



devices are also significant. Rather than continuing to use multiple devices replacing them with a new device can provide higher performance but at less power consumption.

- Although the standard prices of electricity and communications are sufficiently low there are not many ways of procuring them at a lower price, such as large discounts for large-scale contractors or self established power plants, etc. In the case of large-scale facilities, therefore, electricity and communication costs will be higher when compared to overseas.
- In consideration of a global distribution of data centers establishing bases in the three locations of the U.S.A, Europe, and Asia is generally considered appropriate. However, the personnel expenses of employees involved are higher when compared to those in other Asian countries.
- In addition, the normal effective statutory tax rate, including local tax, is high at over 40% when compared with the corporate tax rate of Singapore, an Asian country that is actively attracting data centers.
- Furthermore, many foreign countries and regions are actively providing incentives in attracting data centers<sup>4</sup>. In Japan the availability of incentives remains unclear.
- In addition, domestic data center business operators are lagging behind with regard to acquiring technologies for use in realizing lowering the cost of operating/establishing systems and ensuring their smooth operation, including technologies for efficiently operating large-scale systems using a small number of engineers, etc., when compared to large scale overseas data center business operators. This could inevitably lower the cost competitiveness of domestic data center business operators, even if they provided the same level of business environments as available overseas.

#### **b) Issues to be solved**

- The cost of establishing data centers in Japan and providing services using domestic data centers is considered to be generally quite high.
- Various measures to use in attracting not only data center businesses but also various other industries have been taken by local governments. However, there is no means for those wishing to establish data centers to easily collect information on those measures being available. Ideal locations for data centers are therefore considered to remain unknown.
- Acquisition of technologies for realising lowering the cost of establishing/operating systems and smooth operation is considered not to have made much progress.

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Telephone installations and other communication equipment 10 years

Appended Table II Table of Durability of Machines and Devices

(35) Installations for communications industry 9 years

<sup>4</sup> In the U.S.A., for example, an environment in which incentives for establishing/operating data centers are readily available exists as the fixed property tax rate differs among local governments, while the tax rate can also be changed through negotiations, etc.

According to members of the Study Group the necessary conditions for subsidies are specified for individual business operators according to the number of employees in attracting data centers to Singapore.

### c) Direction in solving issues

- Individual data center business operators are naturally expected to reduce the cost themselves. Securing competitiveness, in particular, will necessitate efforts being made by individual business operators to acquire technologies that enable reducing the costs of establishing/operating systems.
- In contrast, however, discussing taxation support in alleviating the high cost of domestic data center businesses is considered desirable in improving the international competitiveness of data centers, which can now be freely located with the emergence of cloud computing, and revitalizing domestic data centers with consideration given to the cost of establishing the relatively expensive data centers and then providing services using them.
- Operating costs can be reduced by improving energy efficiency via new technologies, including servers and communication devices, etc., and in particular with regard to the processing capacity per unit of power consumption significantly increasing every year and reducing power consumption via direct-current circuiting power supply equipment and reviewing cooling methods such as air conditioning, etc. in data centers. However, the devices and equipment is not being replaced due to their long statutory service life, thus older less efficient devices and equipment may have to continue to be used. In view of promoting lower energy consumption discussing taxation support in facilitating the replacement of equipment to lower power consumption equipment, including reducing the period of useful service life and making replacement of fixed properties easier, etc., can be expected to occur.
- At present a portfolio for data center businesses is lacking, thus making identifying the total investment needed by data center businesses in Japan difficult. For this reason a tax reduction scale and return on investment cannot appropriately be estimated, even if tax incentive measures were to be used. Clarifying/verifying information on data center businesses available domestically and then discussing any required taxation measures using that information is therefore considered appropriate.
- Comprehensively collecting information on various measures to use in attracting data centers that have been taken by local governments, etc. is difficult for individual data center operators, and hence the relevant organizations of data center business operators, etc. are expected to collect that information in an integrated manner and make it available in ensuring various measures by local governments can be the most effectively and efficiently used.
- In addition, discussing the implementation of systems that enable data centers to be easily used in various ways and with the aim of developing engineers that can contribute to realizing lowering the cost and providing diverse services from data center businesses through acquiring technologies which enable effective and smooth service provision via data centers, including technologies for efficiently operating large-scale systems by a small number of engineers, etc., is considered important.

