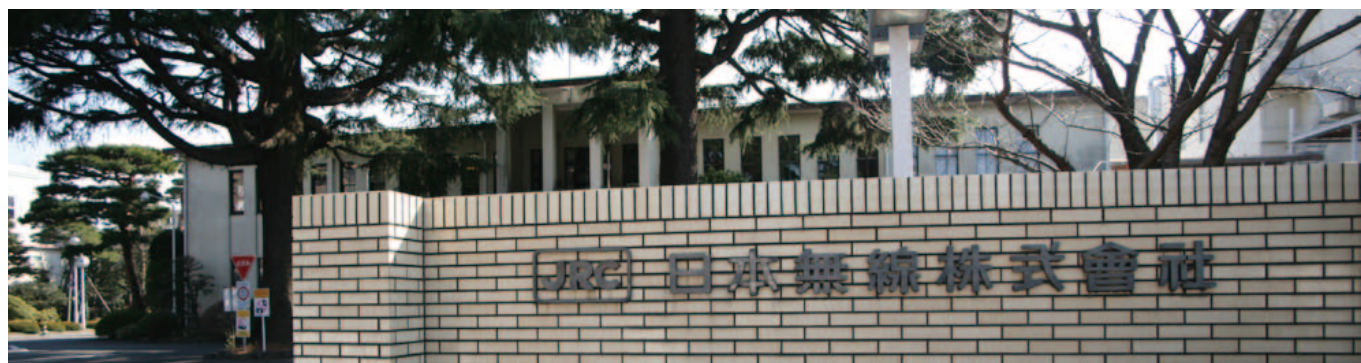


Integrated virtualization of about 300 in-house physical servers
with NTT DATA's BIZXAAS using Cisco UCS
Achieving an eco-friendly, next generation IT platform
by combining with a high-voltage direct current power supply



Installation Background and Challenges

- There were approximately 300 servers in-house, many of which were aging and in need of replacement. The servers were also scattered throughout the departments, and operations were managed individually.
- It was clear that replacing the physical servers as such incurs massive costs. It was also deemed necessary to review the management framework, implement disaster recovery (DR) measures, and reduce power consumption.
- To resolve these challenges, an investigation was launched aimed at the integrated virtualization of servers. To thoroughly reduce power consumption, Japan Radio Co., Ltd decided to introduce direct current (DC) in order to feed the servers.
- Regarding the construction and management of the new system, NTT DATA (who responded positively to the DC power supply) was selected as a system integrator with rich experience and results. Its BIZXAAS was adopted and Cisco UCS, which is DC power supply capable, was chosen for the physical servers for integrated virtualization.

Installation Solution

- Cisco Unified Computing System (UCS)
 - Cisco UCS 5108 Blade Server DC Chassis
 - Cisco UCS B200 M2 Blade Server
 - Cisco UCS 6248 Fabric Interconnect
 - Cisco UCS 2104 Fabric Extender
 - Cisco UCS Manager
 - Cisco UCS C200 M2 Rack-Mount Server (for the DR site)
- Cisco MDS 9124 Multi-Layer Fabric Switch (As of March 2012)

Effects of Installation

- With integrated virtualization using Cisco UCS, around 100 physical servers will be integrated into only seven machines. This makes it possible to reduce both the space of the server setup and power consumption.
- Thanks to the high-voltage direct current power supply (HVDC), energy efficiency was improved a further 10-20%.
- In addition to simplifying the physical structure of the system, the group of virtual servers can now be backed up as a whole. Thus, this makes the system for the DR site easily achievable.
- The adoption of BIZXAAS for the system construction and management enabled NTT DATA's know-how to be used and allowed the in-house managerial and administrative workload to be reduced.