## **(2) Difficulty in establishing/operating data centers due to systematic factors**

### **a) Current status**

- In many cases legislation (including local government ordinances) that applies to data centers and data center businesses varies depending on the structure of data center buildings, services provided via information and communications networks using data centers, and regions where the data centers are located. Comprehensively identifying applicable regulations in advance is therefore difficult for data center business operators and users of data centers.
- Especially with overseas business operators that provide services via information and communications networks it will be difficult for Japan to be a candidate for data centers because there are no English documents available explaining the pertinent legislation applicable to establishing data centers in Japan and for then using domestic data centers.

### **b) Issues to be solved**

- Establishing data centers or providing services via information and communications networks using the abovementioned data centers will require investigation and discussion of applicable legislation and the cost of dealing with them at each individual location. It will therefore be difficult in many cases for individual data center business operators and users of data centers providing services via information and communications networks to utilize the results of past investigations and discussions.
- While the number of cases of domestic providers of services via information and communications networks using overseas data centers has been increasing the use of domestic data centers has not because Japanese legislation is considered unpredictable and the use of domestic data centers not considered subject to discussion, thus resulting in the market being dominated by overseas data centers.
- In addition, there are some regions where the demand for data centers is high but legislation is in place that make establishment of data centers difficult.
- For example, the Tokyo Metropolitan Ordinance on Environmental Preservation<sup>5</sup> obligates greenhouse gas emissions to be reduced at certain work places in achieving greenhouse gas emission reduction goals, which is considered to have had a certain effect on reducing greenhouse gas emissions in the region. Data centers contribute to overall reducing greenhouse gas emissions by aggregating and more efficiently operating servers, etc., which are a source of greenhouse gas emissions and have been distributed over wide areas, but the greenhouse gas emissions will then be aggregated in one location, thus making newly establishing data centers in Tokyo difficult if data centers were to be subjected to the obligation of reducing greenhouse gas emissions.

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<sup>5</sup> “Obligation for Greenhouse Gas Emissions Reduction and Greenhouse Gas Emission Trading System” in accordance with the “Ordinance on Environmental Preservation to Secure the Health and Safety of Citizens of the Tokyo Metropolitan Area”.

### **c) Direction in solving issues**

- Considering that a variety of legislations is established for specific purposes using a variety of domestic assumptions and data centers have been established to a certain degree under current legislation, revising overall legislation to allow for the development of data center businesses is considered unlikely.
- However, there is some legislation that is making implementation of data center businesses difficult, even if they are required for a specific purpose. Any such legislation will necessitate the relevant organizations of data center business operators, etc. taking the lead in logically presenting the requirements of data center business operators and requesting more acceptable revisions to be made.
- At present the demand for data centers is high in Tokyo. The Tokyo Metropolitan Ordinance on Environmental Preservation will necessitate explaining the more efficient energy use that will be made possible by aggregating servers, etc. in data centers using concrete figures and requesting sufficient consideration be given to greenhouse gas emissions reduction effects through not only use from work sites in Tokyo but also the use from workplaces outside Tokyo/Japan.
- In addition, establishing data centers in accordance with regionally applicable legislation and providing services using domestic data centers requires specific know-how. The relevant organizations of data center business operators, etc. should therefore promote accumulating the necessary know-how to deal with that legislation.
- In addition, although Japan has the most advanced information and communications environment in the world it has been pointed out that the energy of social and economic activities in Japan has not been fully displayed because the utilization of information and communications technologies has not been progressing rapidly enough. The development of systems that facilitate the smooth establishment of data centers in Japan and their utilization therefore need to be discussed. These measures will express Japan's intention of attracting data centers and thus effectively function as an appeal for its suitability for data centers.
- English documents, etc. that enable overseas service providers to readily use domestic data centers should initially be prepared by individual data center business operators as part of invitational packages in a competitive manner.

### **3.2 Insufficient solicitation of advantages of domestic data centers**

Similar to other industries in Japan domestic data center business operators provide high-quality services but the appeal of that quality has not been fully used. In addition, the advantages of using domestic data centers also have not been appealed to. This issue needs to be solved in thus enabling their competitiveness to be fully displayed.

## **(1) Appropriate solicitation of service quality**

### **a) Current status**

- Anyone intending to use services provided by data centers from Japan has the possible choices of either domestic data centers of domestic data center business operators or data centers of large-scale overseas data center business operators that are globally developing businesses.
- Services provided by domestic data center business operators are generally of high-quality and reliability but are considered to depend on the strong business consciousness of data center business operators or their employees, and are not reflected in contract related documents such as SLAs (Service Level Agreements). In addition, the content of services can vary among the different data center business operators and the acquisition of international standards (Tier Performance Standards<sup>6</sup>, TIA-942<sup>7</sup>, and CASBEE<sup>8</sup>, etc.) that overseas data center users refer to in procuring customers is not progressing among domestic data center business operators.
- Users of overseas data centers that intend to discuss the use of domestic data centers are in many cases already engaged in global businesses and possess the necessary know-how for use in collaborations between large numbers of workplaces through their original information systems. They typically request housing services used to accommodate these original systems that meet international standards.
- Data center business operators that are globally developing businesses provide services of various quality levels in parallel. Collectively requesting services to be provided by those business operators therefore results in the expectation that combined services from high-quality services through to services of reasonable quality at low price will be provided. These data center business operators are considered to be selected in many cases for this very reason.

### **b) Issues to be solved**

- Services provided by domestic data center business operators are of high quality and reliability but are not reflected in contract related documents such as SLAs. In addition, the method of explaining the content of services varies among the different data center business operators. It is therefore difficult for data center users to understand the level of quality the respective services are provided at.
- For this reason it is considered difficult for data center users to establish optimal systems via a combination of multiple data centers using domestic data centers.

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<sup>6</sup> Requirements for data center facilities compiled by the Uptime Institute in the U.S.A. Facilities are categorized into four categories, Tier I through IV, according to the required conditions.

<sup>7</sup> A standard for designing and constructing data centers established by the Telecommunications Industry Association (TIA) based on the four categories of the Tier Performance Standard. It became an ANSI (American National Standard Institute) in 2005 and is also known as ANSI/TIA-942-2005.

<sup>8</sup> Comprehensive Assessment System for Building Environment Efficiency. A tool for use in comprehensively evaluating the environmental efficiency of buildings established by the Institute for Building Environment and Energy Conservation. Similar evaluation systems also exist in the U.S.A. and U.K.

- Furthermore, the acquisition of international standard certifications that are referred to in procuring customers by overseas data center users is not progressing among domestic data center business operators. Domestic data centers are therefore considered to be excluded from being candidates for procurement even if Japan were to be selected as a possible location for establishing data centers.

### **c) Direction in solving issues**

- Developing systems that enable data center users to easily compare multiple data centers through standardizing terms related to data center businesses, matters to be presented in pre-publication documents, including catalogues, etc., content specified in SLAs and methods for describing it is considered desirable.
- These standards should include international standards that overseas data center users can easily understand and for domestic data center users to easily use in comparisons with overseas data centers with consideration given to data center business operators not having to acquire multiple certifications. Current international standards not matching domestic data center business environments leads to the consideration that revising international standards could be necessary.
- The data center market is a business sector in which free competition based on market principles predominates and hence the above standards will need to be established by the relevant organizations of data center business operators, etc. as a measure of enabling data center users to easily compare data centers.
- In addition, establishing systems for data centers with specific service levels that are in accordance with these standards being certified by third parties is considered desirable in presenting reliable data center businesses to data center users in an easy to understand manner.
- Platform functions that enable the provision of services for optimal data center usage by combining, for example, highly reliable but expensive data center businesses and very cheap but mediocre stability data center businesses are considered possible through the above measures.