Japan Radio Co., Ltd has broad-ranging business activities worldwide as a comprehensive manufacturer of system electronics. Here, more than 300 in-house physical servers are undergoing integrated virtualization with BIZXAAS, NTT DATA's comprehensive cloud service. For the platform, NTT DATA selected Cisco UCS (Unified Computing System) which is optimized for virtualized environment and has been used for its in-house IT system. In the first-year plan, it was decided that about 100 servers would be integrated into only seven blade servers (in theory, one blade chassis). What we want to focus on in this system is the adoption of the high-voltage direct current power supply (HVDC). This will reduce power supply loss by 10-20% and achieve an eco-friendly IT platform. In the future, the remaining servers will be sequentially integrated into the new system, and we will also consider providing know-how on the use of HVDC to other companies.

With virtualization, pursuing greater reduction of power consumption Shift to the high-voltage direct current power supply

Limiting the power consumption of data centers continues to pose a crucial managerial challenge to many IT-driven corporations. Increased power consumption is linked to higher CO₂ emissions, which is a factor in environmental degradation. It also increases power costs. The importance of this challenge has been significantly heightened since the Great East Japan Earthquake.

One means of resolving this issue, which has been receiving increasing attention, is the integrated virtualization of servers. If high-performance servers are adopted and multiple existing servers are operated through virtualization, the number of devices in data centers can be greatly reduced and power consumption can be diminished. However, taking this to the next level, other approaches are at the forefront to further improve energy efficiency. Taking the initiative in this area is Japan Radio Co., Ltd.

The company was founded in 1915 as a comprehensive manufacturer of system electronics. Japan Radio Co., Ltd has a broad-ranging business worldwide, from state-of-the-art communications equipment, such as PHS and ETC, local disaster prevention information systems of high public benefit, to marine leisure products popular throughout the world. Their foundations lie in comprehensive technological strength cultivated through many years of developing wireless communication systems.

So, by what means is Japan Radio achieving improved energy efficiency? The answer is by utilizing a direct current power supply. For the integrated virtualization of in-house servers, NTT DATA (which has rich experience and results in the construction and management of IT platforms) was selected and its BIZXAAS was adopted to construct private clouds. For the platform, Cisco UCS was adopted, which is direct current power supply capable, and a high-voltage direct current power supply (HVDC)

"The decision to install the HVDC system was made to minimize power consumption. The eco-friendly IT platform we have achieved will surely be a reference for other companies."



Mr. Hajime Baba
General Manager
IT Promotion Department
Japan Radio Co., Ltd

"In the future, we want to make HVDC a pillar of business. Working with NTT DATA group and Cisco, we definitely hope to expand the HVDC-driven eco-friendly IT platform."



Mr. Atsushi Ito
Manager
HVDC Project Team
Solution Business
Division
Japan Radio Co., Ltd

"Recently, all data centers have seen rising power costs and power installation maintenance costs. The direct current power supply system is a crucial technology in reducing such costs."



Mr. Yasunae Terada
Deputy Manager
System Platforms Sector
NTT DATA Corporation



Japan Radio Co.'s 'FRESH HVDC' supports the supply of high voltage DC power to servers. The 'FRESH HVDC' converts AC power into high voltage DC power, which is instantly fed to the server rack. As the AC/DC conversion occurs only once, energy efficiency is potentially heightened.

jointly developed with Japan Radio Co., Ltd and NTT DATA Intellilink Corporation was combined. Through this, the loss due to AC-DC conversion is minimized. This adoption of HVDC power supply systems is the first commercial installation in Japan.

The trigger for launching this project is described by Mr. Hajime Baba, Japan Radio Co., Ltd. IT Promotion Department Director: "At Japan Radio, we took an inventory of the system in December 2010. The results made it clear that there were about 300 servers scattered throughout the company, of which around 40% were more than five years old. There were also a large number of servers managed by individual departments, and the data backup and maintenance system was also in need of update."

To solve this problem, Japan Radio IT Promotion Department created a server integration policy. The policy was proposed to the management team and approved the morning of March 11, 2011. This was just before the Great East Japan Earthquake. Surprisingly, the details of the proposal seemed to predict the future situation in Japan.