## **(2) Solicitation of advantages of data centers located in Japan**

### **a) Current status**

- Many end users are using services provided via the internet without actually being aware where the data centers incorporating the servers are located. Service providers using overseas data centers without being aware of it due to the development of cloud computing technologies or end users using services over the internet without being aware of the location of the data centers suggests that end users can be considered to be using servers over the internet provided via overseas data centers without being aware of the possibility that domestic consumer protection laws do not apply or their rights are limited by the laws and regulations of where the data centers are located.
- At the same time, and if end users are not aware of the actual location of data centers, many

business operators that provide services over the internet compare domestic data centers and overseas data centers merely from the point of view of establishing services.

- A global distribution of data centers makes establishing bases in three locations in the U.S.A, Europe, and Asia typically considered appropriate. Japan has enough positives to be a candidate location for data centers, including an advanced infrastructure that would enable the smooth establishment of data centers and provision of services using data centers, an environment in which employees can comfortably live, and stable social conditions, etc., but large-scale data centers are yet to have been established by overseas data center operators that are globally developing services.
- In recent years, in particular, cold high latitude regions are being regarded as the new ideal location for data centers in reducing the power consumed in cooling data centers. Japan has regions that have all the positives of an advanced infrastructure that would enable the smooth establishment of data centers and provision of services using data centers, stable social conditions, and a cold climate that other Asian regions rarely have, but large-scale data centers are yet to have been established by overseas data center operators that are globally developing services.

#### **b) Issues to be solved**

- With regard to issues with using overseas data centers the understanding of end users and business operators providing services over the internet will need to be obtained. But even if business operators that provide services over the internet establish services using domestic data centers there is no means of appealing to the advantages of such services, for example domestic consumer protection laws being applicable, to end users.
- Although Japan is an ideal location for data centers in the Asian region with regard to the international distribution of data centers its characteristics are yet to have been fully utilized.

#### **c) Direction in solving issues**

- Establishing a system for use in indicating in an understandable manner that services are being provided via the internet and domestic data centers, or that is “services that can be used worry free” and to which domestic consumer protection laws apply, is considered desirable. Obtaining the understanding of end users that the services are protected by consumer protection laws will develop an environment in which services provided via the internet using domestic data centers are considered favourable. This could be considered to be the advantage of providing services for domestic end users using domestic data centers over overseas data centers.
- In this case establishment of certification systems by the government could result in the government selecting services that are preferable to the government from various and diverse services provided via the internet, and hence certification systems should be established by the private sector via a third party certification system.

- If indicating specifics only to end users in Japan proves difficult, for example with cases where the same services are provided worldwide, indicating in an easy to understand manner that domestic consumer rights can be secured via SLAs, etc. would be considered appropriate.
- In addition, broadly appealing to the fact that Japan is an ideal location for data centers in the Asian region and fully utilizing its advantages is considered necessary.
- In regions that are considered ideal for data centers, in particular, data centers that are capable of achieving high levels of energy conservation via use of new technologies can be established, for example data center business could be implemented using simple facilities such as container-type data centers by utilizing export containers at a low level of environmental impact. However, current legislation was established without assuming the emergence of these technologies. Developing these regions as “special zones” for which special incentives are available in enabling easier use of those technologies would therefore be considered. These measures would then express Japan’s intention of attracting data centers and thus effectively function in appealing to its suitability for data centers.

### **3.3 Issues limiting the use of domestic data centers**

When using data centers established in Japan systems that may subject acts involved in storing/sending data to criminal penalties, for example the Copyright Act, exist, which could curb the use of the data centers. This issue is, however, expected to be resolved.

#### **a) Current status**

- Services provided via the internet can be used globally. From the end users’ point of view services provided using domestic data centers and those provided using overseas data centers cannot be distinguished between.
- Because of these circumstances video picture distribution businesses using domestic data centers mostly distribute video pictures with cleared rights (examples: Yahoo! Video, NHK on demand, etc.).
- In contrast to that, however, many video picture hosting/distribution services (services that accept video picture contributions from end users and then make them available to others; examples: YouTube, Nico Nico Douga, etc.) use overseas data centers and many domestic end users are actively both contributing and viewing them.
- Under the current Copyright Act distributing content to the public without the consent of the rights holders (copyright holders or holders of neighboring rights) is an infringement of their rights (subject to criminal penalties) (Articles 2 and 23 of the Copyright Act). Therefore implementing distribution services where the consent of the right holder is difficult to obtain, for example video picture hosting/distribution services using domestic data centers, will be of high risk for distribution business operators.
- In the U.S.A. distribution business operators are exempt from any criminal liability for



distributing information without the consent of the right holder without being aware of the fact if they make specific efforts to prevent any infringement of rights and with the aim of eliminating information contributed without the consent of the right holder under the U.S. Copyright Act.

- Provision of services based on information contributed by end users, including video pictures, etc., necessitates the use of overseas data centers such as those in the U.S.A. rather than domestic data centers in avoiding any legal risk.

#### **b) Issues to be solved**

- Services that suit use of domestic data centers, for example services that accept contributions from domestic end users and then makes them available to other domestic end users, are actually being provided using overseas data centers, thus reducing revenue opportunities for domestic telecommunications carriers and data center business operators, and for data to be accumulated in Japan. This situation needs to be improved upon.
- At the same time the rights of holders that are protected by the Copyright Act in Japan are considered in practice to be not being secured by domestic legislation when overseas data centers are used to provide the services.
- In addition, if the rightholders request for protecting their rights, it must be handled by legislations of locations where data centers are established. Since languages, legal systems, business practices can vary conducting rights protection activities is considered to be difficult when compared to doing so in Japan.

#### **c) Direction in solving issues**

- Disrupting communications, etc. in disabling domestic use of services provided using overseas data centers is considered inappropriate from the point of view of the confidentiality of communications and fair use, etc. In contrast, works without cleared rights are being provided from overseas and thus the rights of the holders in practice not being secured. In consideration of this discussing methods of securing the rights of holders via domestic legislation while also enabling the provision of works using domestic data centers is considered desirable.
- In doing so establishing methods for use in enabling smooth service provision in cases where reasonable efforts are made to prevent any infringement of rights is considered worth discussion.
- Taking into consideration that at present discussion on the scope of fair use of works is taking place at the Subdivision on Copyrights, Council for Cultural Affairs of the Agency for Cultural Affairs, etc., establishing systems for specifically discussing this matter and holding careful discussions toward reaching a consensus is considered the expectation.

### **3.4 Other revitalization measures**

There appear to be other issues to be solved in revitalizing domestic data centers, although they

are not directly linked to the competitiveness of them. These issues are also expected to need to be solved.

**a) Current status**

- Virtual hosting services (hereinafter referred to as “HaaS”) using cloud computing technologies are rapidly being commenced upon.
- Business operators that are providing large-scale HaaS from overseas tend to be acquiring cloud computing technologies not just with the aim of providing cloud computing technologies to third parties but also with the aim of using the technologies as the primary users themselves. For example they are utilizing operational technologies acquired through the experience of establishing/operating systems in providing concrete services for use themselves in information systems for third parties.
- At the same time business operators that are providing large-scale HaaS overseas have technologies for use in operating extremely large scale systems with a relatively small number of engineers and are capable of providing necessary and sufficient processing capacity that users request at an extremely low price when compared to conventional hosting services through having developed technologies for flexibly setting the timing of service provision and processing capacity to be provided, and thus are of very strong cost competitiveness.
- In contrast to this, however, the provision of HaaS has domestically been commenced upon but many business operators have just commenced upon providing services and are at the stage of adding service menus through investigating services in demand in the market.