Positive attitude toward handling a direct current power supply was valued and the adoption of NTT DATA's proposal was decided

Mr. Baba reflects, "Broadly speaking, there were four issues we were aware of at the time."

First was the reduction of TCO. Though many of the in-house servers were aging and in dire need of replacement, proceeding with a like-for-like replacement would incur huge costs. Limiting such costs was required.

Second was the operating efficiency. Servers were installed into multiple sites, operations management was also fragmented, and burdens were increasing. Likewise, the method of using physical servers in such a state caused difficulties when servers handled sudden increased demand.

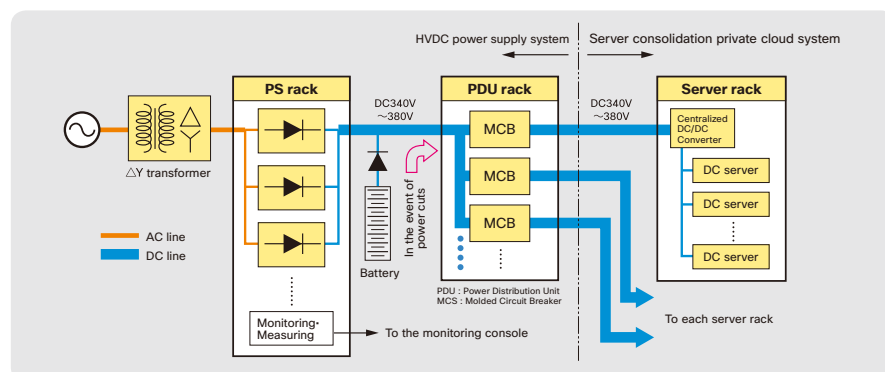
Third was the implementation of disaster recovery (DR) measures. If there is no thorough backup system in place, there is a risk that business will come to a halt in the event of widespread disaster. Such eventualities must be avoided.

Fourth is to become more eco-friendly. Mr. Baba adds, "We decided to install the HVDC system in order to minimize power consumption."

In April 2011, an RFP was created that incorporated these details, and this was presented to several IT vendors on May 16. In July 2011, the decision was made to adopt BIZXAAS, proposed by NTT DATA from among around 10 company proposals. The main reasons were the experience and results of NTT DATA, and their positive response to handling HVDC.

"NTT DATA has a history of providing direct current power supply servers, and know-how related to direct current power supplies has been acquired through NTT DATA Intellilink Corporation's experience and development," comments Mr. Yasunae Terada of NTT DATA who had presented the system to Japan Radio. Mr. Fumio Mura of NTT DATA Intellilink Corporation, which provided the server power supply technology, described this know-how as follows:

"Previously, DC power supplies were considered to be more prone to causing flames and electric shock than AC ones, due to 'discharge phenomenon,' an arc generated



Power supply system for the newly constructed system. High-voltage direct current power is supplied to the server rack using HVDC, and the voltage is converted in the rack and supplied to the servers. The backup battery for power outages is also connected through a simple structure using a single diode.

"There are numerous proven results on using BIZXAAS with Cisco UCS, so we made this proposal with confidence. It is also equipped with the optimal features for integrated virtualization."



Mr. Tetsuo Fukumi
Assistant Manager
System Platforms Sector
NTT DATA Corporation

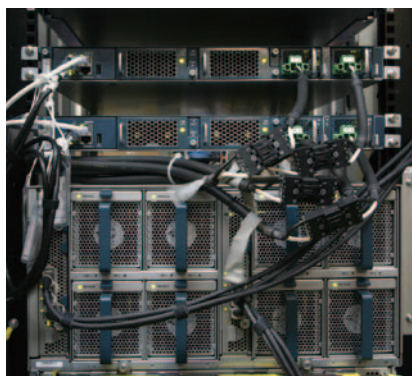
"We achieved a DC power supply that is safer than AC power supplies. This is also featured in the new system."