**b) Issues to be solved**

- With regard to acquisition of technologies for establishing/operating information systems, including cloud computing technologies, more concrete and superior technologies can be acquired through acquiring them via actually establishing/operating systems with the aim of providing concrete services rather than with the aim of providing them to the third parties.
- Furthermore, overseas large-scale SaaS business operators are considered to be of strong cost competitiveness through acquisition of superior operating technologies.

**c) Direction in solving issues**

- Considering that utilization of cloud computing technologies in Japan is still in its infancy rapidly compiling “requirements for ideal data centers” among the domestic HaaS providers and ASP/SaaS business operators that will be the main users of HaaS and facilitating establishment of data centers according to these requirements is considered desirable in enabling smooth provision of services which will then most suit domestic users.
- Labor division systems for efficiently establishing data centers, accumulating know-how on smooth service provision by the relevant organizations of data center business operators, etc.,

and efficiently providing services according to domestic users' needs will all need to take place.

- In addition, smoothly implementing the above labor division will require platform functions for use in providing overall optimal services by combining multiple data centers. Discussing the formulation of guidelines for use in enabling collaborated use of multiple data centers, including whether necessary or not, will need to take place by the relevant organizations of data center business operators, etc., in enabling single users to easily use multiple data centers in combination.

## **4. Ideal measure development in the future**

As described above data centers are the bases used to provide services via information and communications networks and are extremely important for the development of an information and communications industry that is inseparable with information and communications networks as well as the overall social and economic activities of Japan. In addition, data centers can be used from anywhere in the world regardless of their location. Bases for the information and communications industry will naturally concentrate in regions where data centers are developed and various social and economic activities facilitated.

As described in Chapter 1 highly aggregated large scale data centers can provide more advanced services at a lower cost. Once they are established, therefore, transferring them to other regions would prove difficult. For this reason the competitiveness of domestic data centers will need to be strengthened without a moment's delay while the establishment and expansion of data centers are rapidly progressing with the development of an information and communications infrastructure and the emergence of cloud computing.

In consideration of that concretely responding to the following issues in revitalizing domestic data centers is considered desirable.

### **(1) Response to difference in business environments with regard to international competitiveness**

- As described above the development of domestic data centers is essential in the development of the information and communications industry as well as overall social and economic activities of Japan. The relatively high cost of establishing domestic data centers and providing services using them therefore leads to taxation support, including reducing the period of service life, etc., in improving international competitiveness and revitalizing domestic data centers needing to be discussed. Facilitating the replacement of devices, etc. used at data centers to a smaller number of new high performance low power consumption devices would enable data center businesses to be implemented more efficiently at lower cost and contribute to improved energy efficiency, including lower energy consumption, etc. Administrative authorities will therefore need to discuss taxation support, including reviewing the statutory service life of the pertinent devices, etc., in thus making replacement of the devices used at data centers easier and with the aim of revising their taxation in around FY 2011.
- In addition, preparing statistic information, including estimates on data center business related investment, etc., will be necessary in making the estimates more effective in discussions held by the relevant organizations of data center business operators, etc., and with by the summer of 2010 being considered the most appropriate.
- In addition, enabling data center business operators to adequately utilize measures for use in attracting data centers taken by local governments will lower the cost of data center businesses and contribute to the revitalization of the regions where the data centers will be established.