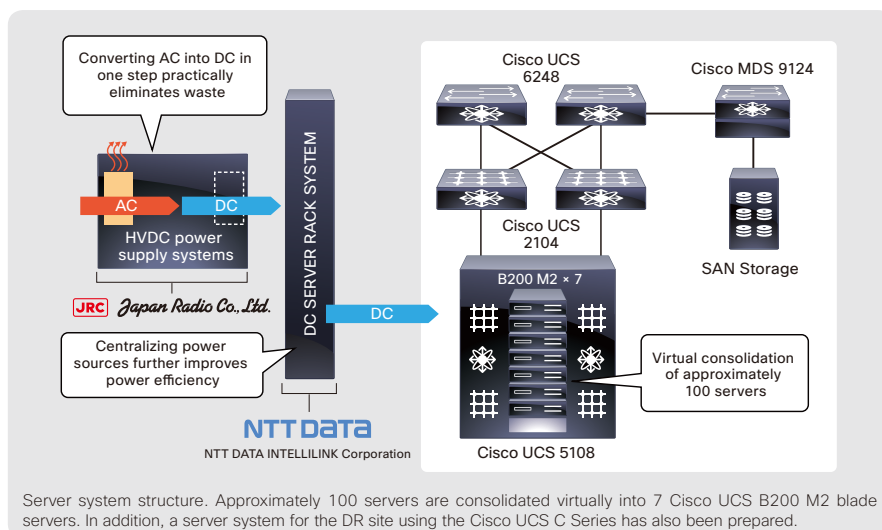
Mr. Fumio Mura
Group Manager
Green Consulting
Business Unit
Solution Business
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Corporation



Front view of the Cisco UCS. 2 Cisco UCS 6248 units at the top, with 7 Cisco UCS B200 M2 units stored in the blade chassis underneath.



Rear view of the Cisco UCS. DC power is supplied via a black cable and connector.



when switching off DC current at certain timings. This is why direct current power supplies are not widely used. However, these and similar problems can be avoided through adequate planning and installation. We have achieved a direct current power supply that is even safer than an alternating current power supply using a method called the 'midpoint grounding,' an arc prevention mechanism comprised of only three components, and wiring inside the rack using a safety voltage of DC 48V or less. These are also featured in the system at this time."

On the other hand, Mr. Baba commented, "We also valued the cost benefit, compared with carrying out all the server construction and management ourselves." He explained that the adoption was supported by the utilization of NTT DATA's system construction and management know-how, which allowed for smoother integration of the servers while reducing the in-house management burden.

Construction of the system started in August 2011, and equipment installation began in September. The pilot system was completed in December. Here the integrated virtualization of around 20 servers was carried out, and test runs were performed. Full-scale server migration is undergoing in January 2012.

Integration of approximately 100 servers into 7 blades Reduced power consumption by 70% or more

The physical servers for the integrated virtualization adopted the direct current power supply servers provided by NTT DATA and Cisco UCS. At present, seven UCS B series blade servers are in operation, and 100 additional servers are planned for integrated virtualization in the first year. As the server for the DR site, the Cisco UCS C series Rack Server was adopted. Presently the new server is being operated in the same in-house data center for the test run, however off-site housing is planned for the future.

So why did NTT DATA propose the Cisco UCS as the server for integrated virtualization? One reason is that, as Mr. Terada explains, Cisco was also positive about handling the direct current power supply: "When we were going to make the proposal in May 2011, we approached Cisco who immediately committed to embracing it."

Mr. Tetsuo Fukumi of NTT DATA added, "There are numerous proven results on using BIZXAAS with Cisco UCS, so we made this proposal with confidence. NTT DATA Intellilink Corporation, who worked with us to construct the system, had also retained Cisco UCS know-how. The memory capacity is larger than that of competitor server products, and it is equipped with the optimal features for integrated virtualization, with simple top-of-rack network cabling/configuration, and easy configuration of the centralized virtualization settings of the server network."