Establishing mechanisms for identifying measures used to attract data centers taken by local governments, etc. and enabling various data center business operators to view them, etc. by the summer of 2010 is therefore considered appropriate. In addition, establishing a council consisting of these organizations, willing local governments, and the Ministry of Internal Affairs and Communications in promoting the smooth establishment of those mechanisms is considered desirable.

- Furthermore, the relevant organizations of data center business operators, etc. will need to request that any legislation which makes implementation of data center businesses difficult be changed through logically indicating the requirements of data center businesses to the competent authorities responsible for that legislation. Many business operators are requesting that application of the Tokyo Metropolitan Ordinance on Environmental Preservation, in particular, be revised or abolished. They should therefore make a unified effort to obtain understanding on the actual situation with data centers etc. The government will also need to continue to support activities in obtaining a broad understanding of the importance of those data centers.
- In addition, discussing legislation in enabling the smooth establishment and use of data centers in Japan in thus facilitating further revitalization of social and economic activities in Japan and utilizing domestic data centers as bases to develop information and communications engineers is considered necessary.

## **(2) Response to solicitation of advantages of domestic data centers**

- Clearly indicating the conditions of use of services provided to data center users will make use of them easier and contribute to more appropriate selection of data centers by data center users. Promoting standardization of terms related to data center businesses, matters to be presented in pre-publication documents, including catalogues, etc., content to be specified in SLAs and methods used to describe them with consideration given to conformance to international standards by the relevant organizations of data center business operators, etc. by the summer of 2010 is considered appropriate. The government is also expected to support these activities.
- In addition, making discussing mechanisms for use in certifying data center businesses that disclose information in accordance with standards and mechanisms for certifying services in thus providing data center businesses with certification as “services that can be used without any worries and to which domestic consumer protection laws apply” by these organizations in parallel with the aim of reaching a conclusion by the end of FY 2010 is considered appropriate.
- Enabling highly energy efficient data centers that can be selected by overseas users, including container-type data centers, etc., to be easily established in ideal locations for data centers is considered desirable. Discussions being held by administrative authorities on establishing a special zone system in enabling social proof-of-concept experiments for use in discussing the ideal method of establishing/operating data centers are therefore considered appropriate.

### **(3) Response to issues limiting the use of domestic data centers**

- Enabling works to be easily distributed from domestic data centers while securing the rights on works will expand the scope of data center businesses while also contributing to improved convenience for the end users. After completion of the Study Group the administrative authorities should therefore maintain systems for specifically discussing mechanisms to use in enabling works to be distributed easily using domestic data centers on the assumption that distribution business operators will make all reasonable efforts to prevent any infringement of rights, continue such discussions, and rapidly reach a conclusion in cooperation with the right holders.

### **(4) Response to other revitalization measures**

- In order to make services provided using domestic data centers meet the needs of domestic data center users the relevant organizations of data center users will need to compile “requirements for ideal data centers” and present them to domestic data center business operators by the summer of 2010.
- In addition, discussions should be held on the formulation of guidelines for use in enabling collaborative use of multiple data centers in thus enabling single users to easily use multiple data centers in combination, including whether necessary or not, by the relevant organizations of data center business operators, etc. and with the aim of reaching a conclusion by the end of FY 2010.

## ● Conclusion

As described in this report the emergence of cloud computing technologies is providing data center users with an environment that enables them to select the most appropriate data centers in the world. Data centers are considered most likely to be established in a distributed manner over the three regions of the U.S.A., Europe, and Asia in thus operating them via a global labor division system through which the most appropriate data centers can be used in the future. Because of this some foreign countries are actively attracting data centers through providing incentive taxation measures. However, large-scale data centers of global competitiveness are yet to have been established in Japan, even though the conditions for safely establishing data centers are adequate, such as being capable of establishing data centers and smoothly providing services using these data centers and social conditions being very stable, etc. Lowering the cost of establishing data centers in Japan and providing services via them through implementing the various measures described in Chapter 4 and enabling data centers in Japan that can face global competition with the advantage of scale through facilitating the development of environments which enable more smooth service provision will be important in solving this issue.

The Study Group expects that this report will contribute to economic growth in Japan by re-establishing information distribution bases in Asia through revitalizing domestic data centers, improving the competitiveness of the information and communications industry in Japan, and the development of environments in which the rights of users of services provided from domestic data centers are fully protected, etc. through the measures described in this report.

## • Glossary

(In alphabetical order)

Item	Page (first appeared)	Description
Availability	11	Assuring users access to information when required. Services that provide information are always available for use.
ASP [Application Service provider]	4	Business operators that provide business application software to customers via the internet.
CASBEE [Comprehensive Assessment System for Building Environment Efficiency]	19	Comprehensive assessment system for benchmarking building environment efficiency. A tool used to comprehensively evaluate the environmental efficiency of buildings that was established by the Institute for Building Environment and Energy Conservation. Similar evaluation systems also exist in the U.S.A. and U.K.
Collocation	4	Services that rent out locations for establishing servers connected to the internet. In addition to the physical location used to establish servers, communication networks and power supply equipments are provided in environments in which information security measures, including earthquake resistant facilities and room entry control, etc., are taken. Also known as “housing”.
Down sizing	3	Reducing the size of computer systems. Replacing centralized processing systems using mainframe computers with distributed processing systems using workstations and PCs, etc. in reducing the cost of information processing.
Green electricity	12	Electricity with low CO <sup>2</sup> emissions, including wind, water, and solar powered, etc.
HaaS [Hardware as a Service]	4	Services that partially rent out the functions/capacity of servers, etc., such as CPUs and storage. Also known as “virtual hosting”.
Housing	4	Services that rent out locations for establishing servers connected to the internet. In addition to the physical location used to establish servers, communication networks and power supply equipments are provided in environments in which information security measures, including earthquake resistant facilities and room entry control, etc., are taken. Also known as “collocation”.
Internet traffic	1	The volume of digital data, including voice, documents, and video pictures, etc., transferred over the internet. It is used to provide a rough idea of the status with use of communication networks. “Increased traffic” refers to a status wherein the volume of data over communication networks has increased.
ITU	1	International Telecommunication Union. A



[International Telecommunication Union]		specialized agency of the United Nations responsible for information and communication technologies whose main duties include [1] international frequency distribution, [2] telecommunications standardization, and [3] technical support for developing nations.
Open system utilization	3	Rather than establishing systems using the products of specific vendors whose specifications are not open to public systems (open systems) are used that consist of products of various vendors whose external specifications are open to public perusal.
Platform services (Platform as a Service)	13	Services that rent out platforms used to execute application programs.
PUE [Power Usage Effectiveness]	12	A value calculated by dividing the overall power consumption of data centers by the power consumption of the servers, etc. A value close to 1 indicates less power is consumed by equipment other than servers, etc., thus meaning that the data center has better power usage effectiveness.
SaaS [Software as a Service]	4	Services that provide the functions of application software via networks according to the needs of customers.
Scalability	5	Expandability of computer systems. Capability that enables users to use as much computer resources as they need and in a flexible manner according to the amount of work they need to do.
SLA [Service Level Agreement]	19	A system used by service providers to guarantee users of a service the appropriate quality by including in the contract service quality guaranteed items and provisions concerning reduction of usage fees in case they are not achieved, etc.
TIA-942	19	A standard used in the design and construction of data centers that was established by the Telecommunications Industry Association (TIA) which is based on four categories of the Tier Performance Standard. It became an ANSI (American National Standard Institute) in 2005 and is also known as ANSI/TIA-942-2005.
Tier Performance Standards	19	Requirements for data center facilities compiled by the Uptime Institute in the U.S.A. Facilities get categorized into the four tiers of I through IV according to the required conditions.
Virtual hosting	4	Services that rent out partial functions/capacities of servers, etc. such as CPUs and storage. Also known as "HaaS".