Power is supplied to the server as follows: first, the alternating current power source is converted into a direct current high voltage of 340V using the Japan Radio HVDC power supply system; this is introduced into the integrated power distribution system in the server rack. Here, the voltage is converted to safer levels and distributed to the servers. The advantages of high-voltage between the power supply and power

Japan Radio Co., Ltd



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Main Office: Fujizawa Bldg, 4-30-16, Ogikubo, Suginami-ku, Tokyo

Mitaka Plant: 5-1-1, Shimorenjaku, Mitaka-shi, Tokyo

Founded:

December 1915 (Taisho 4)

Capital:

14.704 billion yen

Number of employees:

non-consolidated: 2851, consolidated: 3766 (as of March 2011)

Turnover:

non-consolidated: 99.637 billion yen, consolidated: 107.705 billion yen (as of the March 2011 period)

A long established manufacturer and distributor of wireless communication systems. Displaying collective strength in system electronics while accomplishing unique expansion and deploying worldwide projects in a broad range of areas, from the latest state-of-the-art communications equipment, such as PHS and ETC, and local disaster prevention information systems of high public benefit, to marine leisure products popular throughout the world. Also, actively advancing environmental approaches, providing approaches for private clouds using highly energy-efficient high-voltage direct current power supply systems.

distribution are, as Mr. Mura explains, “that it is connected by fine wiring capable of limiting the current, and that it enables long distance power supply.” This system also achieves a supply of power between floors, with the power supply system on the first floor and the server room on the second floor.

The reduced number of physical servers thanks to integrated virtualization of the servers is expected to reduce power consumption by 70% or more compared with simply replacing the physical servers. Mr. Baba indicated that HVDC and the related equipment of the direct current power supply server will also provide 10-20% higher power efficiency compared with an alternating current power supply. He also explained the major advantages of having a seamless connection to a backup battery in the event of power loss (a switchover process occurs with an AC power supply that is not necessary with a DC power supply) and simple connection to renewable energy sources such as solar panels.

Mr. Terada remarked, “Recently, all data centers have seen rising power costs and power installation maintenance costs, and these costs commonly account for more than half of all costs related to data center operation.” He indicated that the direct current power supply system reduces these costs and will be a crucial technology for the future.

Improved operability and easily achieved disaster recovery Planning to present this experience actively off-site

Of course, the advantages of server integration are not only reduced power consumption. Operability also improves dramatically.

“We have scheduled power outages twice a year at the plant, and previously many servers needed to be shut down manually. There were also different administrators for each server, which made this a difficult task. However, under the new system, this procedure can be performed simply. Likewise, if the new server is needed temporarily, the configurations preset with UCS can be copied and reused, and the virtual machine can be started up simply, without individually configuring each network,” Mr. Baba says.

It is also important to note that integrating the servers and reducing the number of units reduced the installation space. Only two racks are needed to operate roughly 100 virtual machines, including storage. The server system for DR is contained in only one rack.

The number of servers will be gradually expanded in the future, and the plan is to eventually achieve integrated virtualization of all 300 machines. On the other hand, Japan Radio Co., Ltd is also considering providing this system construction know-how and HVDC system to other companies.

“In the future, we want to make HVDC a pillar of business,” says Mr. Ito, the Director of the Japan Radio HVDC Promotion Project Team. He explained that, with overseas expansion in mind, Cisco UCS, which is among the first to adopt HVDC and can be procured globally, can have a major impact.

They gave their closing thoughts as follows: “The eco-friendly IT platform we have achieved will surely be a reference for other companies” (Mr. Baba). “Working with NTT DATA Group and Cisco, we definitely hope to expand an HVDC-driven eco-friendly IT platform” (Mr. Ito).

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